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User Manual

Tektronix

ATM150
ATM Cell Generator and Analyzer

070-9399-01

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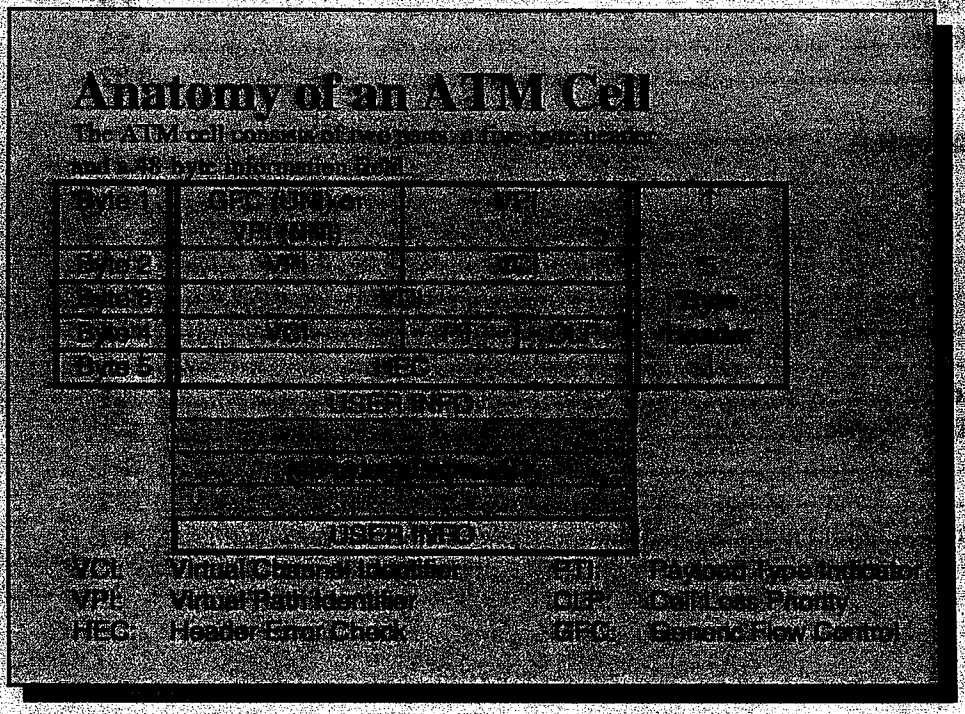
ATM150

ATM Cell Generator/ Analyzer

User Manual

Tektronix

Microwave Logic Products



Part Number 070-9399-01

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Contents

Software Revision List
Revision History/ Legal/ Disclaimer/ Safety Practices, including Laser Safety/ Reader Comment Card
General Safety Procedures

1. Introduction

Functional Description of ATM150 1-1
Diagrams of front and rear panels 1-3

2. Getting Started

Operating Basics 2-1
Quick Start 2-3
System Performance Verification (Instrument Test) 2-13

3. Reference

Front Panel 3-1
Generator 3-3
Analyzer 3-3
Utility 3-6
Menu Structure
Generator Softkeys 3-9
Analyzer Softkeys 3-22
Rear Panel 3-32

4. Applications & Examples

Appendices

A. ATM Basics A-1
B. Specifications B-1
C. Default Settings C-1
D. Block Diagram D-1
E. Remote Commands E-1
F. Service Information/ Warranty F-1
G. RS-232 Interface G-1
H. GPIB Interface H-1
I. Options I-1

Glossary
Index

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Safety Practices, including Laser Safety

When operating the ATM150, always follow these safety practices.

AC Power

The instrument is designed to be powered from 90-125 or 220-240 VAC; 300 VA max. Voltage switching is automatic. There is no voltage switch.

Ground the Instrument

The ATM150 is grounded through its AC power cord. Plug this power cord only into a properly grounded, three-conductor outlet. If you operate the instrument without a proper ground then should there be a fault in the instrument, there is the potential that all metal surfaces on the instrument can become a potential shock hazard.

Use the Proper Fuse

Operating the instrument with an improper fuse creates a fire hazard. The correct fuses to install in the ATM150 are shown below:

Power Voltage	Fuse Type
115 VAC	5AT, 250 VAC
230 VAC	2.5 AT, 250 VAC

Note

The ATM150 test set is equipped with optical test capability. Use an optical patch cord with a 7 to 10 dB optical attenuator when testing the optical interfaces.

Use Proper Caution When the LASER Output is On

Never look directly into the laser output of your instrument, or into the output of an optical patch cord connected to this output. If your instrument is equipped with an optical option, the laser output can cause permanent damage to your eyes if you do not following these precautions.

Do Not Operate in Explosive Atmospheres

This instrument does not provide protection from static discharges or arcing components and therefore must not be operated in an explosive atmosphere .

Do Not Remove Instrument Covers

To avoid a shock hazard and to maintain proper air flow, never operate the ATM150 with any of its metal covers removed. There is a plastic cover that protects the front panel while the test equipment is not in use. This plastic cover must be removed in order to access the controls on the front panel of the ATM150.

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Laser Safety

To prevent personal injury, ensure the following information is reviewed before operating the module.

The Microwave Logic ATM150 is classified as a Class I product as per the United States Food and Drug Administration (FDA) Standard 21 CFR Ch 1040.10. The FDA definition of Class I product is that Laser radiation in excess of 195 uW (at 1310 nm) shall not be accessible during operation, with any controls set to give maximum radiation. The maximum power emitted from the Microwave Logic ATM150, when measured at 20 cm from the Tx Laser aperture is -17dB (19 uW). The laser radiation emitted from the Microwave Logic ATM150 aperture when the fiber optic cable is disconnected has a wavelength of 1310 nm, which is in the near infrared spectrum and is invisible.

CAUTION: The use of optical instruments with this product will increase eye hazard.

The module incorporates two safety mechanisms to prevent accidental or unauthorized emission of laser radiation. These are listed below:

Laser Safety Mechanisms

Laser Radiation Emission Warning Indicator	The "LASER ON" LED on the front-panel of the test set indicates the laser is activated.
Cover on Optical Out Connector	This cover must be in place whenever the optical output port is not in use. The cover must be removed by hand when connecting an optical cable to the Optical Out connector. ENSURE THE LASER IS DEACTIVATED before making the connection.

General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Use Proper Voltage Setting. Before applying power, ensure that the line selector is in the proper position for the power source being used.

Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Ground the product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth gruond. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

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The common terminal is at ground potential. Do not connect the common terminal to elevated voltages (see Specification section for further details).

Safety Certification Compliance

Category	Description
Temperature (operating)	5 to +40°C
Altitude (maximum operating)	2000 meters
Equipment Type	Test and Measuring
Safety Class	Class I (as defined in IEC 1010-1, Annex H) - grounded product
Overvoltage Category	Supply Input - Overvoltage Category II (As defined in IEC1010-1, Annex J) Measuring Inputs - Overvoltage Category I (As defined in IEC1010-1, Annex J)
Pollution Degree	Pollution Degree 2 (as defined in IEC 1010-1). Note - Rated for indoor use only

Low Voltage Declaration

Category	Description
EC Declaration of Conformity - Low Voltage	Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities; Low Voltage Directive 73/23/EEC EN61010-1/A1 Safety requirements for electrical equipment for measurement, control, and laboratory use

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Safety Standards

Category	Standards
U.S. Nationally Recognized Testing Laboratory Listing (NRTL)	UL 1244 - Electrical and Electronic Measuring and Testing Equipment
Canadian Certification	CAN/CSA-22.2.No. 231 CSA Safety Requirements for Electronical and Electronic Measuring and Testing Equipment

Warning and Caution Labels

Paragraphs or sections in the ATM150 User's Guide that contain important safety information will be identified by either a CAUTION or a WARNING label in the left hand margin. These labels are explained below:

Icon	Label	Meaning
	**WARNING!**	Indicates a safety practice that must be followed to avoid **possible injury** to the user and possible damage to the instrument.
	**CAUTION!**	Indicates a safety practice that must be followed to prevent **possible damage** to the ATM150 or other instruments used with the ATM150.

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Please circle one number for each statement.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The manual is well organized.	1	2	3	4	5
I can find the information I want.	1	2	3	4	5
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I can easily understand the instructions and procedures.	1	2	3	4	5
The instructions are complete.	1	2	3	4	5
The manual is clearly written.	1	2	3	4	5
The concepts and vocabulary are easy to understand.	1	2	3	4	5
The examples are clear and useful.	1	2	3	4	5
The manual contains enough examples.	1	2	3	4	5
The illustrations are clear and helpful.	1	2	3	4	5
The manual contains enough illustrations.	1	2	3	4	5
The layout & format enhance the manual's usefulness.	1	2	3	4	5
The information in the manual is accurate.	1	2	3	4	5
The manual, taken as a whole, is a good learning tool.	1	2	3	4	5
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The quality of this manual would influence any repeat purchase decision.	1	2	3	4	5
This manual meets my overall expectations.	1	2	3	4	5

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ATM150 Cell Generator and Analyzer

meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility and Low Voltage Directive 73/23/ECC for Product Safety. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EMC Directive 89/336/EEC:

EN 55011	Class A Radiated and Conducted Emissions
EN 55011	Class B Radiated and Conducted Emissions

EN 50081–1 Emissions:
EN 55022 Class B Radiated and Conducted Emissions
EN 60555–2 AC Power Line Harmonic Emissions
EN 50082–1 Immunity:
IEC 801–2 Electrostatic Discharge Immunity
IEC 801–3 RF Electromagnetic Field Immunity
IEC 801–4 Electrical Fast Transient/Burst Immunity
IEC 801–5 Power Line Surge Immunity

Low Voltage Directive 73/23/EEC:

EN 61010–1	Safety requirements for electrical equipment for measurement, control, and laboratory use
EN 61010–2–031:1994	Particular requirements for hand–held probe assemblies for electrical measurement and test

Tektronix, Inc. claims compliance to the EMC Directive 89/336/EEC for the following products when they are used with the above named product:

High–quality shielded cables must be used to ensure compliance to the above listed standards.
This product complies when installed into any of the following Tektronix instrument enclosures:
1700F00 Standard Cabinet
1700F02 Portable Cabinet
1700F05 Rack Adapter

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1. *Introduction*

Functional Description of ATM150

Powerful, programmable, and portable, the ATM150 from Tektronix is a generator/ analyzer for real-time Asynchronous Transfer Mode (ATM) testing. The ATM150 is optimized to stress and evaluate ATM cell switching networks and network components.

Standard Features

- Portable, economical ATM test set
- Current operation up to 155.52 Mbps
- Six interface **options** available now include:
  - DS3 with or without PLCP
  - DS1 with or without PLCP
  - E1 and E3, with or without PLCP
  - 100Mbps fiber (TAXI)
  - 155.52 Mbps SONET OC-3c/ SDH STM-1
- Cell Delay Histogram for performance benchmarking
- Measures Quality of Service parameters, including cell losses, cell delays, and cell errors
- CCITT/ITU, ANSI, and ATM Forum compliance
- Internal hard drive and built-in 3.5" disk drive for software upgrades, test data storage and instrument setup storage

Generator

The generator creates a constant stream of 53-byte ATM cells with standard CCITT or ANSI cell headers. These cells are mapped into a variety of physical interfaces, selectively using the SONET ATM mapping or the Physical Layer Convergence Protocol (PLCP). The ATM150 supports cell data rates up to 155.52 Mbps.

The ATM150 generates up to 8191 different cell headers and one is reserved for idle cells for a total of 8192. Up to four can be used for test cell VPI/VCI addresses and the remainder can be programmed for background traffic, allowing analysis at four destinations from one generator.

The generator produces a wide range of statistically defined traffic patterns. The user can vary the average and peak bandwidth as well as the degree of burst to emulate Constant Bit Rate (CBR) or Variable Bit Rate (VBR) traffic approximating uniform, Gaussian, Poisson, or user-defined distributions.

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Test cell information fields contain a time-tag, used to calculate cell delay times and delay variations, and a sequence-tag to allow detection of lost cells. The remainder of the field is encoded with a pseudo-random number sequence to allow cell error detection. HEC and cell payload errors can be generated to stress and evaluate network performance.

Analyzer

The analyzer synchronizes and delineates the ATM cells from the selected input using the SONET ATM mapping or the Physical Layer Convergence Protocol (PLCP). Header Error Control (HEC) errors are detected and counted. Physical layer (SONET, DS-3, and PLCP) alarms and errors are detected.

Valid cells matching one user-selected VPI/VCI (test cell) are detected, counted and routed for further analysis. Valid active cells not matching a programmed VPI/VCI are counted as misrouted and discarded. Valid idle cells are counted and discarded.

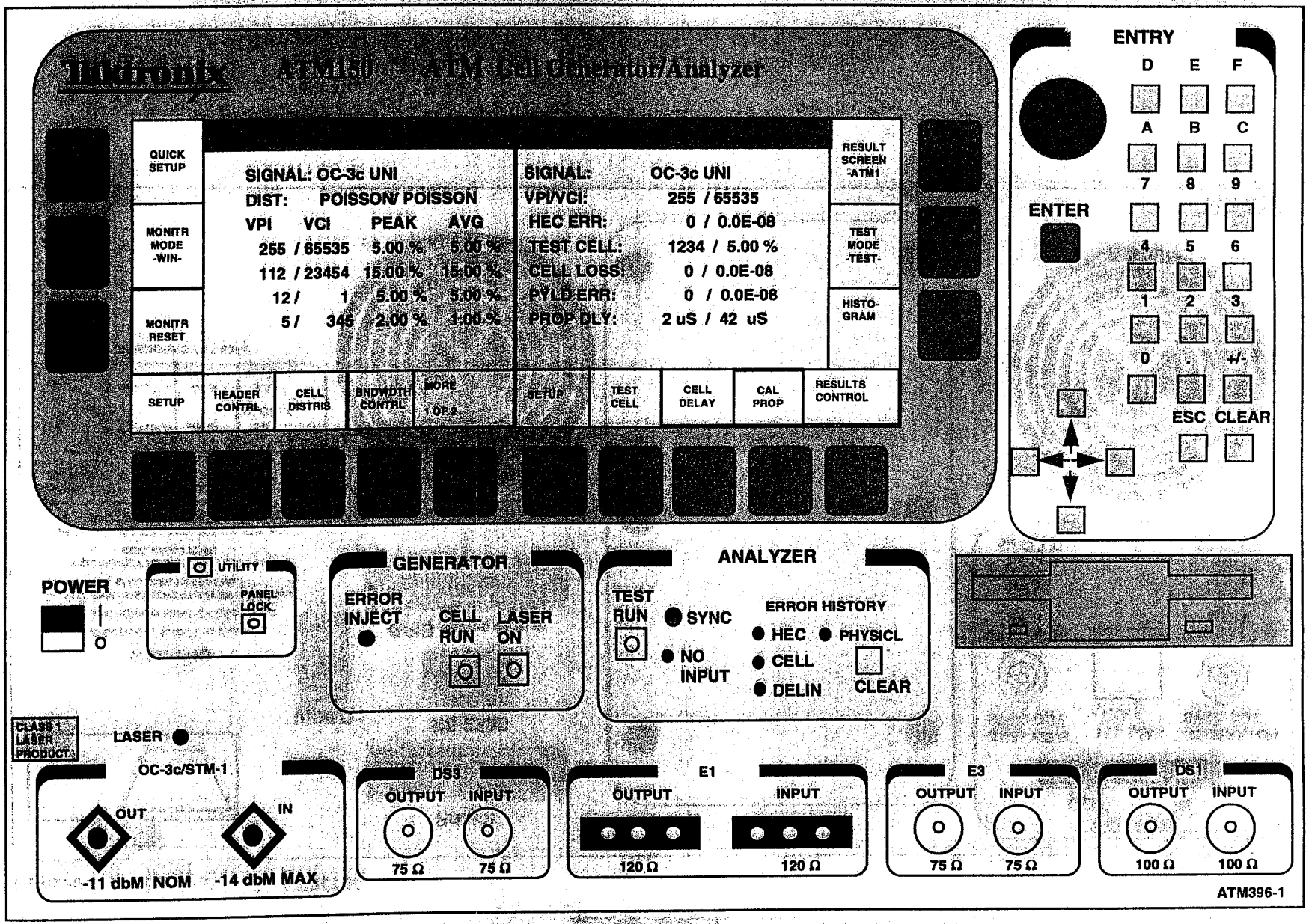
Circuitry compares the test cell payload data with a reference pseudo-random number sequence to detect ATM cells with bit errors. These errors are counted for cell error ratio calculations. The cell time-tag is compared to the reference clock to determine the cell delay. The calculated delays are stored in variable-sized bins for cell delay variation (jitter) analysis. Lost cells are detected by ensuring the current sequence-tag is one greater than the sequence-tag from the previous test cell. Sequence errors are detected and counted for cell loss ratio measurements. An on-board DSP accumulates and processes the cell data for statistical measurements.

Interfaces

The instrument includes a high resolution LCD display for the user interface, which features softkeys and pop-up menus. The 3.5" MS-DOS compatible floppy disk drive can be used to store test results, save test setups and transfer test data to a personal computer for further analysis. Also included are RS-232 and GPIB interfaces, which can be used for downloading test data or automated remote control.

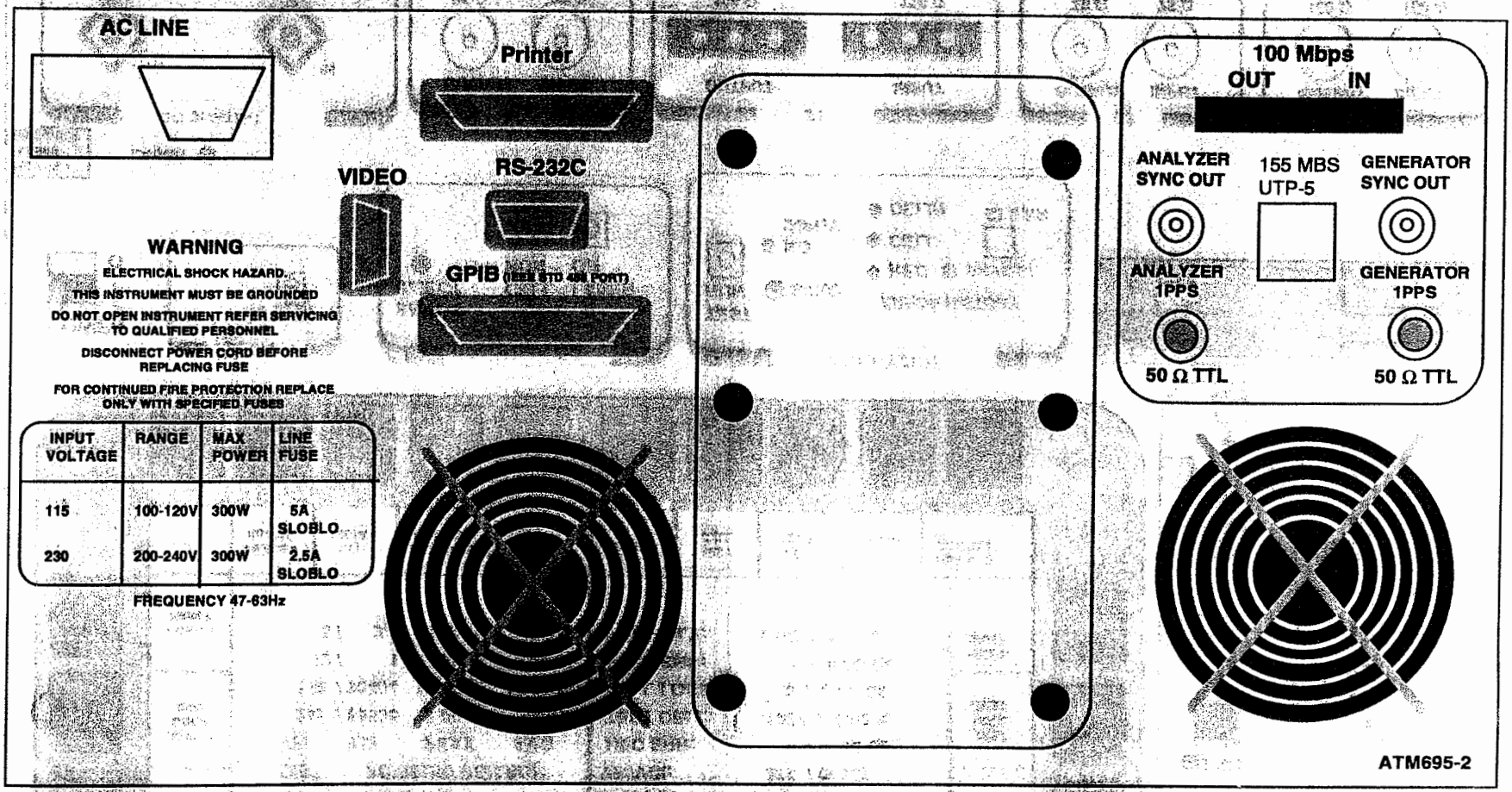
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Figure 1-1 -- Front Panel - ATM150



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Figure 1-2 -- Rear Panel - ATM150



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2. *Getting Started*

Operating Basics

This section briefly introduces the front panel of the ATM150. Knowledge of the front panel will help in the Quick Start exercise that follows this information.

ATM150 Front Panel

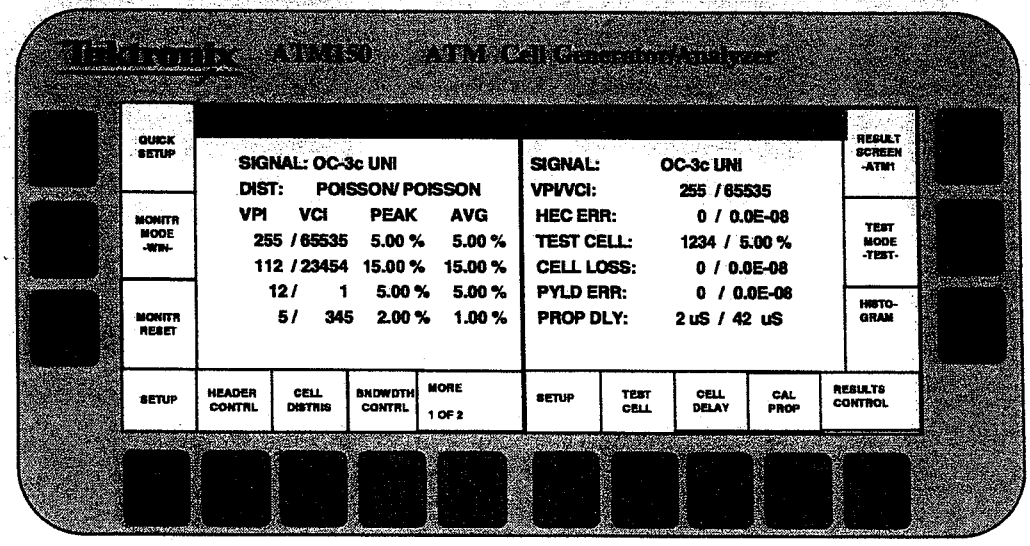
The front panel is divided into eleven sections:

Display and softkeys	Entry keys	Power switch
Utility	Generator	Analyzer
OC-3c/STM-1	DS3	DS1
E1	E3	

Display in General

The display is divided into two halves, one side is for Generator setup and bandwidth measurements, the other side is for Analyzer setup and test measurement data.

Figure 2-1 -- Softkey portion and LCD screen of ATM150 Front Panel



ATM396-1

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The Generator and Analyzer each have their own softkeys, which are labeled around the outside edge of the display. Pressing a softkey can initiate an action or it can bring up a pop-up window. When a key is pressed with a pop-up window, that key will reverse video to indicate it is active. It will remain active until either the escape key is pressed or that key is pressed again.

If a second softkey on the other side is pressed while one key is active, it will become the active key. The initial softkey will show diagonal lines indicating that when the second softkey becomes inactive, the first softkey will resume the active state.

Entry keys

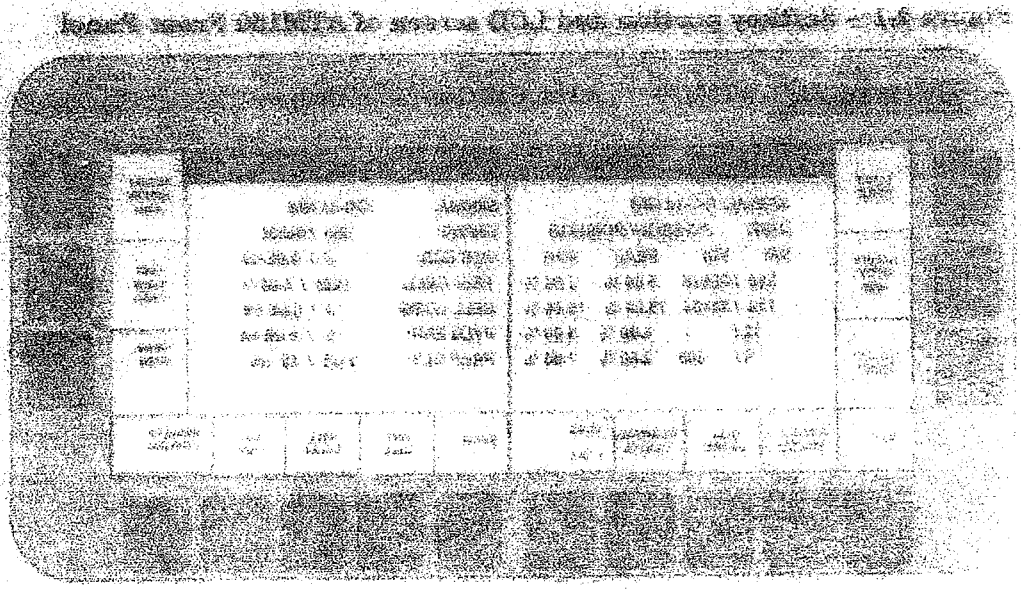
The ENTRY keys are used to change values, selections and move the cursor. Values changed by the knob are immediately written to the hardware. Values changed by the keys are either entered by the ENTER key, the turn knob, or abandoned by the ESC key.

The ENTER key will be ignored for the menu fields that can be changed with the turn knob located in the entry pad. Softkeys can be used to bring up pop-up windows, and the ESC key is used to remove pop-up windows. The ENTRY keys are positioned to the right of the LCD screen (See Figure 2-1).

Other labeled areas on ATM150 Front Panel

The Generator and Analyzer sections show various states of operation and activate Cell Run and Test Run. The Analyzer section also includes an Error History LED display.

The physical interface cable connections take up the entire bottom of the front panel.



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Quick Start

DS3 Signal

The objective of this exercise is to configure the ATM150 for a DS3 interface and then generate and analyze ATM test cells. The exercise begins by setting up the Generator side of the ATM150 by changing choices within the SETUP, HEADER CONTROL and CELL DISTRIBUTION softkeys.

Setting up the Analyzer side will follow the Generator exercise, with choices to be made to the Analyzer's SETUP and TEST CELL softkeys.

Also covered in this Operating Basics exercise are the Utility functions that permit changes to the RS-232, GPIB and Remote Interfaces; designating the monitor for LCD or VGA and adjusting the contrast of the ATM150's LCD display.

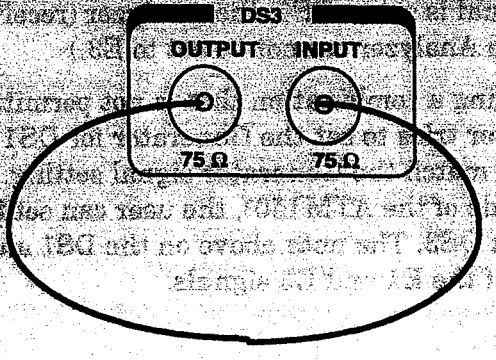
For full detail on all menu screens and choices, refer to Chapter 3.

- ❑ Turn the POWER switch ON. The ATM150 will display a start-up screen while it goes through self-diagnostics.
- ❑ Hook a 75 ohm BNC coax cable between the DS-3 output line on the front panel to the DS-3 input line also located on the front panel.

Note

The ATM150 test set is equipped with optical test capability. Use an optical patch cord with a 7 to 10 dB optical attenuator when testing the optical interfaces. This warning does not apply specifically to this exercise, as the following exercise demonstrates the DS3 capabilities of the unit.

Figure 2-2 - Hook coax cable between DS-3 Output and Input



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Generator

- **SETUP-** On the Generator side of the ATM150's LCD screen, press the softkey labeled 'SETUP'. This will bring up a menu of choices.

SETUP		
		*Other choices **
OUTPUT SIGNAL	DS3	DS1; OC-3c; E1; E3 STM-1; 100Mbps
CELL FORMAT	UNI	NNI
CLOCK SOURCE	INT	RECOVERED*
DS3 PLCP MODE	ON	OFF
DS3 FRAMING	CBIT	MX3
PAYLOAD SCRAMBLE	ON	OFF
SYSTEM PARAMETERS... (see submenu following the DS3/DS1, E1/E3 note)		

*** Note: DS3 and DS1 signals, E1 and E3 signals**

Each signal interface module includes transmitter and receiver circuitry. In general, the transmitter and receiver operate independently allowing the transmitter of one interface module (for example, OC-3c) to be used simultaneously with the receiver of another interface module (for example, DS3). However, the DS1/DS3 and E1/E3 interfaces combine two interfaces on the same module. In this case, if both the transmitter and receiver of the DS1/DS3 module are used, the module must be set to the same signal. This situation also applies to the E1/E3 module.

For example, the DS1 circuitry is shared with the DS3 circuitry (E1 circuitry is shared with E3 circuitry). If the Generator (transmitter) signal is set to DS1, the Analyzer (receiver) cannot be set to DS3. (If the Generator is set to E1, the Analyzer cannot be set to E3.)

The ATM150 will prevent the user from setting a combination that is not permitted. If the Analyzer is set for DS3 operation and the user tries to set the Generator for DS1 operation, the ATM150 will change the Analyzer to DS1 to match the Generator signal setting. In this example (DS1 operation on the Generator side of the ATM150), the user can set the Analyzer to OC-3c or any other signal interface except DS3. The note above on the DS1 and DS3 signals apply in the same manner to the operation of the E1 and E3 signals.

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submenu to SYSTEM PARAMETERS...		
1PPS SOURCE	INT	EXT
SYNC PULSE OUTPUT	ATM	PHYSICAL
HEC COSET	ENABLE	DISABLE

The 1PPS Source choice controls the timing used for the cell delay measurements.

For proper delay measurements, the Generator and corresponding Analyzer should use the same source for the 1PPS.

UNI (User-Network Interface) is the ATM cell format that includes the GFC and a smaller VPI. NNI (Network-Network Interface) is the ATM cell format that does not include the GFC.

If the choices do not match what is listed in the table above, make changes (instructions follow) on the screen to conform to the table. Move from line to line with the cursor keys (either/or up or down arrows). Make changes within the highlighted block by pressing the ENTER key or knob. To get back to the main display, press the original softkey (in this case, 'SETUP') or press the ESC key in the ENTRY keys section of the ATM150.

- **HEADER CONTROL** - The next softkey on the Generator side to press is 'HEADER CONTRL'. A pop-up menu will appear on top of the main Generator screen.

HEADER CONTRL		
		Other choices/ranges
TEST * CELL NUMBER	1	1 to total active cells (1,2,3,4)
GFC	0	0-15
VPI / VCI	1 / 1	0-4095 ** / 0-65,235
PTI / CLP	0 / 0	0-7 / 0-1
ACTIVE HEADER GENERATION	.....(submenu - see following)	
RANDOMIZE	ON	OFF
SEE CELL DISTRIBUTION MENU FOR CUSTOM FILE TRANSFER		

* The CELL NUMBER can be TEST or ACTIVE.

** The VPI value is 0 to 255 if the cell format is UNI

If necessary, change what is on screen to match this table, by using the cursor arrow keys and/or the ENTER key, knob or keypad. Return to the main Generator screen by pressing the softkey again ('HEADER CONTRL') or pressing 'ESC'.

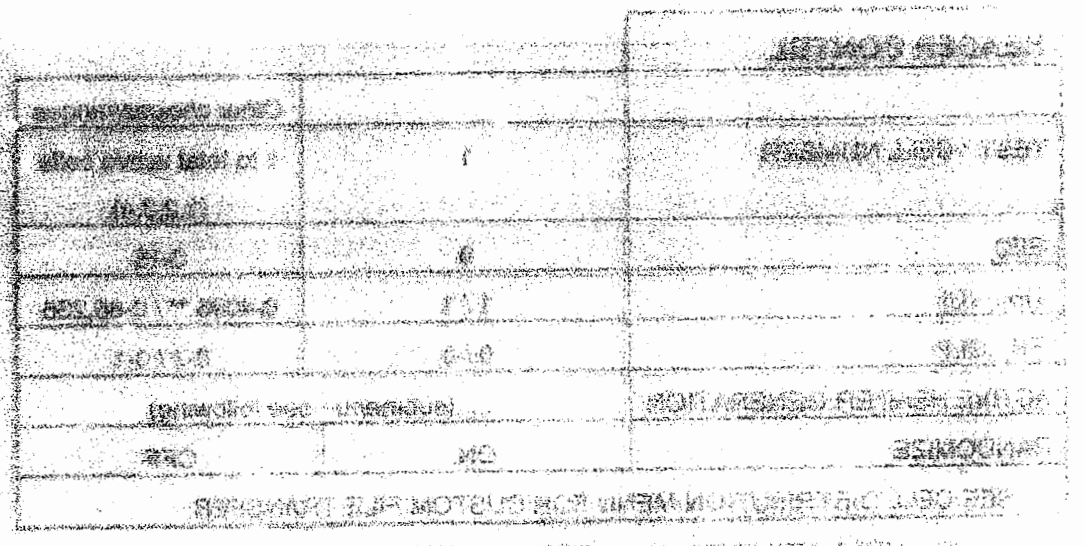
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- **ACTIVE HEADER GENERATION** Submenu to **HEADER CONTROL** -While in the 'HEADER CONTROL' menu, press the 'ENTER' key when the cursor is sitting on one of the dot-dots in the ACTIVE HEADER GENERATION line of choice. The following pop-up menu will appear on top of the main Generator screen.

submenu to HEADER CONTROL

ACTIVE HEADER GENERATION

		Other choices
NUMBER OF CELLS	16	0-8191
GFC	0	0-15
VPI / VCI	15 / 1000	0-255/ 0-65,535
PTI / CLP	0 / 0	0-7 / 0-1
VCI INCREMENT	1	
<GENERATE ACTIVE HEADERS>		



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❑ **CELL DISTRIBUTION** - On the Generator side of the ATM150's screen, press the softkey labeled 'CELL DISTRIB'. A pop-up menu will appear on top of the main Generator screen.

CELL DISTRIB		
		*Other choices**
ACTIVE	**CONSTANT** 50.0% CELL BURST COUNT: 1	UNIFORM GAUSSIAN POISSON RAMP
IDLE	**CONSTANT** 50.0% CELL BURST COUNT: 1	UNIFORM GAUSSIAN POISSON RAMP
RANDOMIZE	ON	OFF
CUSTOM FILE TRANSFER	.....(submenu - see following)	

* Be aware that making choices other than 'CONSTANT' for the active cells brings up related choices other than 'CELL BURST COUNT'. The submenu choices related to 'UNIFORM', 'GAUSSIAN', 'POISSON', 'RAMP' and 'CUSTOMIZED' are not shown in this exercise. See *Menu Structure* in Chapter 3 for a complete set of menu screens. See Chapter 4 for applications information on what these statistical distributions are used for.

Note ACTIVE and IDLE cell choices can be different. In order to facilitate this Quick Start exercise, follow the sample screens.

The Randomize function scrambles the starting point of the statistical distributions, as well as, all values through the entire distribution, to better emulate traffic in the network that does not always begin at a certain point.

submenu to CELL DISTRIB **CUSTOM FILE TRANSFER**		
DRIVES	HARD DRIVE	FLOPPY
CUSTOM FILENAME	XXXXXXXX	
<LOAD FROM DISK>		
<!!! DELETE FILE !!!>		

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Return to the main Generator screen by pressing the softkey again ('CELL DISTRIB') or pressing 'ESC'.

❑ **BANDWIDTH CONTROL** - Press the key "Bandwidth Control" to bring up the following menu. Set the Bandwidth control to the following values.

BANDWIDTH CONTROL

IDLE BANDWIDTH	50.00%	
(Based on Cell Distribution)		
TEST CELL BANDWIDTH		
1)	1 / 1	50.0%
2))	1 / 2	.0%
3))	1 / 3	.0%
4))	1 / 4	.0%
TRAFFIC BANDWIDTH		.0%
BANDWIDTH CONTROL	PERCENTAGE	

The Generator side is now ready to send ATM test cells to the Analyzer.

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Analyzer

- On the Analyzer side of the ATM150's main screen are softkeys labeled 'SETUP' and 'TEST CELL'.
- **SETUP** - Press the softkey labeled 'SETUP' on the Analyzer side and a pop-up menu will appear on top of the main LCD screen.

SETUP		
		*Other choices **
INPUT SIGNAL	DS3	DS1; OC-3c; E1; E3 STM-1; 100Mbps
CELL FORMAT	UNI	NNI
LOOPBACK	DISABLE	ENABLE
DS3 PLCP MODE	ON	OFF
DS3 FRAMING	CBIT	MX3
PAYLOAD SCRAMBLE	ON	OFF
SYSTEM PARAMETERS... (see submenu following the DS3/DS1, E1/E3 note)		

* When the LOOPBACK is ENABLED, the left side of the front panel screen displays the following message: ***ANALYZER IN LOOPBACK.

*** Note: DS3 and DS1 signals, E1 and E3 signals**

Each signal interface module includes transmitter and receiver circuitry. In general, the transmitter and receiver operate independently allowing the transmitter of one interface module (for example, OC-3c) to be used simultaneously with the receiver of another interface module (for example, DS3). However, the DS1/DS3 and E1/E3 interfaces combine two interfaces on the same module. In this case, if both the transmitter and receiver of the DS1/DS3 module are used, the module must be set to the same signal. This situation also applies to the E1/E3 module.

For example, the DS1 circuitry is shared with the DS3 circuitry (E1 circuitry is shared with E3 circuitry). If the Generator (transmitter) signal is set to DS1, the Analyzer (receiver) cannot be set to DS3. (If the Generator is set to E1, the Analyzer cannot be set to E3.)

The ATM150 will prevent the user from setting a combination that is not permitted. If the Analyzer is set for DS3 operation and the user tries to set the Generator for DS1 operation, the ATM150 will change the Analyzer to DS1 to match the Generator signal setting. In this example (DS1 operation on the Generator side of the ATM150), the user can set the Analyzer to OC-3c or any other signal interface except DS3. The note above on the DS1 and DS3 signals apply in the same manner to the operation of the E1 and E3 signals.

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submenu to SYSTEM PARAMETERS...		
1PPS SOURCE	GENERATOR	EXT
SYNC PULSE OUTPUT	ATM	PHYSICAL
HEC COSET	ENABLE	DISABLE

The 1PPS Source choice controls the timing used for the cell delay measurements.

For proper delay measurements, the Generator and corresponding Analyzer should use the same source for the 1PPS.

UNI (User-Network Interface) is the ATM cell format that includes the GFC and a smaller VPI. NNI (Network-Network Interface) is the ATM cell format that does not include the GFC.

The values in the Analyzer Physical Layer pop-up menu should match the values entered in the Generator Physical Layer pop-up menu. If the choices do not match what is listed in the table above, make changes on the screen to conform to the table. Move from line to line with the cursor keys (either/or up or down arrows). Make changes within the highlighted block by pressing the ENTER key or knob. To get back to the main display, press the original softkey (in this case, 'PHYSICL LAYER') or press the ESC key in the ENTRY keys section of the test set.

- **TEST CELL** - Press the softkey labeled 'TEST CELL' and a pop-up menu will appear on top of the main LCD screen.

TEST CELL		
		Other choices
DISABLE * LINK TO TEST CELL	1	2,3,4
GFC	0	0-15
VPI / VCI	1 / 1	0/255 / 0-65,535
PTI / CLP	0 / 0	0-7 / 0-1

* Choices are DISABLE AND ENABLE

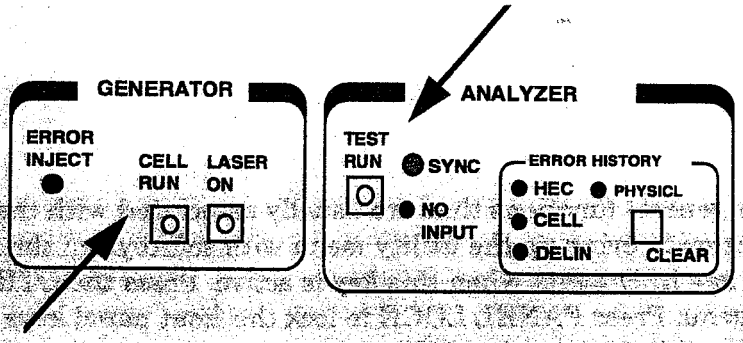
When the LINK TO TEST CELL choice is ENABLE, the next three lines (GFC, VPI/VCI, and PTI/CLP) do not appear on the screen

The values in the Analyzer Test Cell pop-up menu should match the values entered in the Generator Header Control pop-up menu. If necessary, change what is on screen to match this table, by using the cursor arrow keys and/or ENTER key, knob or keypad. Return to the main Analyzer screen by pressing the softkey again ('TEST CELL') or pressing 'ESC'.

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ATM Test Cells

- ❑ The Analyzer is now ready to receive the ATM test cells sent by the Generator. Press down the button 'CELL RUN' (LED light on) in the Generator key section and then press down the 'TEST RUN' (LED light on) button in the Analyzer key section.



The screen on the Generator side will display measured Peak and Average bandwidth of the test cells going out. The Analyzer will show the count of incoming test cells, and the effective bandwidth being used. In the example that has been detailed here, the test cell percentage on the Analyzer side should match the percentage value of test cell #1 on the Generator side.

RESULT SCREEN

The RESULTS SCREEN softkey on the Analyzer side of the LCD screen permits four choices for the display of test information. Push the softkey until the appropriate choice appears under the RESULTS SCREEN name: **ATM1** or **ATM2** - for ATM Layer information, or **PHYS1** or **PHYS2** for Physical Layer alarms.

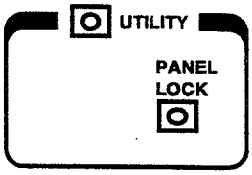
Example of Results

RESULTS SCREEN (s)

ATM1	ATM2	PHYSICAL1	PHYSICAL2
Signal: DS3 COSET/UNI PLCP			
VPI/VCI.....1/1	VPI/VCI 1/1	VPI/VCI 1/1	
HEC ERR 5 0.01E-07	Test elapsed 0-15:21:43.0	Alarms:	Test elapsed: 0-15:18:35.5
Test cell 5.6E+0970.704 Mbps	Idle cell 47999 50.00%	HIST	
Cell loss 5 0.09E-08	Misinsert 454080 47.30%	Parity: 0 0.00e-11	PLCP B1: 0
PYLD ERR 0 0.00E-08		LCV: 0	PLCP FEBE: 0
PROP DLY 2 US 5 US		DS3 FEBE: 0	

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- **Utility**- Pressing the 'UTILITY' button changes the labels of the bottom row of softkeys on the Generator side of the ATM150's main LCD screen.



The UTILITY box contains many general functions that are usually associated with the user interface. Press the UTILITY button to bring up the utility menu with softkeys on the front panel LCD display. The internal key LED lights when this key is active. Press the UTILITY key again to exit the utility submenu. Press PANEL LOCK to lock the front panel keys out. The PANEL LOCK LED is lit when this function is active.

The utility menu has the following selections:

Factory Default	Selection of this softkey returns the ATM150 to factory settings. This is useful to clear custom settings when it is time to run different tests
RS-232	This softkey allows customization of values between the ATM150 and the RS-232 device
GPIB	This softkey allows customization of values between the ATM150 and the GPIB device
Remote	This softkey allows customization of values between the ATM150 and the Remote device
Time Date	Set the current time 00:00:00 AM or PM. Set current date 00/00/00.
Monitor	This softkey allows changing the monitor display from LCD to VGA. This would be used if an external VGA monitor was being used so a group of people could see the test status and results all at the same time. The front panel display is not available when the display output is being seen on an external VGA monitor.
Contrast	Select CONTRAST to adjust the LCD display screen contrast. Use the knob in the entry keys section to adjust the contrast. The range of values is 0 - 9.
Printer Port	The ATM150 permits a choice of RS-232 port or LPT port printing.

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System Verification Test (Instrument Test)

Power Requirements

The ATM150 is configured with a 110/220 VAC power supply (auto voltage switching).

Instrument setup

- Set the ATM150 on a flat surface.
- Raise the front of the instrument by moving the handle under the instrument body. The handle moves by pushing two buttons at the center of the spot where the handle connects to the instrument body.
- Pull-off the end cap to reveal the front panel of the ATM150.
- Connect the AC power cord on the rear panel. Before connecting the power cord to an AC outlet, be sure that the AC Power switch on the front panel is OFF.
- Press the AC Power switch ON. During the initial power-up sequence, the instrument performs a diagnostic self-test. In the event a self-test error message is displayed, record the message and call Tektronix, Microwave Logic Products Customer Service at (800-643-2167) for assistance. There are no user-serviceable parts in the ATM150, except the fuse located on the rear panel.

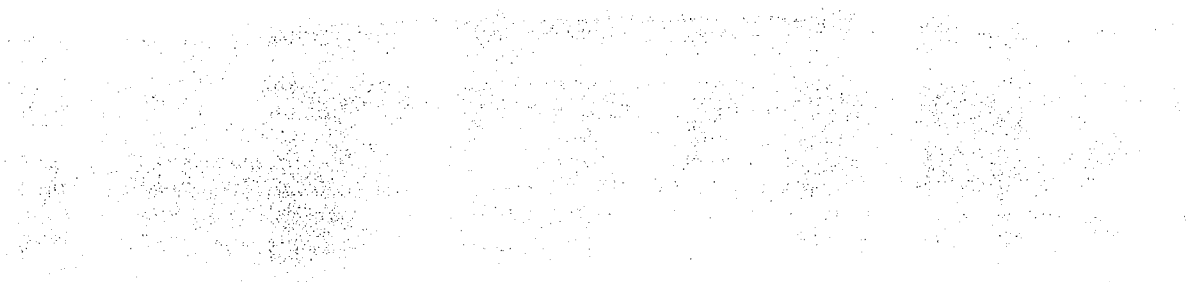
Instrument checkout

After the initial unpacking, the ATM150 should be checked for proper electrical operation. Follow the Operating Basics exercise detailed on pages 2-3 through 2-11 in this section. The exercise reviews use of the softkeys, entry keys and knob, as well as Generator and Analyzer ATM Test Cell functions.

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3. *Reference*

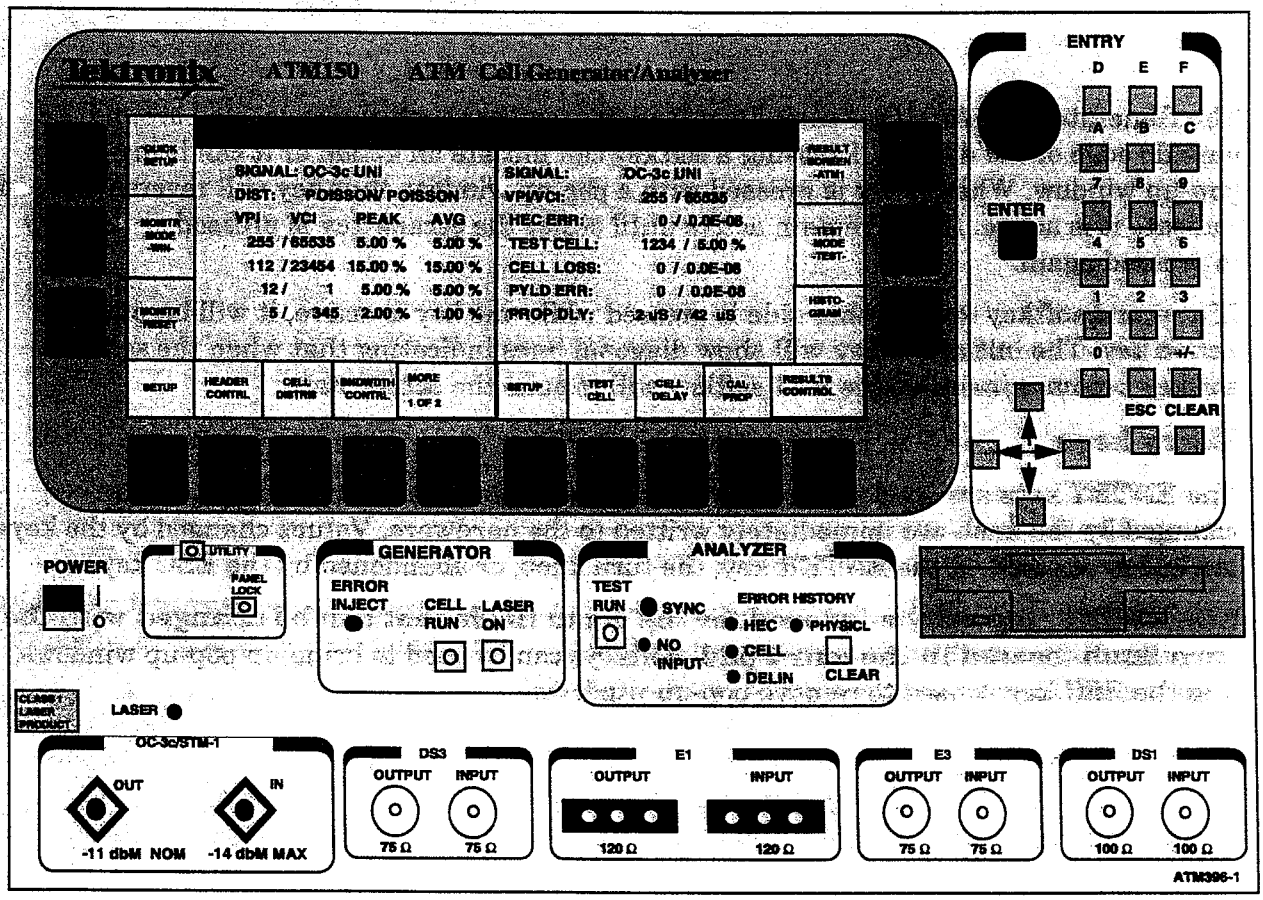
This section discusses all the hardware and software features of the ATM150. It will work through the front and rear panels, electrical connections, all hardware switches and connections, all software screens and all choices available.

ATM150 Front Panel

The front panel is divided into eleven sections:

Display and softkeys	Entry keys	Power switch
Utility	Generator	Analyzer
OC-3c/STM-1	DS3	DS1
E1	E3	

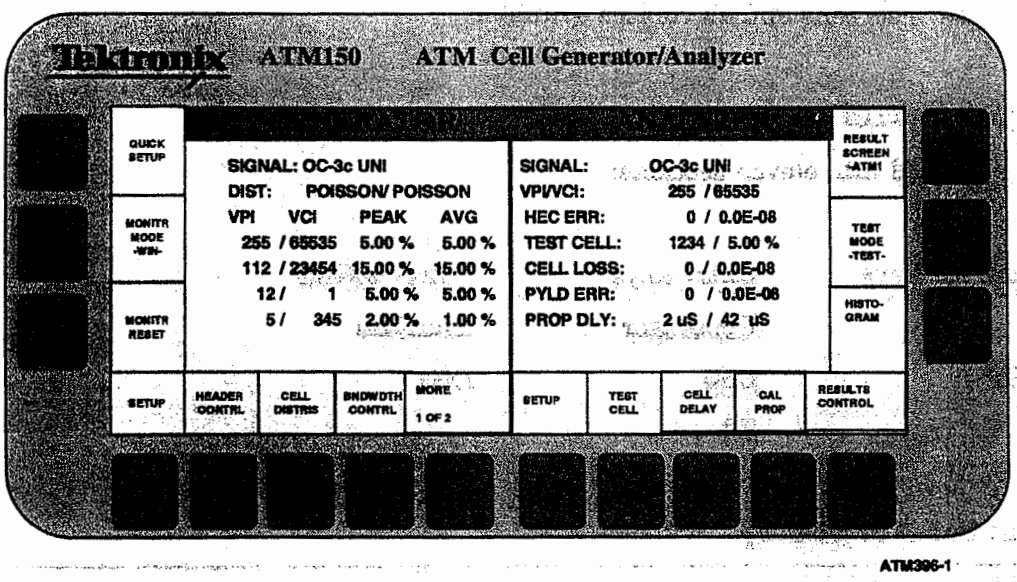
Figure 3-1 -- Front Panel of ATM150



Display in General

The display is divided into two halves, one side is for Generator setup and bandwidth measurements, the other side is for Analyzer setup and test measurement data.

Figure 3-2 -- Softkey portion and LCD screen of ATM150 Front Panel



The Generator and Analyzer each have their own softkeys, which are labeled around the outside edge of the display. Pressing a softkey can initiate an action or it can bring up a pop-up window. When a key is pressed with a pop-up window, that key will reverse video to indicate it is active. It will remain active until either the escape key is pressed or that key is pressed again.

If a second softkey on the other side is pressed while one key is active, it will become the active key. The initial softkey will show diagonal lines indicating that when the second softkey becomes inactive, the first softkey will resume the active state.

Entry keys

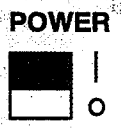
The ENTRY keys are used to change values, selections and move the cursor. Values changed by the knob are immediately written to the hardware. Values changed by the keys are either entered by the ENTER key, the turn knob, or abandoned by the ESC key.

The ENTER key will be ignored for the menu fields that can be changed with the turn knob located in the entry pad. Softkeys can be used to bring up pop-up windows, and the ESC key is used to remove pop-up windows.

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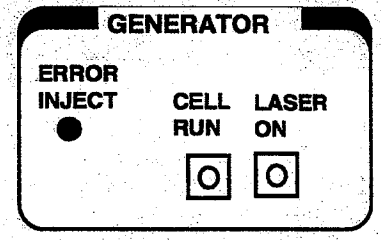
Power Switch

The on/off power switch is located on the left side of the test instrument below the LCD screen.



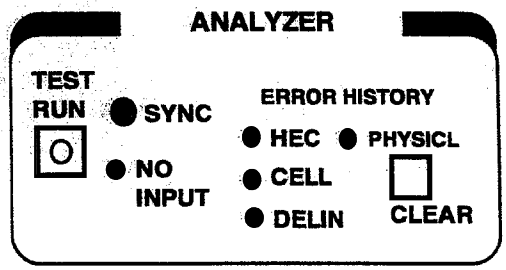
Generator

The Generator box on the front panel of the ATM150 contains status indicators, providing operating status at a glance. The CELL RUN button with LED light activates the generation of ATM test cells. The LASER ON button with LED light activates the laser for generation of ATM test cells while using the optical interfaces. The Generator outputs one physical channel with up to four VPI/VCI addresses.



Analyzer

The Analyzer box on the front panel of the ATM150 contains status and history indicators, providing operating status at a glance. The TEST RUN button with LED light activates the analysis of ATM test cells. The ERROR HISTORY LED display shows at a glance what type of four different types of errors have been detected. The ERROR HISTORY highlights PHYSICL (cables); HEC (ATM Cell Header, Cell Error measurement), CELL (Cell Loss or Payload Error of ATM cell measurement) and DELIN (Delineation - where the test instrument can not find the beginning and/or ends of ATM test cell errors). The Analyzer inputs one physical channel and can match on one VPI/VCI.



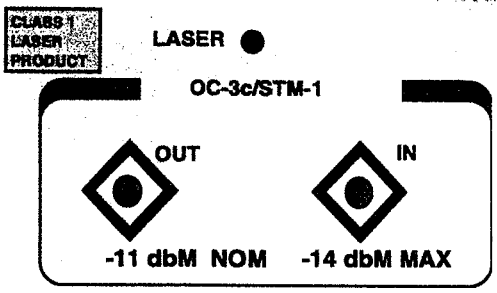
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Note

The ATM150 test set is equipped with optical test capability. Use an optical patch cord with a 7 to 10 dB optical attenuator when testing the optical interfaces.

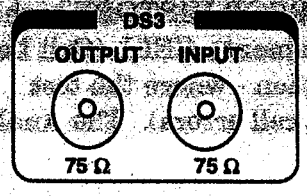
OC-3c/STM-1

Starting in the lower left corner of the ATM150's front panel are the Generator output and the Analyzer input cable connections for the 155.52Mbps SONET OC-3c/SDH STM-1. The OC-3c/STM-1 connection can handle either single-mode or multi-mode fiber cable with a FC/PC connection. Be aware of a "key" tab on the OC-3c/ STM-1 optical cable that must correspond with the "key" slot on the OC-3c/STM-1 optical connection.



DS3

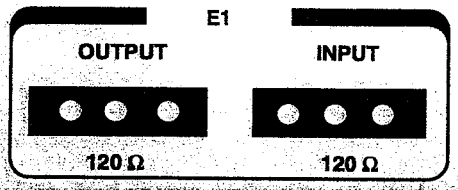
Moving to the right, the next Generator output and Analyzer input cable connections are for the DS3 physical interface. The DS-3 connections use 75 ohm BNC coax cables.



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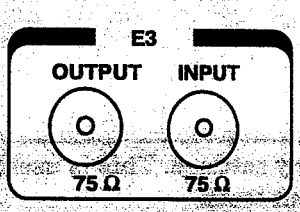
E1

In the middle of the front panel is the Generator output and Analyzer input cable connections for the E1 physical interface. The E1 connections use 120 ohm Siemens-compatible E1 connection cables.



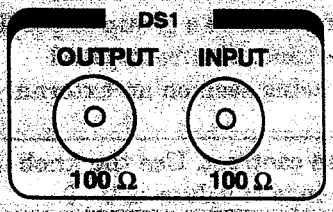
E3

E3 is the Generator output and the Analyzer input connection when using the E3 physical interface. The E3 connections require 75 ohm BNC coax cables.



DS1

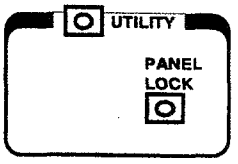
DS1 is the Generator output and the Analyzer input connection when using the DS1 physical interface. The DS1 connection requires a 100 ohm DS1 patch cord (WECO 310-compatible).



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Utility

Pressing the 'UTILITY' button changes the labels of the bottom row of softkeys on the Generator side of the ATM150's main LCD screen.



The UTILITY box contains many general functions that are usually associated with the user interface. Press the UTILITY button to bring up the utility menu with softkeys on the front panel LCD display. The internal key LED lights when this key is active. Press the UTILITY key again to exit the utility submenu. Press PANEL LOCK to lock the front panel keys out. LED is lit when this function is active. When the UTILITY button is pressed, the three softkeys on the left side of the screen (Generator side) running vertically disappear, so as to not confuse the user with softkey choices that do not have anything to do with UTILITY functions.

The utility menu has the following selections:

Factory Default	Selection of this softkey returns the ATM150 to factory settings. This is useful to clear custom settings when it is time to run different tests.
RS-232	This softkey allows customization between the ATM150 and the RS-232 device.
GPIB	This softkey allows customization of values between the ATM150 and the GPIB device.
Remote	This softkey allows customization of values between the ATM150 and the Remote device.
Time Date	Set the current time 00:00:00 AM or PM. Set current date 00/00/00.
Monitor	This softkey allows changing the monitor display from LCD to VGA. This would be used if an external VGA monitor was being used so a group of people could see the test status and results all at the same time. The front panel display is not available when the display output is being seen on an external VGA monitor.
Contrast	Select CONTRAST to adjust the LCD display screen contrast. Use the knob in the entry keys section to adjust the contrast. The range of values is 0 - 9.
Printer Port	The ATM150 permits a choice of RS-232 port or LPT port printing.

Factory Default

Select FACTORY DEFAULT in the UTILITY choices to reset the unit to its factory default settings. See the Appendices section for default settings. When FACTORY DEFAULT is selected, a pop-up window will ask if you are sure, (NO) will exit without doing the default setting, (YES) will perform the default setting.

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RS-232 Interface

Press RS-232 in the UTILITY choices to setup the RS-232 interface.

RS-232

	Default	*Other choices*
Baud Rate	9600	4800 2400 1200 300
Parity	EVEN	NONE ODD
Data Size	7	8
Stop Bits	1	2
Echo	ON	OFF
XON/XOFF	OFF	ON
EOL Terminator	CR	CR/LF LF/CR LF

GPIB Interface

Press GPIB in the UTILITY choices to setup the GPIB interface.

GPIB

		Other choices
GPIB ADDRESS	14	0-30
GPIB TERM	EOL/LF	EOL ONLY EOI/LF EOI ONLY
GPIB BUS MODE	TALK/LISTEN	OFF BUS

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REMOTE Interface

Press REMOTE in the UTILITY choices to change the debug mode.

REMOTE

		Other choices
COMMAND HEADER	ON	OFF
DEBUG MODE	OFF	ON

Monitor

Select MONITOR in the UTILITY choices to swap between the front panel LCD and the rear panel video connector. This allows the user to connect a VGA screen for group viewing. The front panel display is not available when the display output is being seen on an external VGA monitor.

Contrast

Select CONTRAST in the UTILITY choices to adjust the LCD display screen contrast. Use the knob in the entry keys section to adjust the contrast.

Floppy Drive

The floppy drive uses 3.5" MS-DOS formatted DS-HD 1.44 MB diskettes. The floppy disk drive can be used to store test results, save test setups and transfer test data to a personal computer for further analysis.

Time Date

	TIME/ DATE
Current Date	00/00/00
Current Time	00:00:00 AM or PM
<SET TIME/DATE>	

Printer Port

LPT	Parallel Port
RS232	Serial Port

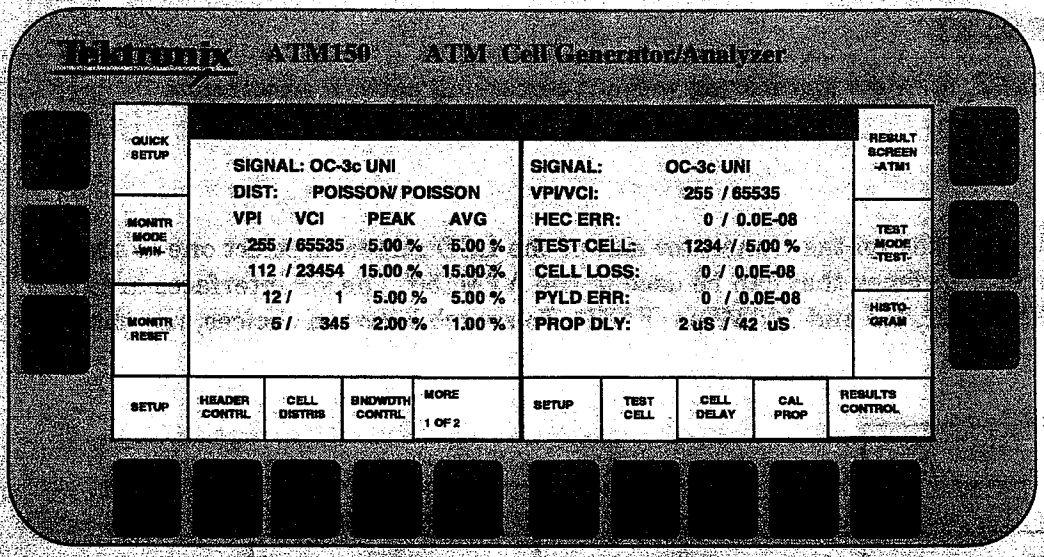
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Menu Structure

Generator Softkeys

This section details the softkeys and the functions available. Starting on the Generator side of the LCD screen at the upper left side, this description will continue on the Analyzer side of the LCD screen. Use the turn knob on right-side of the front panel to change values within menu fields.

Figure 3-3 -- Softkey portion and LCD screen of ATM150 Front Panel



STORE AND RECALL QUICK SETUP

This menu is entered by selecting the upper left-hand softkey. This key is always visible, except when in bar graph mode or utility mode. There are three choices available in this menu: RECALL SETUP; STORE SETUP; and EXIT. Press the corresponding softkey or the Enter key on the keypad to activate the function. The following types of settings are stored in the Store and Recall Quick Setup: Physical Interface Selection and Parameters; Physical Alarm Generation; Header Settings; Cell Parameters; Error Generation; and, System Settings. Header and distribution RAM contents are not stored in the Quick Setup.

Note:

Setups stored to floppy disks are only valid for the instrument they were stored with and should not be used in another ATM150. Stored setups are only valid for the current operating system revision.

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MONITR MODE

The MONITR MODE softkey is tied together with the MONITR CONTROL softkey to choose two types of monitoring: -**WIN**- - the most recent sample of a set period of time (example; WIN set for one second, the monitor will display the errors found in the most recent one-second period, and then the count reset to zero and in the next second, errors are counted) or -**MNTR**- - an accumulation of information starting at the beginning of the test and going on until stopped.

WIN **MNTR**

MONITOR RESET

MONITOR RESET restarts monitoring without restarting pattern generation.

SETUP

Push the SETUP softkey on the Generator side of the LCD screen to select one of six different physical interfaces that can be used in the ATM150. The six interfaces are DS3, DS1, OC-3c/STM-1, E1, E3 and 100Mbps (TAXI). To switch between choices, use the turn knob.

SETUP		
		Other choices*
OUTPUT SIGNAL	DS3	DS1 OC-3c; STM-1 E1; E3 100Mbps
CELL FORMAT	UNI	NNI
CLOCK SOURCE	INT	RECOVERED
DS3 PLCP MODE	ON	OFF
DS3 FRAMING	CBIT	MX3
PAYLOAD SCRAMBLE	ON	OFF
SYSTEM PARAMETERS... (see submenu following the DS3/DS1, E1/E3 note)		

*** Note: DS3 and DS1 signals, E1 and E3 signals**

Each signal interface module includes transmitter and receiver circuitry. In general, the transmitter and receiver operate independently allowing the transmitter of one interface module (for example, OC-3c) to be used simultaneously with the receiver of another interface module (for example, DS3). However, the DS1/DS3 and E1/E3 interfaces combine two interfaces on the same module. In this case, if both the transmitter and receiver of the

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DS1/DS3 module are used, the module must be set to the same signal. This situation also applies to the E1/E3 module.

For example, the DS1 circuitry is shared with the DS3 circuitry (E1 circuitry is shared with E3 circuitry). If the Generator (transmitter) signal is set to DS1, the Analyzer (receiver) cannot be set to DS3. (If the Generator is set to E1, the Analyzer cannot be set to E3.)

The ATM150 will prevent the user from setting a combination that is not permitted. If the Analyzer is set for DS3 operation and the user tries to set the Generator for DS1 operation, the ATM150 will change the Analyzer to DS1 to match the Generator signal setting. In this example (DS1 operation on the Generator side of the ATM150), the user can set the Analyzer to OC-3c or any other signal interface except DS3. The note above on the DS1 and DS3 signals apply in the same manner to the operation of the E1 and E3 signals.

submenu to SYSTEM PARAMETERS...		
1PPS SOURCE	INT	EXT
SYNC PULSE OUTPUT	ATM	PHYSICAL
HEC COSET	ENABLE	DISABLE

The 1PPS Source choice controls the timing used for the cell delay measurements.

For proper delay measurements, the Generator and corresponding Analyzer should use the same source for the 1PPS.

The clock source for 100 Mbps will always be INTERNAL (INT).

UNI (User-Network Interface) is the ATM cell format that includes the GFC and a smaller VPI. NNI (Network-Network Interface) is the ATM cell format that does not include the GFC.

SETUP		
		*Other choices **
OUTPUT SIGNAL	DS1	DS3 OC-3c; STM-1 E1; E3 100Mbps
CELL FORMAT	UNI	NNI
CLOCK SOURCE	INT	RECOVERED
DS1 PLCP MODE	ON	OFF
DS1 FRAMING	ESF	SF
PAYLOAD SCRAMBLE	ON	OFF
SYSTEM PARAMETERS...		

* See note for DS1 under the previous DS3 Setup menu screen.

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SETUP		
		*Other choices **
OUTPUT SIGNAL	E1	DS1; DS3 OC-3c; STM-1 E3 100Mbps
CELL FORMAT	UNI	NNI
CLOCK SOURCE	INT	RECOVERED
E1 PLCP MODE	ON	OFF
E1 CRC	ON	OFF
PAYLOAD SCRAMBLE	ON	OFF
SYSTEM PARAMETERS...		

SETUP		
		*Other choices **
OUTPUT SIGNAL	E3	DS1; DS3 OC-3c; STM-1 E1 100Mbps
CELL FORMAT	UNI	NNI
CLOCK SOURCE	INT	RECOVERED
E3 PLCP MODE	ON	OFF
E3 FRAMING	G.751	G.751 or G.852
PAYLOAD SCRAMBLE	ON	OFF
SYSTEM PARAMETERS...		

*** See note for E1 and E3 under the previous DS3 Setup menu screen.**

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SETUP		
		Other choices
OUTPUT SIGNAL	OC-3c	DS1; DS3 STM-1 E1; E3 100Mbps
CELL FORMAT	UNI	NNI
CLOCK SOURCE	INT	RECOVERED
SONET POINTER	522	0-782
NEW POINTER	522	0-782
<SET NEW POINTER>		
<PERFORM +PJ> **		
<PERFORM -PJ> **		
SYSTEM PARAMETERS...		

** In the OC-3c SETUP above this note, and the STM-1 SETUP below, two of the menu choices are PERFORM +PJ and PERFORM -PJ. The PJ abbreviation stands for pointer justification and permits plus or minus SONET pointer adjustments.

SETUP		
		Other choices
OUTPUT SIGNAL	STM-1	DS1; DS3 OC-3c E1; E3 100Mbps
CELL FORMAT	UNI	NNI
CLOCK SOURCE	INT	RECOVERED
SONET POINTER	522	0-782
NEW POINTER	522	0-782
<SET NEW POINTER>		
<PERFORM +PJ> **		
<PERFORM -PJ> **		
SYSTEM PARAMETERS...		

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HEADER CONTRL

Push the HEADER CONTRL softkey to set-up header information for the ATM cells.

HEADER CONTRL		
		Other choices/ranges
TEST * CELL NUMBER	1	1 to total active cells (1,2,3,4)
GFC	0	0-15
VPI / VCI	1 / 1	0-4095 ** / 0-65,535
PTI / CLP	0 / 0	0-7 / 0-1
ACTIVE HEADER GENERATION	.....(submenu - see following)	
RANDOMIZE	ON	OFF
SEE CELL DISTRIBUTION MENU FOR CUSTOM FILE TRANSFER		

* The CELL NUMBER can be TEST or ACTIVE.

** The VPI value is 0 to 255 if the cell format is UNI

The Randomize function scrambles the starting point of the statistical distributions, as well as, all values through the entire distribution, to better emulate traffic in the network that does not always begin at a certain point.

submenu to HEADER CONTROL ACTIVE HEADER GENERATION		
		Other choices
NUMBER OF CELLS	16	0-8191
GFC	0	0-15
VPI / VCI	15 / 1000	0-255/ 0-65,535
PTI / CLP	0 / 0	0-7 / 0-1
VCI INCREMENT	1	
<GENERATE ACTIVE HEADERS>		

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Note ACTIVE and IDLE cell choices can be different.

CELL DISTRIB

This softkey specifies distribution of active to idle cells. The CELL DISTRIB softkey permits changing the mix of ATM cells. The choices are CONSTANT, UNIFORM, GAUSSIAN, POISSON, and RAMP.

The basic concept behind the ATM cell distributions is that a number of Active cells are transmitted, and then a number of Idle cells are transmitted. These groups of cells are the Burst counts. This process is continued such that there are a series of Active and Idle Bursts. The distributions consist of the series of Active and Idle Burst counts.

After setting the Cell Distributions and moving the cursor to the bottom block (ACCEPT DISTRIBUTIONS). Press the ENTER key. A status line at the top of the LCD panel will signify that the ATM150 is "Programming Distributions...". This will take some time. The ATM150 will prevent further input or softkey changes until it has finished programming the distributions.

CELL DISTRIB		
		*Other choices**
ACTIVE	**CONSTANT** 50.0% Cell Burst Count: **11940**	UNIFORM GAUSSIAN POISSON RAMP
IDLE	**CONSTANT** 50.0% CELL BURST COUNT: **0**	UNIFORM GAUSSIAN POISSON RAMP
RANDOMIZE	ON	OFF
CUSTOM FILE TRANSFER	.....(submenu - see following)	

* See submenu of choices for CELL DISTRIB (Following Custom File Transfer submenu)

submenu to CELL DISTRIB **CUSTOM FILE TRANSFER**		
DRIVES	HARD DRIVE	FLOPPY
CUSTOM FILENAME	XXXXXXXX	
<LOAD FROM DISK>		
<!!! DELETE FILE !!!>		

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Choices for active and idle cells - CELL DISTRIB - choices and values

CELL DISTRIB - choices for active and idle cells		
CONSTANT - the entire distribution consists of a single Burst count		*Values*
ACTIVE	**CONSTANT** 50.0% Cell Burst Count: **1**	(0-65,535)
IDLE	**CONSTANT** 50.0% Cell Burst Count: **0**	(0-65,535)

Choices and values for active and idle cells - CELL DISTRIB

CELL DISTRIB - choices for active and idle cells		
UNIFORM - the distribution consists of Burst counts that vary in size from the minimum count to the maximum counts in increments based on Burst Step size. The occurrence rate for each of the Burst counts will be the same, making a uniform distribution of ATM cell bursts.		*Values*
ACTIVE	**UNIFORM** 58.1% MAX: 100 MIN: 0 STEP: 1	(0-65,535)
IDLE	**UNIFORM** 41.9% MAX: 100 MIN: 0 STEP: 1	(0-65,535)

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Choices and values for active and idle cells - CELL DISTRIB

CELL DISTRIB - choices for active and idle cells		
Gaussian - this distribution simulates a Gaussian distribution of Burst counts. The Gaussian curve is defined by the Mean Burst count and the Standard Deviation from the mean in terms of cells.		*Values*
ACTIVE	**GAUSSIAN** 50.0% MEAN: 120 STD DEV: 20 (Burst Count Range: 60 to 180 Cells)	MEAN = (0-65,533) MAX/ MIN +3/- 3 times STD. DEV.
IDLE	**GAUSSIAN** 50.0% MEAN: 120 STD DEV: 20 (Burst Count Range: 60 to 180 Cells)	MEAN = (0-65,535) MAX/ MIN +3/- 3 times STD. DEV.

65,533 with a STD DEV. of one

Choices and values for active and idle cells - CELL DISTRIB

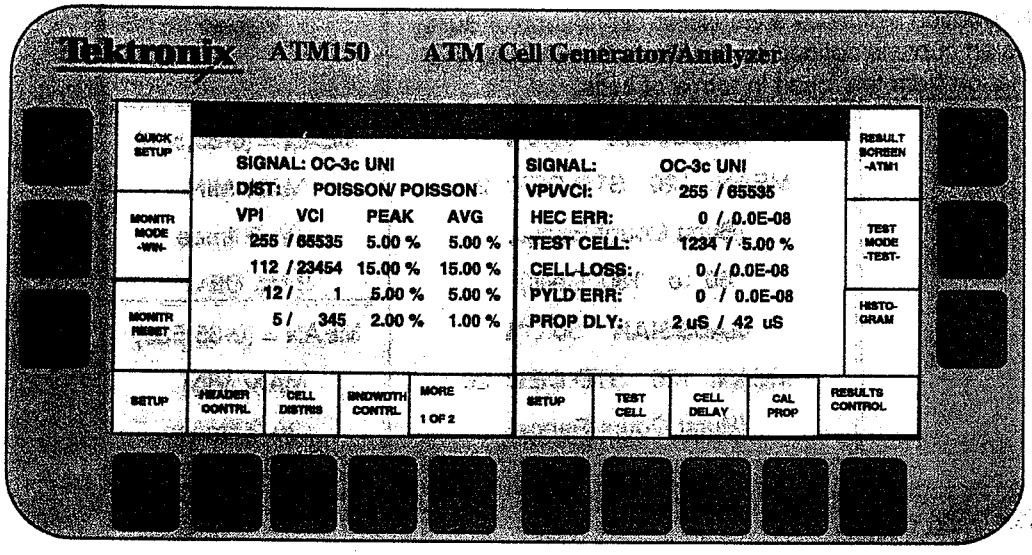
CELL DISTRIB - choices for active and idle cells		
POISSON - this distribution simulates a Poisson distribution of Burst counts. The Poisson curve is defined by the Mean Burst count.		*Values*
ACTIVE	**POISSON** 50.0% MEAN: 36 (Burst Count Range: 18 to 54 Cells	MEAN = (0-65,527) MAX/ MIN +3/- 3 times STD. DEV.
IDLE	**POISSON** 50.0% MEAN: 36 (Burst Count Range: 18 to 54 Cells	MEAN = (0-65,527) MAX/ MIN +3/- 3 times STD. DEV.

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Menu Structure

Analyzer Softkeys

Figure 3-4 -- Softkey portion and LCD screen of ATM150 Front Panel



ATM396-1

RESULT SCREEN

The RESULTS SCREEN softkey on the Analyzer side of the LCD screen permits four choices for the display of test information. Push the softkey until the appropriate choice appears under the RESULTS SCREEN name: **ATM1** or **ATM2** - for ATM Layer information, or **PHYS1** or **PHYS2** for Physical Layer alarms.

Example of Results

RESULTS SCREEN (s)			
ATM1	**ATM2**	**PHYSICAL1**	**PHYSICAL2**
Signal: DS3 COSET/UNI PLCP			
VPI/VCI.....1/1	VPI/VCI 1/1	VPI/VCI 1/1	
HEC ERR 5 0.01E-07	Test elapsed 0-15:21:43.0	Alarms:	Test elapsed: 0-15:18:35.5
Test cell 5.6E+0970.704 Mbps	Idle cell 47999 50.00%	HIST	
Cell loss 5 0.09E-08	Misinsert 454080 47.30%	Parity: 0 0.00e-11	PLCP B1: 0
PYLD ERR 0 0.00E-08		LCV: 0	PLCP FEBE: 0
PROP DLY 2 US 5 US		DS3 FEBE: 0	

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TEST MODE

The TEST MODE softkey on the Analyzer side of the LCD screen is tied together with the RESULTS CONTROL softkey to choose two types of test results: **WIN** - the most recent sample of a set period of time (example; WIN set for one second, the monitor will display the errors found in the most recent one-second period, and then the count reset to zero and in the next second, errors are counted) or -**TEST** - an accumulation of information starting at the beginning of the test and going on until stopped.

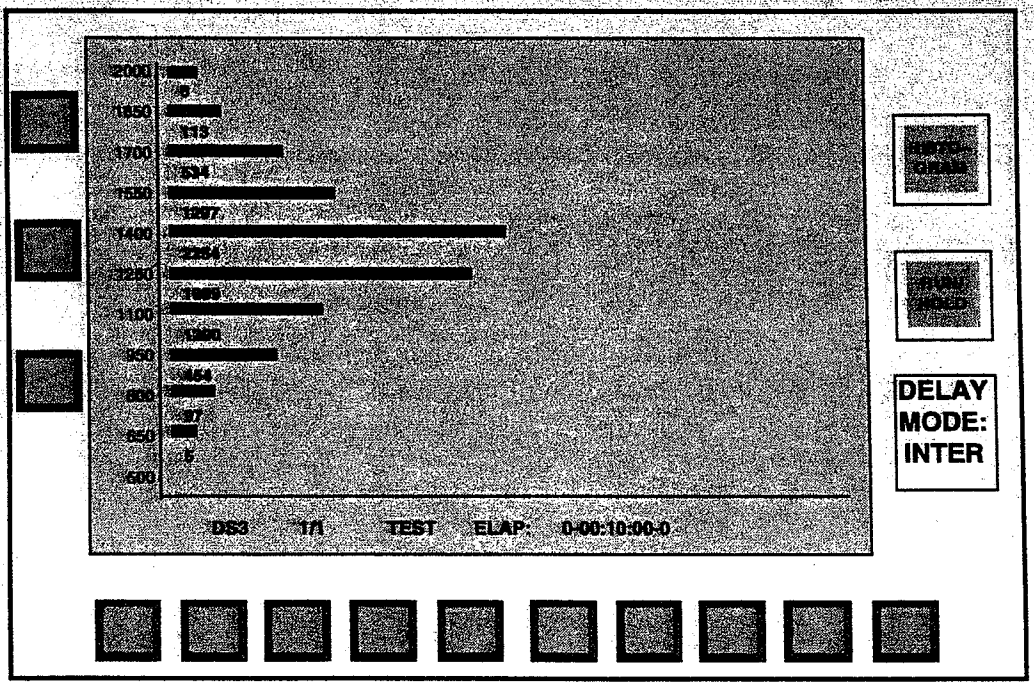
TEST **WIN**

Difference between Test Mode - Test and Test Mode- Window is:

- TEST is a continuous display of results without dropping any past information.
- WINDOW (WIN) is a display of the latest specified seconds. WIN drops all history and past information and shows just the latest results. This test mode is useful in tweaking the network lines.

HISTOGRAM

As the test cells arrive at the Analyzer, these cells are grouped into up to ten different bins. This histogram provides a graphical representation of the quantity of test cells distributed in the various delay bins. The delay bins can be arranged around microsecond delays. This bargraph can be used to set performance benchmarks. There is the ability to RUN and HOLD the distribution of test cells while the graphical histogram is being displayed. The default mode of the Histogram is RUN. To exit the HISTOGRAM function, press the top HISTOGRAM button. The screen example below is that of a Gaussian distribution.



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SETUP

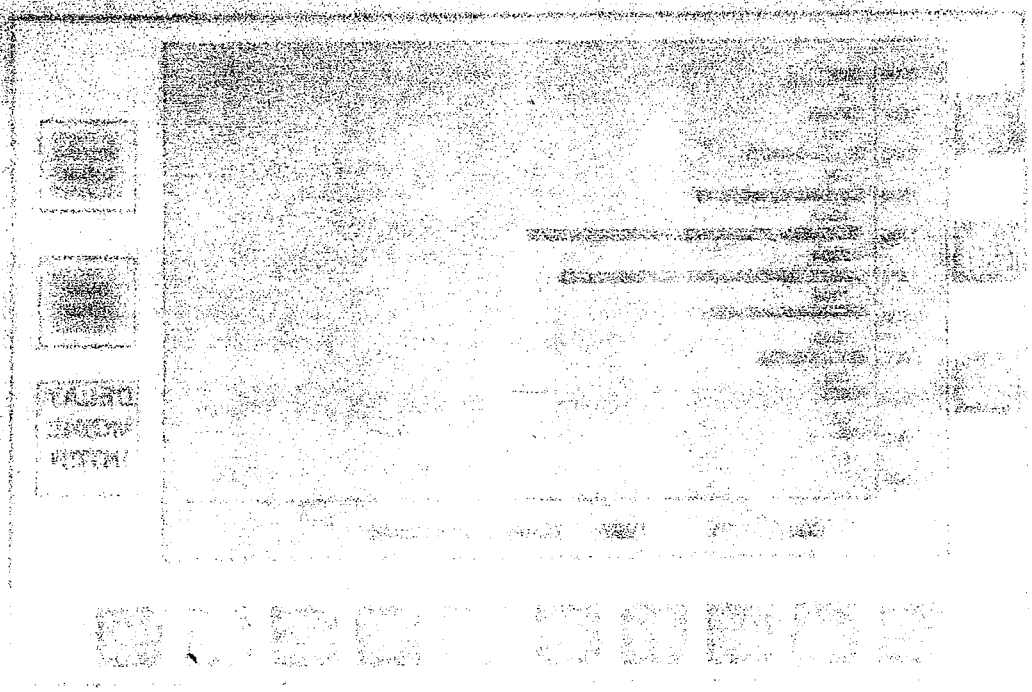
Push the SETUP softkey on the Analyzer side of the LCD screen to select one of six different physical interfaces that can be used in the ATM150. The six interfaces are DS-3, DS-1, OC-3c/STM-1, E1/E3 and 100Mbps (TAXI). To switch between choices, use the turn knob. The LOOPBACK function is the Analyzer capturing information from the network and sending this information straight to the Generator, without analysis. The Generator in turn feeds the signal right back into the network. This Loopback function is the ability to wire the ATM150 test set directly into the network without disturbing the network flow.

*** Note: DS3 and DS1 signals, E1 and E3 signals**

Each signal interface module includes transmitter and receiver circuitry. In general, the transmitter and receiver operate independently allowing the transmitter of one interface module (for example, OC-3c) to be used simultaneously with the receiver of another interface module (for example, DS3). However, the DS1/DS3 and E1/E3 interfaces combine two interfaces on the same module. In this case, if both the transmitter and receiver of the DS1/DS3 module are used, the module must be set to the same signal. This situation also applies to the E1/E3 module.

For example, the DS1 circuitry is shared with the DS3 circuitry (E1 circuitry is shared with E3 circuitry). If the Generator (transmitter) signal is set to DS1, the Analyzer (receiver) cannot be set to DS3. (If the Generator is set to E1, the Analyzer cannot be set to E3.)

The ATM150 will prevent the user from setting a combination that is not permitted. If the Analyzer is set for DS3 operation and the user tries to set the Generator for DS1 operation, the ATM150 will change the Analyzer to DS1 to match the Generator signal setting. In this example (DS1 operation on the Generator side of the ATM150), the user can set the Analyzer to OC-3c or any other signal interface except DS3. The note above on the DS1 and DS3 signals apply in the same manner to the operation of the E1 and E3 signals.



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SETUP		
		Other choices
INPUT SIGNAL	DS3	DS1 OC-3c; STM-1 E1; E3 100Mbps
CELL FORMAT	UNI	NNI
LOOPBACK *	DISABLE	ENABLE
DS3 PLCP MODE	ON	OFF
DS3 FRAMING	CBIT	MX3
PAYLOAD SCRAMBLE	ON	OFF
SYSTEM PARAMETERS...		

*When the LOOPBACK is ENABLED, the left side of the front panel screen displays the following message: ***ANALYZER IN LOOPBACK.

submenu to SYSTEM PARAMETERS...		
1PPS SOURCE	GENERATOR	EXT
SYNC PULSE OUTPUT	ATM	PHYSICAL
HEC COSET	ENABLE	DISABLE

The 1PPS Source choice controls the timing used for the cell delay measurements.

For proper delay measurements, the Generator and corresponding Analyzer should use the same source for the 1PPS.

The clock source for 100 Mbps will always be INTERNAL (INT).

UNI (User-Network Interface) is the ATM cell format that includes the GFC and a smaller VPI. NNI (Network-Network Interface) is the ATM cell format that does not include the GFC.

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SETUP		
		Other choices
INPUT SIGNAL	DS1	DS3 OC-3c; STM-1 E1; E3 100Mbps
CELL FORMAT	UNI	NNI
LOOPBACK *	DISABLE	ENABLE
DS1 PLCP MODE	ON	OFF
DS1 FRAMING	ESF	SF
PAYLOAD SCRAMBLE	ON	OFF
SYSTEM PARAMETERS...		

* When the LOOPBACK is ENABLED, the left side of the front panel screen displays the following message: ***ANALYZER IN LOOPBACK.

SETUP		
		Other choices
INPUT SIGNAL	E1	DS1; DS3 OC-3c; STM-1 E3 100Mbps
CELL FORMAT	UNI	NNI
LOOPBACK *	DISABLE	ENABLE
E1 PLCP MODE	ON	OFF
E1 CRC	ON	OFF
PAYLOAD SCRAMBLE	ON	OFF
SYSTEM PARAMETERS...		

* When the LOOPBACK is ENABLED, the left side of the front panel screen displays the following message: ***ANALYZER IN LOOPBACK.

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SETUP		
		Other choices
INPUT SIGNAL	E3	DS1; DS3 OC-3c; STM-1 E1 100Mbps
CELL FORMAT	UNI	NNI
LOOPBACK *	DISABLE	ENABLE
E3 PLCP MODE	ON	OFF
E3 FRAMING	G.751	
PAYLOAD SCRAMBLE	ON	OFF
SYSTEM PARAMETERS...		

* When the LOOPBACK is ENABLED, the left side of the front panel screen displays the following message: ***ANALYZER IN LOOPBACK.

SETUP		
		Other choices
INPUT SIGNAL	OC-3c	DS1; DS3 STM-1 E1; E3 100Mbps
CELL FORMAT	UNI	NNI
LOOPBACK *	DISABLE	ENABLE
SONET POINTER	522	0-782
NEW POINTER	522	0-782
<SET NEW POINTER>		
<PERFORM+PJ>		
<PERFORM-PJ>		
SYSTEM PARAMETERS...		

* When the LOOPBACK is ENABLED, the left side of the front panel screen displays the following message: ***ANALYZER IN LOOPBACK.

** For the OC-3 signal, two of the menu choices are PERFORM +PJ and PERFORM -PJ. The PJ abbreviation stands for pointer justification and permits plus or minus SONET pointer adjustments.

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SETUP		
		Other choices
INPUT SIGNAL	STM-1	DS1; DS3 OC-3C E1; E3 100Mbps
CELL FORMAT	UNI	NNI
LOOPBACK *	DISABLE	ENABLE
SONET POINTER	522	0-782
NEW POINTER	522	0-782
<SET NEW POINTER>		
<PERFORM +PJ>		
<PERFORM -PJ>		
SYSTEM PARAMETERS...		

* When the LOOPBACK is ENABLED, the left side of the front panel screen displays the following message: ***ANALYZER IN LOOPBACK.

** For the STM-1 signal, two of the menu choices are PERFORM +PJ and PERFORM -PJ. The PJ abbreviation stands for pointer justification and permits plus or minus SONET pointer adjustments.

TEST CELL

Push the TEST CELL softkey on the Analyzer side of the LCD screen to specify header information for the cell under test.

TEST CELL		
		Other choices
DISABLE * LINK TO TEST CELL	1	2,3,4
GFC	1	0-15
VPI / VCI	1 / 1	0-255 / 0-65,535
PTI / CLP	0 / 0	0-7 / 0-1

* Choices are DISABLE AND ENABLE

When the LINK TO TEST CELL choice is ENABLE, the next three lines (GFC, VPI/VCI, and PTI/CLP) do not appear on the screen.

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CELL DELAY

The CELL DELAY softkey on the Analyzer side allows configuration of bins for delay measurements. Configuration of the bins is in micro-seconds of delay.

CELL DELAY CONTROL

DELAY MODE: PROP or INTERCELL *

MIN 0 uS MAX 1000 uS

STARTING DELAY BIN 1			0	
ENDING DELAYS (uS)				
	PROP values *	Intercell values *	PROP values *	Intercell values *
BIN 1 / 2	100	10	200	20
BIN 3 / 4	300	30	400	40
BIN 5 / 6	500	50	600	60
BIN 7 / 8	700	70	800	80
BIN 9 / 10	900	90	1000	100

* The screen will show PROP (propagation) values or INTERCELL values, not both.

There are ten cell delay bins. Each accumulates the number of received ATM Test Cells which have a propagation delay that falls within the range of the bin. The cell delay bins are specified by eleven delay values. There is one Start Delay value and ten End Delay values.

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CAL PROP

Hit the CAL PROP softkey on the Analyzer side to bring up the Calibrate screen. There is a propagation delay between the Generator (transmitter) and Analyzer (receiver), especially as the Generator signal travels out into the live network and returns to the Analyzer. The Calibration Propagation (Cal Prop) feature of the ATM150 measures this delay in order to create a reference value and to account for the delay which can affect the value of information obtained.

CALIBRATE

SIGNAL: OC-3c UNI

REFERENCE VALUE = 14 uS

NOTE: To update this propagation zero reference to the present minimum cell delay, execute below action key.

<CALIBRATE PROPAGATION DELAY>

The line labeled "Signal" for this menu will show Signal and Cell Format (UNI or NNI).

CALIBRATE

SIGNAL: DS3 COSET/ UNI PLCP

REFERENCE VALUE = 47 uS

NOTE: To update this propagation zero reference to the present minimum cell delay, a test must be running.

The line labeled "Signal" for this menu will show Signal, Physical Layer (PCLP for DS3), HEC Coset (if enabled), and Cell Format (UNI or NNI).

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RESULTS CONTRL

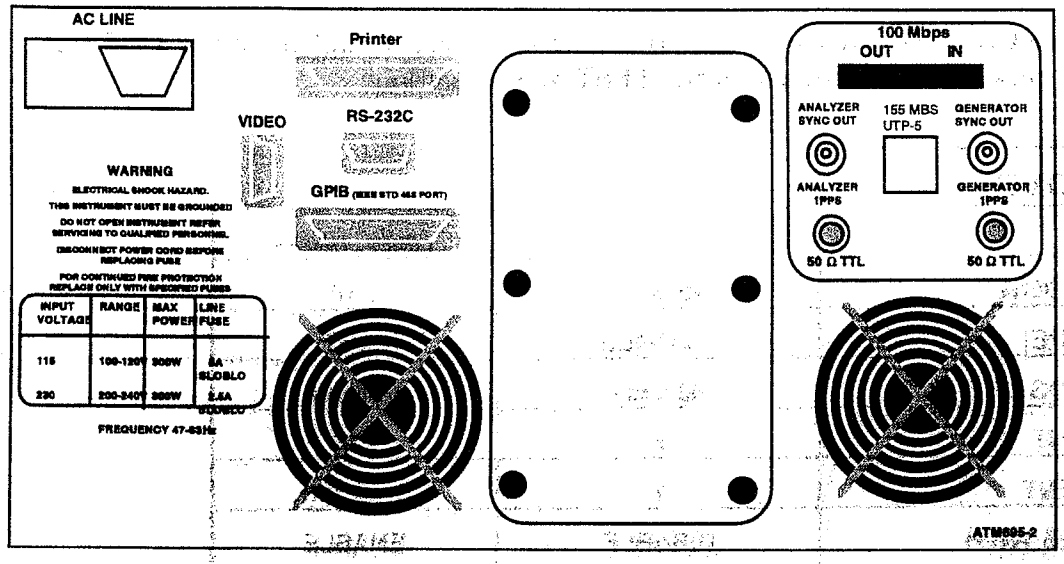
The RESULTS CONTRL softkey changes the bandwidth measurements of the ATM test. This softkey works in conjunction with the TEST MODE softkey.

RESULT CONTROL		
		Other choices
SLIDING WINDOW	**10** SEC	1-10
RESULTS TYPE	UNTIMED	TIMED
RESULTS LENGTH	**60** SEC	1-99,999
SWEEP COUNT	**5**	1-99
VCI INCREMENT	**1**	1-65,355
LINK RESULTS WITH GENERATOR TEST	DISABLE	ENABLE
OUTPUT RESULTS CONTROL...		

submenu to OUTPUT RESULTS CONTROL...		
PRINT EOT CONTROL	OFF	WIN, TEST, BOTH
RESULT FILE	ESULTS.TXT	A-Z, 0-9
<STORE RESULTS TO FLOPPY>		
<PRINT WINDOW MODE RESULTS>		
<PRINT TEST MODE RESULTS>		

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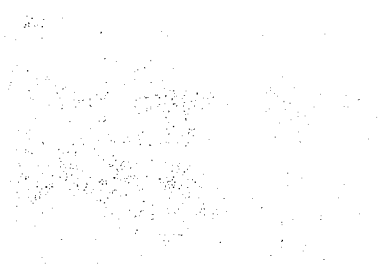
Figure 3-5 -- ATM150 Rear Panel



100 Mbps	The 100Mbps is the Generator output and the Analyzer input connection when using the 100Mbps fiber (TAXI) physical interface. The 100Mb/s connection can handle a multi-mode fiber cable with a SC connection.
Analyzer SYNC	The Analyzer SYNC connection is used to hook-up an oscilloscope, which can look at the data bits going into the unit. The SYNC connection requires a 50 ohm BNC coax cable.
Generator SYNC	The Generator SYNC connection is used to hook-up an oscilloscope, which can look at the data bits going out. The SYNC connection requires a 50 ohm BNC coax cable.
155 MBS UTP-5	RJ-45 - future optional interface - not available at this time.
AC Line	The AC power input accepts either 115 VAC or 230 VAC. Always use the correct fuse with the voltage supplied, 5A SLOBO fuse for 115 VAC, 2.5A SLOBO for 230 VAC. To change the fuse, remove the power cord, then pry out the fuse holder with a flat head screwdriver.
1PPS Connections	The 1PPS (One pulse per second) connection gives the test equipment user the ability to synchronize multiple or remote generators and analyzers.
Video Connector	A DB-15 pin connector supports a VGA screen
Parallel Printer Port	A DB-25 pin connector supports the standard Centronics-type printer interface. This capability will be added in the future.
Serial Port (RS-232C)	A DB-9 pin connector supports the RS-232C interface.
GPIB Connector	An IEEE-488.1 standard GPIB connector is provided for GPIB communication.
Cooling Fans	Two fans provide cooling for the ATM150 internal circuits. Care must be taken to avoid blocking the air flow. A minimum of two inches free space must be provided behind the unit.

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4. ATM-150 Applications & Examples

This section reviews ATM applications and how the ATM-150 Test Set from Microwave Logic can measure, verify, test, emulate, and monitor performance in ATM telecommunications and data communications products. A sampling of specific ATM-150 capabilities to support ATM network applications begins this section with three examples of ATM Load Testing following on page 4-5.

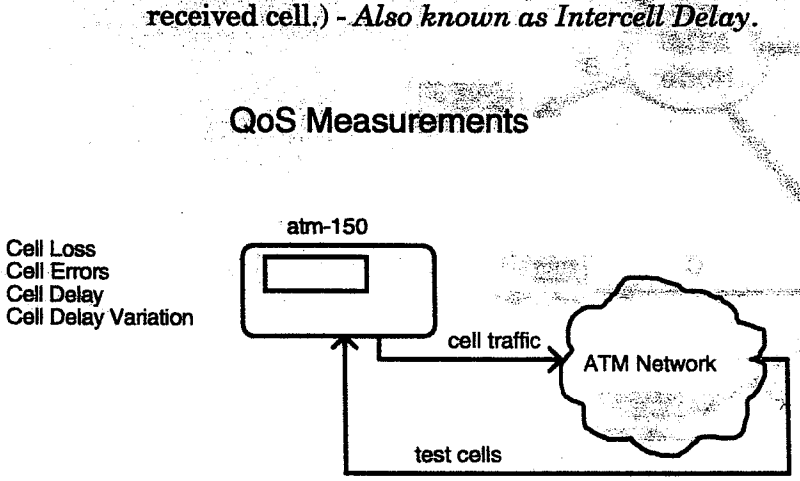
- **Quality of Service (QoS) Measurements**

  QoS parameters are used to define accuracy, speed and dependability of the connection for each user. With ATM's "use-on-demand" capabilities, users need not pay for bandwidth that they do not need. This is preferable to the user of course, but makes the billing-for-services (tariff) mechanism between the network provider and the user much more complex. This tariffing mechanism becomes a negotiated level of QoS. QoS parameters include such different measures as cell loss ratio or maximum transmission delay.

  Out-of-service performance analysis is the most accurate method of performance measuring. The ATM-150 test set supplies a controlled traffic input source to the system-under-test and the effects are observed by monitoring an output port of the system-under-test. The test set then correlates the data it sent to the data it received to obtain an accurate view of how the device behaves under certain conditions.

  The ATM-150 can characterize switch performance in a laboratory, as well as, verify and document actual performance of a network. The ATM-150 measures the follows parameters as defined by the ATM Forum UNI 3.0 document:

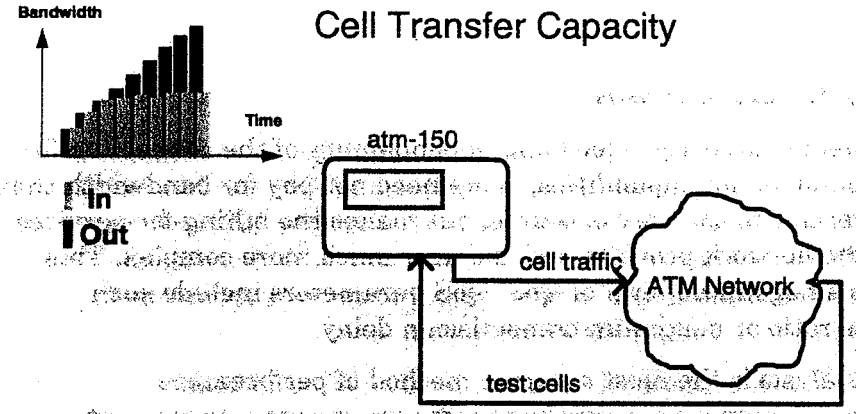
  - Cell Error Ratio (ratio of errored cells to total cells)
  - Cell Loss Ratio (Cells can be counted over periodic time intervals.)
  - Cell Transfer Delay (Delay is computed by comparing the time the cell was transmitted to the time it was received.) - *Also known as Propagation Delay.*
  - Cell Delay Variation (Measure of time between one received cell and the next received cell.) - *Also known as Intercell Delay.*



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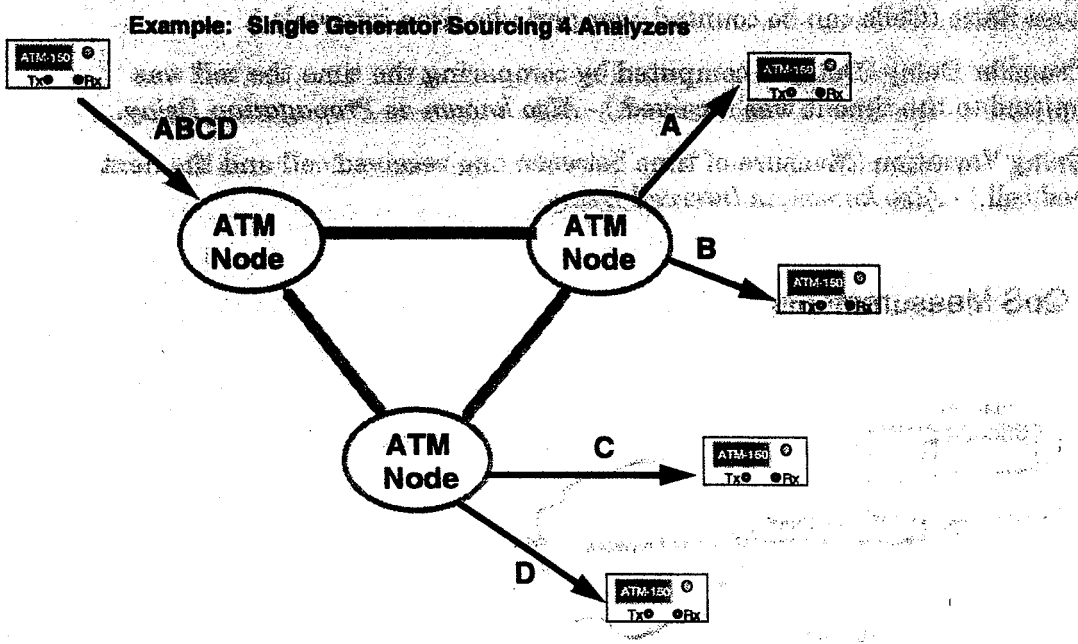
- **Cell Transfer Capacity Verification**

  The ATM-150 tests the response of a network to bandwidth considerations. This test helps determine the network's ability to route traffic when the network is saturated at a certain traffic load (bandwidth). Congestion conditions can be controlled from the ATM-150 by changing the number of channels (VPI/VCI) or the percentage bandwidth utilization.



- **Cross Network Testing**

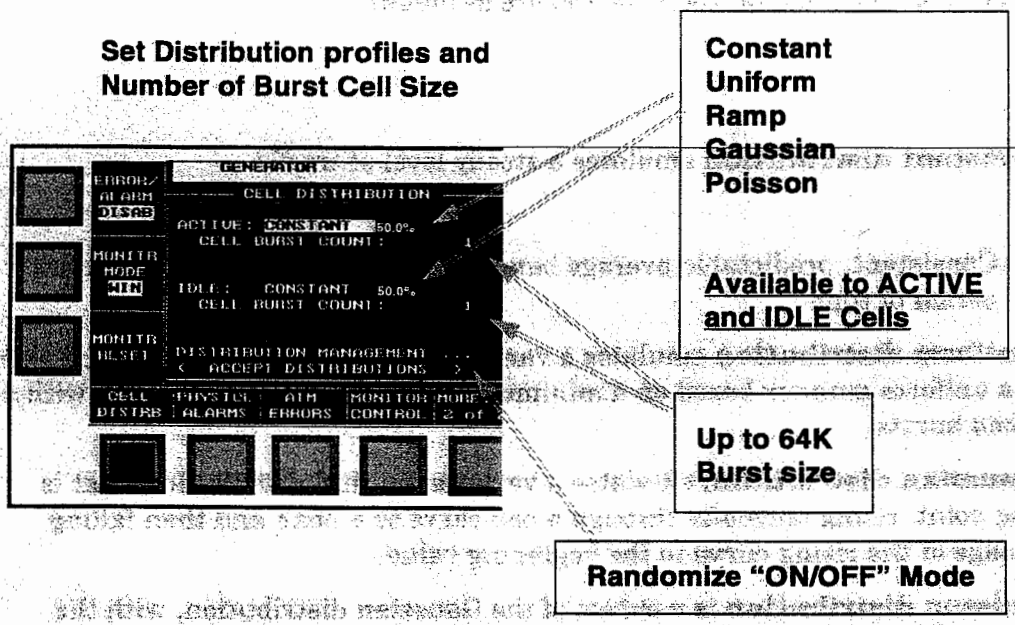
  A single generator can source four receivers positioned around the network, thus testing cell routing in the network. This capability can also point out differences in QoS (cell latency, cell loss ratio, cell error ratio) at different nodes in the network, and helps define the levels at which the quality of any given service is unacceptable.



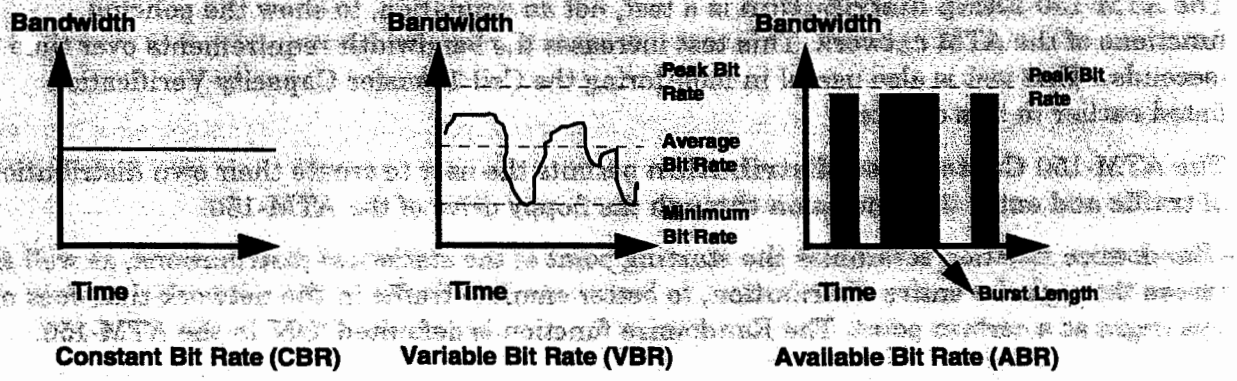
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- **Traffic Emulation**

  Selectable cell distributions can emulate diverse traffic patterns. Statistical distributions of known parameters can provide a reliable comparison of network traffic before and after the effects of a network element or elements. By knowing the distribution and behavior of particular traffic types through the network, available resources can be used more effectively.



Examples of Traffic types are illustrated below:



Constant Bit Rate - Traffic like existing telephony lines, voice or video, mapped into ATM using AAL-1. Use the Constant distribution to emulate this network traffic.

Variable Bit Rate - Traffic like some compressed video or voice and aggregated LAN traffic. Use any and/or all of the variable distributions to emulate this network traffic.

Available Bit Rate - Traffic like local LAN traffic bridged onto ATM, that needs to transfer brief bursts of information, at as high a speed as possible. Use any and/or all of the variable distributions to emulate this network traffic.

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• Statistical Distribution choices in the ATM-150

There are two types of network traffic that can be emulated by the ATM-150: constant and variable. An example of constant traffic is voice. Constant traffic is predictable.

Variable network traffic has no prediction of instantaneous bandwidth. Using statistical distribution emulations is an attempt to predict this traffic.

The statistical distributions available in the ATM-150 are as follows:

Constant traffic

- The ATM-150 **Constant distribution** emulates a steady level of traffic.

Variable traffic - Consistent, predictable average bandwidth use, but varies over a short period of time

- The ATM-150 **Uniform distribution** emulates a variable series of traffic bandwidths and chooses them in a uniform manner based on a minimum/ maximum series of bursts, with a step choice between bursts.
- The ATM-150 **Gaussian distribution** emulates a variable, normal distribution, that is there is a starting point, rising normally through a bell curve to a peak and then falling along a mirror image of the rising curve to the beginning value.
- The ATM-150 **Poisson distribution** is a subset of the Gaussian distribution, with the difference being a more aggressive rise in the bell curve to a peak, with a normal curve fall.
- The ATM-150 **Ramp distribution** is a test, not an emulation, to show the policing functions of the ATM network. This test increases the bandwidth requirements over time (seconds). This test is also useful in monitoring the Cell Transfer Capacity Verification listed earlier in this chapter.
- The ATM-150 **Customized distribution** permits the user to create their own distribution of traffic and enter the emulation through the floppy drive of the ATM-150.

The Randomize function scrambles the starting point of the statistical distributions, as well as, all values through the entire distribution, to better emulate traffic in the network that does not always begin at a certain point. The Randomize function is defaulted 'ON' in the ATM-150.

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Application Example

ATM Load Testing using Gaussian Statistical Cell Distribution

Intercell delay and measurement can be emulated by manipulating the gap between active cells. The ATM-150 has the power to program intercell gaps through the idle cell distribution. This is a unique traffic simulation feature of the ATM-150. The following three ATM-150 examples simulate expected computer data traffic, characterized by burstiness, and can be made to simulate worst case load testing. The examples demonstrate how to run from the ATM-150:

- a 100% Test Cell load;
- a 50% Test Cell, 50% Idle Cell load; and,
- a load made up of test cells and idle cells varied using a Gaussian statistical distribution.

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Example 1 - 100% Test Cell #1 Load Test

For a Constant Cell Distribution, set ACTIVE Test cell #1 to 100%, Burst Count 1

If the IDLE cell is set to 0 in the same Constant Cell Distribution menu, the Output data stream will look like this:

Active	Active	Active	Active	Active	Active	.....

To setup the ATM-150 for *Example #1* load testing, follow the settings below.

Settings for Generator side of ATM-150

Softkey	settings	choices
Setup	Output Signal	DS3
	Cell Format	UNI
	Clock Source	INT
	DS3 PLCP mode	ON
	DS3 Framing	CBIT
	Payload Scramble	ON
System Parameters ...	1PPS Source	INT
	SYNC Pulse	ATM
	HEC COSET	ENABLE
Header Control	TEST Cell number	1
	GFC	0
	VPI/ VCI	1/ 1
	PTI/CLP	0/ 0

Cell Distribution

ACTIVE	Constant	100.0%
Cell Burst Count	1	
IDLE	Constant	.0%
Cell Burst Count	0	

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Bandwidth Control

Test cell #1	100.0%
Test cell #2	0.0%
Test cell #3	0.0%
Test cell #4	0.0%
Idle Bandwidth	0.0%

Settings for Analyzer side of ATM-150

Softkey	settings	choices
Setup	Input Signal	DS3
	Cell Format	UNI
	Loopback	DISABLE
	DS3 PLCP mode	ON
	DS3 Framing	CBIT
	Payload Scramble	ON
System Parameters ...	1PPS Source	INT
	SYNC Pulse	ATM
	HEC COSET	ENABLE
Test Cell	DISABLE Link to Cell number	1
	GFC	0
	VPI/ VCI	1/ 1
	PTI/CLP	0/ 0

Start the Load test by pressing 'CELL RUN' key on the Generator side of the ATM-150, followed by the "TEST RUN" key on the Analyzer side. Press the "ATM RESULTS" softkey on the Analyzer side (More 3 of 3) to see that the TEST CELL reads 100.0%.

In this example, the ATM-150 Analyzer successfully received the Test Cells broadcast by the ATM-150 Generator.

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Example 2 - 50% Test Cell #1, 50% Idle Cell Load Test

For a Constant Cell Distribution, set ACTIVE Test cell #1 to 50%, Burst Count 1

If the IDLE cell is set to 1 in the same Constant Cell Distribution menu, the output data stream will look like this:

Active	Idle	Active	Idle	Active	Idle	.....

To setup the ATM-150 for *Example* #2 load testing, follow the settings below.

Settings for Generator side of ATM-150

Softkey	settings	choices
Setup	Output Signal	DS3
	Cell Format	UNI
	Clock Source	INT
	DS3 PLCP mode	ON
	DS3 Framing	CBIT
	Payload Scramble	ON
System Parameters ...	1PPS Source	INT
	SYNC Pulse	ATM
	HEC COSET	ENABLE
Header Control	TEST Cell number	1
	GFC	0
	VPI/VCI	1/1
	PTI/CLP	0/0

Cell Distribution

ACTIVE	Constant	50.0%
Cell Burst Count	1	
IDLE	Constant	50.0%
Cell Burst Count	1	

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Bandwidth Control

Test cell #1	50.0%
Test cell #2	0.0%
Test cell #3	0.0%
Test cell #4	0.0%
Idle Cell	50.0%

Settings for Analyzer side of ATM-150

Softkey	settings	choices
Setup	Input Signal	DS3
	Cell Format	UNI
	Loopback	DISABLE
	DS3 PLCP mode	ON
	DS3 Framing	CBIT
	Payload Scramble	ON
System Parameters ...	1PPS Source	INT
	SYNC Pulse	ATM
	HEC COSET	ENABLE

Test Cell	DISABLE Link to Cell number	1
	GFC	0
	VPI/ VCI	1/ 1
	PTI/CLP	0/ 0

Start the Load test by pressing 'CELL RUN' key on the Generator side of the ATM-150, followed by the 'TEST RUN" key on the Analyzer side. Press the "ATM RESULTS" softkey on the Analyzer side (More 3 of 3) to see that the TEST CELL reads 50.0%, and the IDLE CELL reads 50.0%.

In this example, the ATM-150 Analyzer successfully received the Test Cells and Idle Cells broadcast by the ATM-150 Generator.

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Example 3 - Altering the Intercell gap to simulate network traffic Test

Here is where the Intercell gap can be manipulated to simulate network traffic. Leave the ACTIVE Cell at Constant, and the switch the Idle Cell to "Gaussian". Set the bandwidth percentage to 0.8% for ACTIVE and 99.2% for IDLE. Next, under the IDLE choice, set the mean value to 120 cells, with a standard deviation of 20.

To setup the ATM-150 for *Example #3* load testing, follow the settings below.

Settings for Generator side of ATM-150

Softkey	settings	choices
Setup	Output Signal	DS3
	Cell Format	UNI
	Clock Source	INT
	DS3 PLCP mode	ON
	DS3 Framing	CBIT
	Payload Scramble	ON
System Parameters ...	1PPS Source	INT
	SYNC Pulse	ATM
	HEC COSET	ENABLE
Header Control	TEST Cell number	1
	GFC	0
	VPI/ VCI	1/ 1
	PTI/CLP	0/ 0
Cell Distribution		
ACTIVE	Constant	0.8%
Cell Burst Count	1	
IDLE	Gaussian	99.2%

Accept the default setting of Mean 120, with a Standard Deviation (STD. DEV.) of 20, or change the mean value to 120 and the STD. DEV. To 20 via the entry keys.

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Bandwidth Control

Test cell #1	0.8%
Test cell #2	0.0%
Test cell #3	0.0%
Test cell #4	0.0%
Idle Cell	99.2%

Settings for Analyzer side of ATM-150

Softkey	settings	choices
Setup	Input Signal	DS3
	Cell Format	UNI
	Loopback	DISABLE
	DS3 PLCP mode	ON
	DS3 Framing	CBIT
	Payload Scramble	ON
System Parameters ...	1PPS Source	INT
	SYNC Pulse	ATM
	HEC COSET	ENABLE
Test Cell	DISABLE Link to Cell number	1
	GFC	0
	VPI/ VCI	1/ 1
	PTI/CLP	0/ 0

The following menu helps create a useful graph of the results in the histogram feature.

Cell Delay

DELAY MODE INTERCELL

MIN 500 uS MAX: 2000 uS

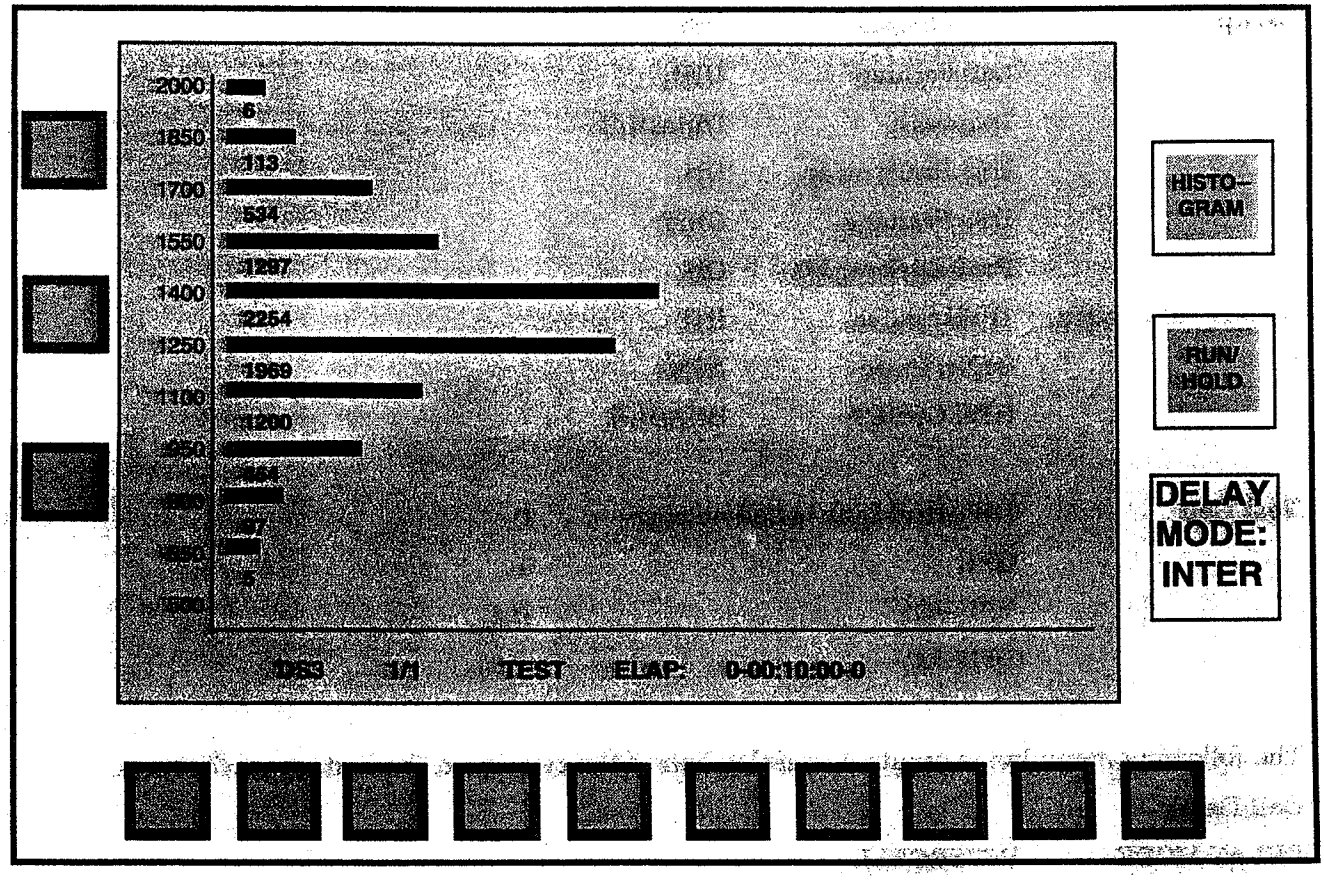
Note: The max setting must be input first, then the min. Use the arrow keys to move to the max. setting first.

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Start the *Example #3* Load test by pressing the 'CELL RUN' key on the Generator side of the ATM-150. There is a 15-30 second wait while the ATM-150 programs the cell headers and the statistical distribution. There is a status line at the top of the LCD screen indicating the programming sequence.

After the programming sequence has finished, press the 'TEST RUN" key on the Analyzer side to collect the information generated by the CELL RUN. The green SYNC LED will light up. Press the "RESULT SCREEN" softkey on the Analyzer side (top softkey on the right-hand side of the front panel) to see that the TEST CELL reads 0.8%, and the IDLE CELL reads 99.2%.

Press the Histogram softkey to graph the Gaussian distribution. Make sure while viewing the histogram that the choice of Delay Mode is INTER.



In this example, the ATM-150 Analyzer successfully received the Test Cells and Idle Cells, varied by Gaussian distribution, broadcast by the ATM-150 Generator.

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Appendices

A. ATM Basics A-1

B. Specifications.....B-1

C. Default Settings C-1

D. Block Diagram.....D-1

E. Remote Commands E-1

F. Service Information/ Warranty F-1

G. RS-232 Interface G-1

H. GPIB Interface.....H-1

I. Options..... I-1

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ATM150 Software Revision List

Software Version	Date	Changes
B.3	9/1/94	Added HDR Randomize Added Physical Layer ALM monitor
1.0	10/5/94	Added Gaussian/ Poisson Distributions Added Remote Commands
1.0b	10/12/94	Added DS3 ATM Cell Payload Scramble (PLCP off)
1.1	10/24/94	Added Loopback (RX of ATM150 picks up network signals and pass them without modification to TX where they rejoin the network) (Ability to wire ATM test set into network without disturbing network flow) Added Intercell Delay (ability to manipulate intercell delays through idle cells)
1.2	11/3/94	Added Propagation Calibration Modified Test Cell Bandwidth Control Added Active/Idle percentage feedback in Cell Distribution menu Modified Gaussian/ Poisson Cell Distributions - No min/max/step - 3 sigmas Distribution RANDOMIZE (not scramble) Histogram defaults to RUN mode MX3 instead of M23 Enter key change (function ignored if turn knob controls choice)
1.21	11/16/94	Internal enhancements (system, Cal Prop)
1.3	12/15/94	DS1 interface Bandwidth control - can be set for percentage or frequency
1.4	07/03/95	DS1 interface E1/E3 interface Redesign front panel to allow simultaneous provisioning of OC-3c, DS1/DS3, and E1/E3 Remove redundant screens Add ATM1, ATM2, PHYS1, PHYS2 Results screens Simplify SETUP screen Line Printer support
1.5	03/25/96	STM-1 interface Store and Recall Quick Setup User-defined header and distribution loading
1.51 or above	1/30/97	Add safety procedures, low voltage directive approvals, change to Tektronix revision system

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Contents

Software Revision List
Revision History/ Legal/ Disclaimer/ Safety Practices, including Laser Safety/ Reader Comment Card
General Safety Procedures

1. Introduction
- Functional Description of ATM150 1-1
- Diagrams of front and rear panels 1-3

2. Getting Started
- Operating Basics 2-1
- Quick Start 2-3
- System Performance Verification (Instrument Test) 2-13

3. Reference
- Front Panel 3-1
- Generator 3-3
- Analyzer 3-3
- Utility 3-6
- Menu Structure
  - Generator Softkeys 3-9
  - Analyzer Softkeys 3-22
- Rear Panel 3-32

4. Applications & Examples

Appendices
- A. ATM Basics A-1
- B. Specifications B-1
- C. Default Settings C-1
- D. Block Diagram D-1
- E. Remote Commands E-1
- F. Service Information/ Warranty F-1
- G. RS-232 Interface G-1
- H. GPIB Interface H-1
- I. Options I-1

Glossary
Index

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Appendix A

ATM Basics

ATM is one of the general class of packet technologies that relay traffic via an address contained within the packet. Unlike packet technologies such as X.25 or frame relay, ATM uses very short, fixed-length packets called cells.

The ATM cell is 53 bytes long, consisting of a five-byte header containing the address and a fixed 48-byte information field (payload). Each cell is identified with virtual circuit identifiers that are contained in the cell header. An ATM network uses these identifiers to relay the traffic through high-speed switches from the sending customer premises equipment (CPE) to the receiving CPE.

ATM provides limited error detection operations. It provides no retransmission services, and few operations are performed on the small header. The intention of this approach - small cells and with minimal services performed - is to implement a network that is fast enough to support multi-megabit transfer rates.

Advantages of ATM

Features	Benefit
Small cell size	Low latency to support real-time services (like voice and video)
Fixed cell length	Fast hardware switching and scalability
Standardization	Usable in all networks (LAN or WAN)

- **Scalability**

ATM is a scaleable technology. The ATM standard describes a 53-byte cell format, but is silent as to items like rates, framing, or physical bearers. Thus many different systems, such as local area networks, switches and public networks can use the same format. Previously, standards usually tied rates and formats into one package incompatible with anything else. With ATM, a cell generated by a 100 Mbps LAN can be carried over a 45 Mbps DS3 to a central office and switched into a 2.4 Gbps SONET transport system. This illustrates three very different systems (LAN, network transport, switching) with the message in the same format, rate scaled to suit the application.

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- **Transparency**

ATM is application transparent. The cell size is a compromise between the long frames generated by data communications applications and the short repetitive needs of voice. It is also suitable for such services as video. ATM will allow free mixture of data and voice or video within the same application with no worry concerning compatibility with LAN or wide area communications.

- **Granularity**

ATM allows the network to be tailored to the application, rather than forcing applications to fit the network. The Time Division Multiplexing (TDM) network has trouble dealing with anything that does not fit the limited granularity of the digital hierarchy: DS0s, DS1s or DS3s. If an application requires more than a DS0, but less than a DS1, the user either buys an entire DS1 or finds several low speed applications and bundles them together to fill the DS1.

ATM allows the user to deliver traffic at rates and degrees of burstiness compatible with the applications running, not at rates convenient to the network.

ATM is a simple, very fast switching and routing process based on the cell address. Unlike X.25, ATM does no processing in the network above the cell level.

- **Networking Flexibility**

ATM also provides networking advantages. For example, ATM can act as a self-routing digital cross-connect system (DCS) providing services users have sought for many years. A common user need is to reconfigure the network to meet changing time-of-day requirements, and of course, to pay only for the bandwidth used.

With ATM, reconfiguration is available on a cell-by-cell basis with no intervention.

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ATM Cell Structure

The ATM cell consists of two parts: a five-byte header and a 48-byte information field.

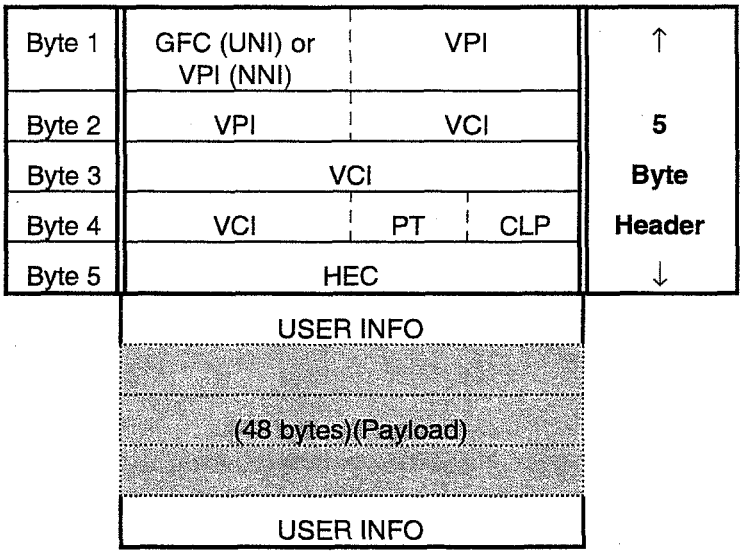


Figure A-1 ATM Cell Structure

- **GFC**

The first four bits of the first byte contain a generic flow control field (GFC). It is used to control the flow of traffic across the User-to-Network interface (UNI), and thus into the network. The Network-to-Network Interface (NNI) does not use the GFC. The VPI in the NNI uses these four bits for additional network addresses. See Figure A-2 for another view of the Cell Structure Format.

- **VPI/VCI** -

The next 24 bits, the last half of byte one, bytes two and three, and the first half of byte four, make up the ATM address. This three-byte field is divided into two sub-fields. The first byte contains the Virtual Path Identifier (VPI) and the second two bytes make up the virtual channel identifier (VCI).

What are VPI and VCI?

ATM is a connection-orientated protocol and as such there is a connection identifier in every cell header which explicitly associates a cell with a given virtual channel on a physical link. The connection identifier consists of two sub-fields, the Virtual Channel Identifier (VCI) and the Virtual Path Identifier (VPI). Together they are used in multiplexing, de-multiplexing and switching a cell through the network. VCIs and VPIs are not addresses. They are explicitly assigned at each segment (link between ATM nodes) of a connection when a connection is established, and remain for the duration of a connection. Using the VCI/VPI, the ATM layer can asynchronously interleave (multiplex) cells from multiple connections.

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Why both VPI and VCI?

The Virtual Path concept originated with concerns over the cost of controlling B-ISDN networks. The idea was to group connections sharing common paths through the network into identifiable units (the Paths). Network management actions would then be applied to the smaller number of groups of connections (paths) instead of a larger number of individual connections (VCI). Management in this instance includes call setup, routing, failure management, bandwidth allocation, and others. For example, use of Virtual Paths in an ATM network reduces the load on the control mechanisms because of the functions needed to setup a path through a network are performed only once for all subsequent Virtual Channels using the path. Changing the trunk mapping of a single Virtual Path can affect a route change for every Virtual Channel using that path.

- **PT**

The next three bits, PT or payload type, indicate the type of information carried by the cell. ATM cells will be used to carry different types of user information that may require different handling by the network or terminating equipment. Cells will also be used to transfer operations and maintenance messages across the network between users or between user and service provider. Codes within this three bit field will indicate the type of message in the payload.

- **CLP**

The last bit of byte four, CLP, indicates the cell loss priority, and is set by the user. This bit indicates the eligibility of the cell for discard by the network under congested conditions. If the bit is set to 1, the cell may be discarded by the network depending on traffic conditions.

- **HEC**

The final byte, the HEC, is the header error control field. This is an error-correcting code calculated across the previous four bytes of the header, designed to detect multiple header errors and correct single bit errors. The HEC does not provide any indication of the quality of data in the information field.

- **ATM Cell Information field**

Following the HEC is the 48-byte cell information field containing the user data. Inserting user data into the information field is accomplished by the ATM adaptation layer (AAL).

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Another view of the ATM Layer Protocol Data Unit Formats

GFC	VPI	VCI	PTI	CLP	HEC	Info
4 bits	1 octet	2 octets	3 bits	1 bit	1 octet	48 octets

GFC - Generic Flow Control	CLP - Cell Loss Priority
VPI - Virtual Path Identifier	HEC - Header Error Control
VCI - Virtual Channel Identifier	Info - Information
PTI - Payload Type Identifier	

ATM CELL FORMAT (UNI)

VPI	VCI	PTI	CLP	HEC	Info
12 bits	2 octets	3 bits	1 bit	1 octet	48 octets

VPI - Virtual Path Identifier	CLP - Cell Loss Priority
VCI - Virtual Channel Identifier	HEC - Header Error Control
PTI - Payload Type Identifier	Info - Information

ATM CELL FORMAT (NNI)

Figure A-2 - Another view of the ATM Layer Protocol Data Unit Formats

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ATM150 Specifications

Cell Generator

Header Generation

Cell header parameters can be adjusted from compatibility with various systems. In addition error can be introduced into the header or the cell payload.

Cell Header Format

UNI	User to Network interface. Includes a 4 bit GFC, an 8 bit VPI, a 16 bit VCI, 3 bit PTI and a 1 bit CLP field.
NNI	Network to Network interface. Includes a 12 bit VPI, a 16 bit VCI, 3 bit PTI and a 1 bit CLP field.

HEC and Coset

Coset On	The HEC is generated using a x^8+x^2+x+1 polynomial, then the $x^6+x^4+x^2+1$ coset polynomial is added.
Coset Off	The HEC is generated using only the x^8+x^2+x+1 polynomial.

HEC Error Generation

Single	The entire HEC byte is inverted for one cell.
Rates	The entire HEC byte is inverted once for every 100 to 10^9 cells.

Cell Error Generation

Single	An entire payload data byte is inverted for one cell.
Rates	An entire payload data byte is inverted once for every 100 to 10^9 cells.

Cell Distribution

Cell distribution provide emulation of traffic types. This is controlled by sequencing through a list of entries representing bursts of active cells or gaps of idle cells between the bursts. The odd entries in the list represent the length of a burst, and even entries the length of a gap. Cell distribution controls automatically provide the entries for these lists.

Distribution Randomize

This parameter applies to all the distributions.

Sequential	Each entry in the list is used sequentially.
Random	Each entry in the list is accessed in a pseudo-random order. The alternation of active and idle entries still maintained.

Constant Distribution

The bursts are always the selected size. Constant distribution is available for active or idle entries.

Burst Size	0-65535 cells

Uniform Distribution

Bursts are generated at the selected minimum size, and at the minimum size plus any integer multiple of the step size up to the maximum size. A uniform amount of each burst size meeting the above criteria are sent. This distribution is available for active or idle entries.

Maximum	1-65535 cells
Minimum	0-65534 cells
Step	1-65535 cells

Gaussian Distribution

Bursts are generated at the selected minimum size, and at the minimum size plus any integer multiple of the step size up to the maximum size. The amount of each burst size meeting the above criteria sent is calculated to produce a Gaussian or normal distribution with a selectable mean and standard deviation. This distribution is available for active or idle entries.

Maximum	1-65535 cells
Minimum	0-65534 cells
Step	1-65535 cells
Mean	1-65535 cells
Std. Dev.	TBD

Poisson Distribution

Bursts are generated at the selected minimum size, and at the minimum size plus any integer multiple of the step size up to the maximum size. The amount of each burst size meeting the above criteria sent is calculated to produce a Poisson distribution with a selectable mean. This distribution is available for active or idle entries.

Maximum	1-65535 cells
Minimum	0-65534 cells
Step	1-65535 cells
Mean	1-65535 cells

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Ramp Distribution

Bursts are generated at sizes approximating a linear ramp from the selected minimum percentage to the selected maximum percentage. The a uniform amount of each burst size meeting the above criteria is sent. The burst size is selected to allow the sequence to repeat in a selected time. This distribution is available only for active entries.

Max. %	1-100 percent of available bandwidth
Min. %	0-98 percent of available bandwidth
Period	1-60 seconds

User-defined Distributions

User defined distributions must be in a list form satisfying the following criteria.

List Length	2 to 65536 entries, always an even number, half burst and half gap.
Burst Length	0 to 65535 cells, a length of zero is used to cascade gaps for long idle periods.
Gap Length	0 to 65535 cells, a length of zero is used to cascade bursts for long bursts, up to full bandwidth.

Header and Bandwidth Control

The ATM150 can store 8191 different active cell headers and one idle cell header. Of the active cell headers up to four are available as test cell headers. These test cells are special in that they contain information fields the analyzer can process to do measurements. Other active cells contain arbitrary information.

UNI Cell Header Editing

GFC	0-15 Generic Flow Control
VPI	0-255 Virtual Path Identifier
VCI	0-65535 Virtual Channel Identifier
PTI	0-7 Payload Type Indicator
CLP	0-1 Cell Loss Priority
HEC	Automatically calculated. Header Error Control

NNI Cell Header Editing

VPI	0-4095 Virtual Path Identifier
VCI	0-65535 Virtual Channel Identifier
PTI	0-7 Payload Type Indicator
CLP	0-1 Cell Loss Priority
HEC	Automatically calculated. Header Error Control

Test Cell Header Control

Number	1-4 which test cell to use.
Enable	Allows use of cell header.
Bandwidth	0.0 to 100.0 % The amount of bandwidth allotted to this header. This is the percentage of the bandwidth available as defined by the cell distributions.

Active Cell Header Control

Number	1-16 which active cell to use.
Bandwidth	Automatically assigned to all available active bandwidth not assign to test cells.

Generator Monitor

Counter circuits continuously monitor the outputs of the four test cell generators and displays peak and average bandwidth.

Monitor Mode

Monitor	Peak and average bandwidth are based on total accumulation.
Window	Peak and average bandwidth are based on a sliding window, selectable from 1-10 seconds.

Test Cell Data

The 48 byte cell payload is constructed of a three byte sequence tag, a three byte time tag and a 42 byte pseudo-random number.

Sequence Tag

Number	20 bit field incremented once each time this test cell is sent.
Parity	4 bit field reflecting the parity of four 5 bit fields of the number.

Time Tag

Time	20 bit field containing the time since the beginning of a second in microseconds.
Parity	4 bit field reflecting the parity of four 5 bit fields of the time.

Pseudo-random Number

A 42 byte number generated by seeding a pseudo-random number generator with the 4 bits from the sequence tag and five bits from the time tag. The generator uses a x^9+x+1 polynomial.

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Cell Analyzer

Test Cell Filter

Test cells are identified by comparing with the test cell filter.

Cell Header Format

UNI	User to Network interface. Includes a 4 bit GFC, an 8 bit VPI, a 16 bit VCI, 3 bit PTI and a 1 bit CLP field.
NNI	Network to Network interface. Includes a 12 bit VPI, a 16 bit VCI, 3 bit PTI and a 1 bit CLP field.

UNI Cell Header Editing

GFC	0-15 Generic Flow Control
VPI	0-255 Virtual Path Identifier
VCI	0-65535 Virtual Channel Identifier
PTI	0-7 Payload Type Indicator
CLP	0-1 Cell Loss Priority

NNI Cell Header Editing

VPI	0-4095 Virtual Path Identifier
VCI	0-65535 Virtual Channel Identifier
PTI	0-7 Payload Type Indicator
CLP	0-1 Cell Loss Priority

HEC and Coset

Coset On	The HEC is compared using a x^8+x^2+x+1 polynomial, then the $x^6+x^4+x^2+1$ coset polynomial is added. Cells which fail are discarded.
Coset Off	The HEC is compared using only the x^8+x^2+x+1 polynomial. Cells which fail are discarded.

Measurements

The analyzer uses a local time reference and the cell time tags to measure cell delay. It uses the sequence tags to determine cell loss and the pseudo-random number to determine cell error.

Results Control

Test	Results are displayed based on total accumulation since the test begun.
Window	Results are displayed based on a sliding window, selectable from 1-10 seconds.

Results Display (ATM)

Count measurements range from 0 to $1.84x10^{19}$ switching from decimal to scientific notation at $1.00x10^8$. Percentages are in the from 100.00 %. Time measurements are in microseconds up to one second.

HEC Errors	Header error control byte errors, displayed in total and percentage.
Test Cells	Test cells received, displayed in total and percentage.
Cell Loss	Lost cells, displayed in total and percentage.
Payload	Cells with errors in the payload, displayed in total and percentage.
Delay	Shows the minimum and maximum delay in microseconds.

Results Display (Cell Delay)

Cell delay measurements are sorted into 10 bins for viewing. Bin values reflect the number of cells which have delays falling within the bin's delay range.

Bar Graph

Cell delay bins can be displayed in a bar graph form. The bars represent the values in each of the 10 bins.

Run	The bars follow the bin data automatically scaling to make best use of the screen width.
Hold	The bars freeze in their current position.

Cell Delay Bin Parameters

Bin sizes can be automatically configured or manually adjusted.

Automatic	The bin sizes are generated by dividing the difference between selected minimum and maximum delays by ten.
Manual	The starting delay of the first bin and the end of all the bins is user defined.

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SONET OC-3c Interface

The SONET OC-3c Physical Interface allows the ATM150 to generate and analyze cell streams at 155.52 Mbs. This interface conforms to Bellcore TR-TSY-253 and ATM Forum UNI Specification Version 3.0. The interface can transmit and receive ATM cells within a concatenated OC-3 frame (OC-3c). The optical interface is available in a multi-mode configuration or a single-mode option which can be used with either single-mode or multi-mode systems.

Generator

Pointer Manipulation

New Pointer	Changes the transmitted pointer to an arbitrary value, by issuing a New Data Flag (NDF). Valid range for pointers is 0-782.
Increment	Increase the pointer value by one.
Decrement	Decreases the pointer value by one.

Alarm Generation

LOS	Generates an all zero output.
LOF	Inverts a bit in the A1 byte.
B1	Inverts the entire B1 byte, causing section BIP errors.
Line AIS	Sets all the signal, except the section overhead, to ones before scrambling. This alarm overrides line FERF, LOP and all path alarms.
Line FERF	Forces a 110 code in bits 6-8 of the K2 byte.
LOP	Sets the pointer to an out of range value.
B2	Inverts all of the B2 bytes, causing line BIP errors.
Path AIS	Sets the SPE and H1-H3 pointer bytes to all ones before scrambling. This alarm overrides all other path alarms.
Path FERF	Sets bits 1-4 of the G1 byte to 1001. This will override path FEBE.
Path FEBE	Sets bits 1-4 of the G1 byte to 0001 ten times every second, causing ten path FEBEs every second.
Path RAI	Sets bit 5 of the G1 byte to one. This alarm is also known as path yellow.
B3	Inverts the entire B3 byte, causing line BIP errors.

Cell Mapping

The ATM cells are mapped directly into the SPE. H4 points to the beginning of the next cell for compatibility with older systems.

Cell Scrambling

The self-synchronous scrambler is enabled for OC-3c operation. The 48 payload bytes are scrambled.

Output Timing

Internal	An internal crystal oscillator provides the output frequency.
Recovered	The output frequency follows the received timing.

Output

Rate	155.52 Mbs +/- 4.6 PPM
Encoding	NRZ with frame synchronous scrambling.
Type	Single-mode 1310 nm laser or Multi-mode 1310 nm LED
Level	Single-mode -10 dbm typical. Multi-mode -14 dbm typical
Connector	FC/PC

Data Source

Internal	Cells are generate from the internal cell generator.
Loop-back	Cells are copied from the received data input.

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Analyzer

Alarm Monitoring

LOS	Indicates no ones occurred in the input signal for at least 17 microseconds.
LOF	Indicates no frame was found for at least 3 milliseconds.
B1	Detects errors in the section BIP bytes.
Line AIS	Indicates the value 111 occurred in bits 6-8 of the K2 byte for at least 5 consecutive frames.
Line FERF	Indicates the value 110 occurred in bits 6-8 of the K2 byte for at least 5 consecutive frames.
LOP	Indicates no valid pointer was found for 8 consecutive frames.
B2	Detects errors in the line BIP bytes.
Path AIS	Indicates when the H1 and H2 bytes are all ones for 3 consecutive frames.
Path FERF	Detects when bits 1-4 of the G1 byte are 1001 for two consecutive frames.
Path FEBE	Detects when a 1-8 value occurs in the G1 byte.
Path RAI	Indicates when bit 5 of the G1 byte is set to one for 10 consecutive frames. This alarm is also known as path yellow.
B3	Detects line BIP errors.

Cell Scrambling

The self-synchronous scrambler is enabled for OC-3c operation. The 48 payload bytes are descrambled.

Cell Delineation

Cells are delineated using HEC searching. H4 is not used.

Cell Delineation Search Parameters

Alpha	Seven incorrect headers to begin a search for new cell alignment.
Delta	Six correct headers to declare delineation.

Input

Rate	155.52 Mbs +/- 100 PPM
Encoding	NRZ with frame synchronous scrambling.
Type	1310 nm photodetector
Sensitivity	Single-mode -28 dbm typical. Multi-mode -30 dbm typical
Connector	FC/PC

STM-1 Physical Interface

The STM-1 Physical Interface allows the ATM150 to generate and analyze cell streams at 155.52 Mbs. This interface conforms to ATM Forum UNI Specification Version 3.0 and ITU I.432. The interface can transmit and receive ATM cells within a STM-1 frame. The optical interface is a single-mode configuration which can be used with either single-mode or multi-mode systems.

Generator

Pointer Manipulation

Pointer S-bits	The S(0) and S(1) bits in the pointer are set to zero and one respectively. (This contrasts with SONET where both are zero.)
New Pointer	Changes the transmitted pointer to an arbitrary value, by issuing a New Data Flag (NDF). Valid range for pointers is 0-782.
Increment	Increase the pointer value by one.
Decrement	Decreases the pointer value by one.

Alarm Generation

LOS	Generates an all zero output.
LOF	Inverts a bit in the A1 byte.
B1	Inverts the entire B1 byte, causing Regenerator Section BIP errors.
MS-AIS	Sets all the signal, except the section overhead, to ones before scrambling. This alarm overrides MS-RDI, LOP and all AU alarms.
MS-RDI	Forces a 110 code in bits 6-8 of the K2 byte.
LOP	Sets the pointer to an out of range value.
B2	Inverts all of the B2 bytes, causing Multiplex Section BIP errors.
AU-AIS	Sets the payload and H1-H3 pointer bytes to all ones before scrambling.
HP-REI	Sets bits 1-4 of the G1 byte to 0001 ten times every second, causing ten path FEBE every second.
HP-RDI	Sets bit 5,6, and 7 of the G1 byte to one.
B3	Inverts the entire B3 byte, causing path BIP errors.

Cell Mapping

The ATM cells are mapped directly into the payload. H4 points to the beginning of the next cell for compatibility with older systems.

Cell Scrambling

The self-synchronous scrambler is always enabled. The 48 payload bytes are scrambled.

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Output Timing

Internal	An internal crystal oscillator provides the output frequency.
Recovered	The output frequency follows the received timing.

Output

Rate	155.52 Mbs +/- 20 PPM
Encoding	NRZ with frame synchronous scrambling.
Type	Single-mode 1310 nm laser or
Level	Single-mode -10 dbm typical.
Connector	FC/PC

Data Source

Internal	Cells are generated from the internal cell generator.
Loop-back	Cells are copied from the received data input.

Analyzer

Alarm Monitoring

LOS	Indicates no ones occurred in the input signal for at least 17 microseconds.
LOF	Indicates no frame was found for at least 3 milliseconds.
B1	Detects errors in the Regenerator BIP bytes.
MS-AIS	Indicates the value 111 occurred in bits 6-8 of the K2 byte for at least 5 consecutive frames.
MS-RDI	Indicates the value 110 occurred in bits 6-8 of the K2 byte for at least 5 consecutive frames.
LOP	Indicates no valid pointer was found for 8 consecutive frames.
B2	Detects errors in the Multiplex Section BIP bytes.
AU-AIS	Indicates when the H1 and H2 bytes are all ones for 3 consecutive frames.
HP-REI	Detects when a 1-8 value occurs in the G1 byte.
HP-RDI	Indicates when bit 5 of the G1 byte is set to one for ten consecutive frames.
B3	Detects path BIP errors.

Cell Scrambling

The self-synchronous scrambler is enabled. The 48 payload bytes are descrambled.

Cell Delineation

Cells are delineated using HEC searching. H4 is not used.

Cell Delineation Search Parameters

Alpha	Seven incorrect headers to begin a search for new cell alignment.
Delta	Six correct headers to declare delineation.

Input

Rate	155.52 Mbs +/- 100 PPM
Encoding	NRZ with frame synchronous scrambling.
Type	1310 nm photodetector
Sensitivity	Single-mode -28 dbm typical.
Connector	FC/PC

100 Mbs Interface (TAXI)

The 100 Mbs Physical Interface allows the ATM150 to generate and analyze cell streams at 100 Mbs. This interface conforms to ATM Forum UNI Specification Version 3.0. The interface can transmit and receive ATM cells over multi-mode fiber using a 4B/5B encoding. The interface is commonly known as TAXI because it uses Advanced Micro Device's TAXI circuits.

Generator

Cell Mapping

Active ATM cells are preceded by the TT code indicating start of cell. When no cells are available, JK codes indicating sync are sent. Idle cells are not sent and replaced with JK codes. Both 4 bit nibbles of each cell byte are replaced with 5 bit code words.

Cell Mapping Modes

Normal	Active ATM cells are preceded by the TT code. Another TT code and active cell can immediately follow. At 100% bandwidth there will be no JK codes.
Safe	A JK code is inserted between the end of a cell and next TT code and active cell.

Output

Rate	100 Mbs +/- 100 PPM (125 MHz clock)
Encoding	NRZI with 4B/5B
Type	Multi-mode 1310 nm LED.
Level	Multi-mode -14 dbm typical
Connector	Duplex SC

Analyzer

Violation Monitoring

Violation Detects errors of the 4B/5B encoding.

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Cell Delineation

Cells are delineated implicitly using the TT start of cell code.

Input

Rate	100 Mbs +/- .1% (125 MHz clock)
Encoding	NRZI with 4B/5B
Type	1310 nm photodetector.
Sensitivity	Multi-mode -28 dbm typical
Connector	Duplex SC

DS1 / DS3 Interface

The DS1 / DS3 Physical Interface allows the ATM150 to generate and analyze cell streams at 44.736 Mbs or 1.544 mbs The interface can conform to CCITT G703, Bellcore TR-TSY-499 and ATM Forum UNI Specification Version 3.0. The interface can transmit and receive ATM cells within a DS3 frame (either M23 or C-bit) or a DS1 frame (either SF, or ESF). These cells can be directly mapped or an IEEE 802.6 Physical Layer Convergence Protocol (PLCP) can be used.

Generator

DS3 Alarm Generation

LOS	Generates all zero output.
LOF	Inverts all M and F bits in the DS3 frame.
AIS	Inserts a 1010 pattern in the DS3 payload.
LCV	Causes one line code violation on the B3ZS code 10 times a second.
IDLE	Inserts a 1100 pattern in the DS3 payload.
PARITY	M23 mode all the P-bits are inverted. C-bit mode all parity C-bits are inverted.
FERF	Sets the X1 and X2 to zero.
FEBE	Sets the FEBE C-bits to zero.

DS1 Alarm Generation

LOS	Generates all zero output.
AIS	Generates an unframed all-ones pattern.
LOF (Red)	Removes all framing.
Yellow	Generates framing appropriate yellow alarm.

PLCP Alarm Generation

LOF	Inverts a bit in the A1 and A2 byte.
PARITY	Inverts a bit in the P0-P11 bytes.
RAI(Yellow)	Sets bit 5 in the G1 byte.
FEBE	Inserts one FEBE in each frame.
B1	Inserts one BIP error in each frame.

PLCP Control

On	The PLCP frame structure is used to carry ATM cells within the DS1/DS3 frame.
Off	The ATM cells are directly mapped within the DS1/DS3 frame

PLCP Timing Alignment

Internal	A nibble stuff pattern of 13,14,14 is used for DS3 PLCP. A fixed pattern is used for DS1 PLCP.
Recovered	The PLCP follows the received timing and stuff pattern.

Cell Scrambling

The self-synchronous scrambler is disabled for PLCP operation and enabled when cells are directly mapped

Output Timing

Internal	An internal crystal oscillator provides the output frequency.
Recovered	The output frequency follows the received timing.

DS1 Output

Rates	1.544 Mbs +/- 20 PPM
Encoding	Bipolar
Impedance	100 Ω
Level	Cross-connect
Connector	WECO 310 compatible

DS3 Output

Rates	44.736 Mbs +/- 20 PPM
Encoding	Bipolar with Three Zero Suppression (B3ZS)
Impedance	75 Ω
Level	Cross-connect (≈700 mV)
Connector	BNC

Data Source

Internal	Cells are generate from the internal cell generator.
Loop-back	Cells are copied from the received data input.

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Analyzer

DS1 Alarm Monitoring

LOS	Detects all zero input.
AIS	Detects an unframed all-ones pattern.
LOF (COFA)	Detects loss or change of framing.
Yellow	Generates framing appropriate yellow alarm.
CRC-6	Counts CRC-6 errors in ESF mode
Frame Bit	Counts incorrect framing bits.
LCV	Counts line code violations

DS3 Alarm Monitoring

LOS	Detects when a sequence of ≥175 zeros occurs.
LOF	Detects when frame alignment changed or cannot be found.
AIS	Detects a continuous 1010 pattern in the DS3 payload.
LCV	Detects a line code violation in the B3ZS encoding.
IDLE	Detects a continuous 1100 pattern in the DS3 payload.
PARITY	M23 mode, detects P-bit parity errors. C-bit mode, detects C-bits parity errors.
FERF	Detects if X1 and X2 are zero.
FEBE	Detects if FEBE C-bits are zero.

PLCP Alarm Monitoring

LOF	Detects when PLCP frame alignment changed or cannot be found.
PARITY	Detects errors in the P bytes and A1-A2 bytes.
RAI(Yellow)	Detects bit 5 in the G1 byte.
FEBE	Detects FEBE indications.
B1	Detects BIP errors.

PLCP Control

On	The PLCP frame structure is used within the DS1 or DS3 frame. ATM cells are implicitly delineated.
Off	The ATM cells are assumed to be directly mapped within the DS1 or DS3 frame. ATM cells are delineated using HEC searching.

Cell Delineation Search Parameters

Alpha	Seven incorrect headers to begin a search for new cell alignment.
Delta	Six correct headers to declare delineation.

DS1 Input

Rate	1.544 Mbs +/- 100 PPM
Encoding	Bipolar
Impedance	100 Ω
Level	Cross-connect
Connector	WECO 310 compatible

DS3 Input

Rate	44.736 Mbs +/- 100 PPM
Encoding	Bipolar with Three Zero Suppression (B3ZS)
Impedance	75 Ω
Level	Cross-connect
Connector	BNC

E1 / E3 Interface

The E1 / E3 Physical Interface allows the ATM150 to generate and analyze cell streams at 34.368 Mbs or 2.048 mbs The interface can conform to CCITT G.703, G.751, G.832 and ATM Forum UNI Specification Version 3.0. The interface can transmit and receive ATM cells within a E3 frame (either G.832 or G.751) or a E1 frame. These cells can be directly mapped or an IEEE 802.6 Physical Layer Convergence Protocol (PLCP) can be used.

Generator

E3 Alarm Generation

LOS	Generates all zero output.
FRAME	Errors bits in the E3 frame.
LCV	Causes one line code violation on the HDB3 code 10 times a second.
PARITY	Errors parity bits.
FERF	Inserts FERF bit.(G.832)
RAI	Sets bit 11 of te frame (G.751)

E1 Alarm Generation

LOS	Generates all zero output.
AIS	Generates AIS or TS16 AIS
LOF	Removes all framing.
Remote	Generates remote alarm or remote multi-frame alarm.

PLCP Alarm Generation

LOF	Inverts a bit in the A1 and A2 byte.
PARITY	Inverts a bit in the P0-P11 bytes.
RAI(Yellow)	Sets bit 5 in the G1 byte.
FEBE	Inserts one FEBE in each frame.
B1	Inserts one BIP error in each frame.

PLCP Control

On	The PLCP frame structure is used to carry ATM cells within the E1/E3 frame.
Off	The ATM cells are directly mapped within the E1/E3 frame

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PLCP Timing Alignment

Internal	A fixed pattern is used for the PLCP.
Recovered	The PLCP follows the received timing and stuff pattern.

Cell Scrambling

The self-synchronous scrambler is enabled for PLCP and direct mapped operation.

Output Timing

Internal	An internal crystal oscillator provides the output frequency.
Recovered	The output frequency follows the received timing.

E1 Output

Rates	2.048 Mbs +/- 20 PPM
Encoding	AMI or HDB3
Impedance	120 Ω
Connector	Siemens 3-pin

E3 Output

Rates	34.368 Mbs +/- 20 PPM
Encoding	AMI or HDB3
Impedance	75 Ω
Connector	BNC

Data Source

Internal	Cells are generate from the internal cell generator.
Loop-back	Cells are copied from the received data input.

Analyzer

E1 Alarm Monitoring

LOS	Detects all zero input.
AIS	Inducates when AIS or TS 16 AIS exists for 104 ms.
OOF	Detects loss or change of framing.
RED	Detects 25 intervals of 4ms with an OOF
CRC	Counts CRC errors
Frame Bit	Counts incorrect framing bits.
LCV	Counts line code violations
FEBE	Counts Far End Block Errors

E3 Alarm Monitoring

LOS	Detects when a sequence of ≥32 zeros occurs.
OOF	Detects when frame alignment changed or cannot be found.
AIS	Detects an all ones pattern.
LCV	Counts line code violations
PARITY	Counts parity errors.
FERF	Detects FERF (G.832)
RAI	Detects RAI (G.751)
FEBE	Counts FEBE (G.832)

PLCP Alarm Monitoring

LOF	Detects when PLCP frame alignment changed or cannot be found.
PARITY	Detects errors in the P bytes and A1-A2 bytes.
RAI(Yellow)	Detects bit 5 in the G1 byte.
FEBE	Detects FEBE indications.
B1	Detects BIP errors.

PLCP Control

On	The PLCP frame structure is used within the E1 or E3 frame. ATM cells are implicitly delineated.
Off	The ATM cells are assumed to be directly mapped within the E1 or E3 frame. ATM cells are delineated using HEC searching.

Cell Delineation Search Parameters

Alpha	Seven incorrect headers to begin a search for new cell alignment.
Delta	Six correct headers to declare delineation.

E1 Input

Rate	2.048 Mbs +/- 100 PPM
Encoding	AMI or HDB3
Impedance	120 Ω
Connector	Siemens 3-pin

E3 Input

Rate	34.368 Mbs +/- 100 PPM
Encoding	AMI or HDB3
Impedance	75 Ω
Connector	BNC

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Environmental

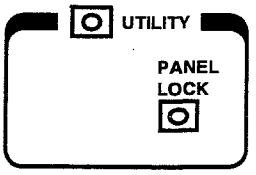
Power	AC power inputs accepts either nominal 115 VAC or 230 VAC, 300 W Max
Temperature	Operation 5 to 40 degrees C Storage -10 to 60 degrees C
Size	8"H x 14"W x 20"D 20.3 cm H x 35.6 cm W x 50.8 cm D
Weight	30 lbs (13.7 kilograms)
Frequency	47 - 63 Hz

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Appendix C

Factory Default ATM-150 Settings

To reset the ATM-150 to the Factory Default Setting, press the 'UTILITY' button on the front panel of the unit.



The UTILITY box contains many general functions that are usually associated with the user interface. Press the UTILITY button to bring up the utility menu with softkeys on the front panel LCD display. The internal key LED lights when this key is active. Press the UTILITY key again to exit the utility submenu. Press PANEL LOCK to lock the front panel keys out. LED is lit when this function is active.

Factory Default	Selection of this softkey returns the ATM-150 to factory settings. This is useful to clear custom settings when it is time to run different tests.

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Generator Setup

output signal = oc-3c

cell format = uni

clock source = int

sonet pointer = 522

new pointer = 522

ds3 plcp mode = on

ds3 framing = cbit

payload scramble = on

ds1 plcp mode = on

ds1 framing = esf

e3 plcp mode = on

e3 framing = g.751

e1 plcp mode = on

taxi sync byte output = safe

Generator System Parameters

1pps source = int

sync pulse output = ATM

hec coset = enable

GPIB

gpib address = 14

gpib term = eoi / lf

gpib bus mode = talk / listen

Header Control

test cell number = 1

gfc = 0

vpi = vci = 1

pti = clip = 0

Header Parameters

randomize = on

Monitor

monitor = lcd

Monitor Control

sliding window = 10 seconds

monitor type = untimed

monitor length = 60 seconds

sweep count = 5

vci increment = 1

Monitor Mode Button = Win

OC-3c Physical Alarms

los = off

lof = off

b1 = off

l-ais = off

l-ferf = off

lop = off

b2 = off

p-ais = off

p-ferf = off

p-febe = off

p-rai = off

b3 = off

Output Results Control

print eot control = off

results file = results1.txt

Printer Port Button = Lpt

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Remote

command header = off

debug mode = off

Results Control

sliding window = 10 seconds

results type = untimed

results length = 60 seconds

sweep count = 5

vci increment = 1

link results with generator test = disable

Results Screen Button = AMT1

RS-232

BAUD RATE = 9600

PARITY = EVEN

DATA SIZE = 7

STOP BITS = 1

ECHO = ON

EOL TERMINATION = CR

RUN/HOLD BUTTON = RUN

STM-1 Physical Alarms

los = off

lof = off

b1 = off

ms-ais = off

ms-rdi = off

lop = off

b2 = off

au-ais = off

hp-rei= off

hp-rdi = off

b3 = off

Test Cell

disable link to test cell 1

gfc = 0

vpi = 1

vci = 1

pti = 0

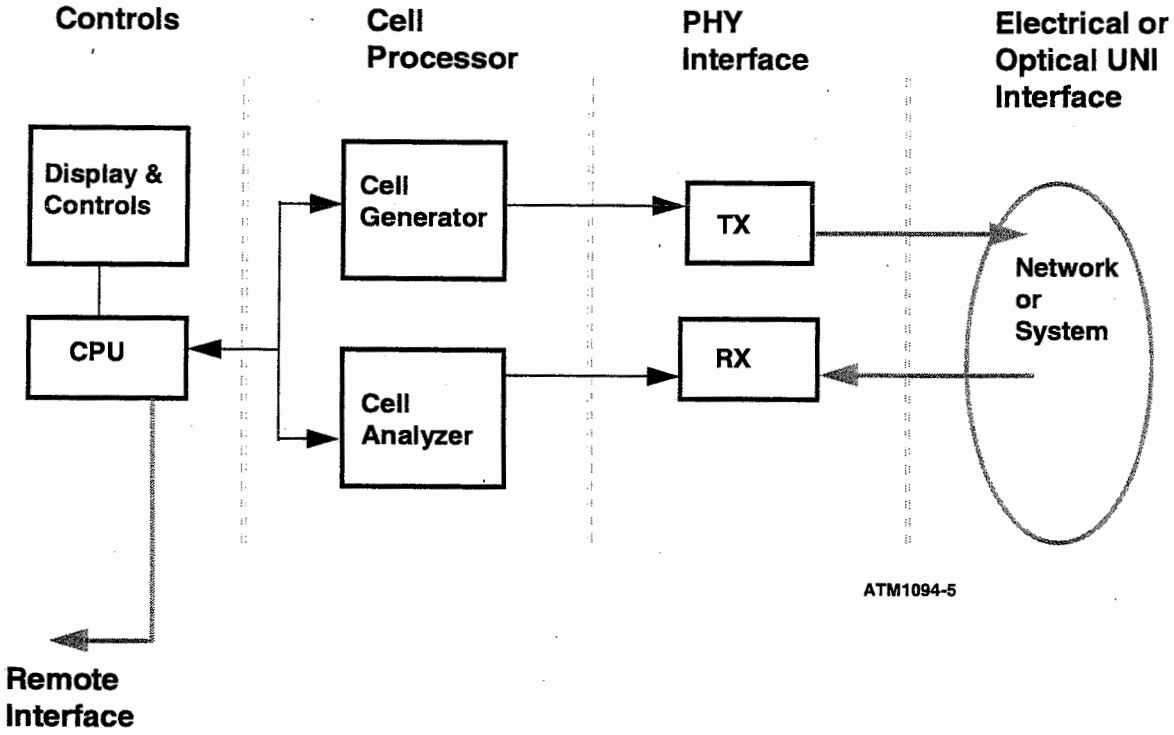
clp = 0

Test Mode Button = Test

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ATM-150 Functional Block Diagram



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Appendix E

Remote Command Set

Alphabetical listing of all commands begins on page E-2
Index of all commands begins on page E-149

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Alphabetical List of Commands

==========

***cls**

ACTION: (Clear Status) Clears the Status Registers.

Example: *cls

==========

***ese** [n]

ACTION: Sets the Standard Event Status Enable Register to 'n'.

'n': 0 to 255

Example: *ese 0

***ese?**

ACTION: Returns the current Standard Event Status Enable Register.

Response: number value

Example: *ese?
255

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==========

***esr?**

ACTION: Returns the current Standard Event Status Register.

NOTE: For details on this and other registers used for GPIB SRQs, refer the GPIB Appendix.

Response: number value

Example: *esr?
0

==========

***idn?**

ACTION: Returns the ATM150 identification.

Response: Manufacturer , Model , 0 , Firmware level

Example: *idn?
Tektronix , atm150 , 0 , 1.5

==========

***lrn?**

ACTION: Returns the current device setup as a series of remote command message units, such that this response can be sent back to the unit to restore it to the current state.

Response: A sequence of response messages

Example: *lrn?
AN_CELLFRMT UNI
AN_COSET ON
AN_DS3FRAME CBIT
...

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==========

***opc**

ACTION: Sets the Operation Complete message in the Standard Event Status Register immediately.

Example: *opc

***opc?**

ACTION: Immediately returns a value of 1, which indicates operation complete.

Response: number value

Example: *opc?
1

==========

***rst**

ACTION: Resets the device to the default configuration.

Example: *rst

==========

***sre** [n]

ACTION: Sets the Service Request Enable Register.

'n': 0 to 255

Example: *sre 255

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---

***sre?**

ACTION: Returns the current Service Request Enable Register.

Response: number value

Example: *sre?
191

==========

***stb?**

ACTION: Returns the current contents of the Status Byte, where bit 6 is the Master Summary Status Bit.

Response: number value

Example: *stb?
96

==========

***tst?**

ACTION: Returns the self-test result. The scope of the test is limited. A response of 0 indicates successful completion.

Response: number value

Example: *tst?
0

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==========

***wai**

ACTION: Stops the processing of all remote commands until all operation are complete (see *opc).

Example: *wai

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==========

active_bw?

ACTION: Returns the allowed bandwidth for the test and active cells as determined by the current cell distributions.

<NR3 numerc>

Example: active_bw?

ACTIVE_BW 5.00E-3

==========

active_cell [cellnum],[gfc],[vpi],[vci],[pti],[clp]

ACTION: Modifies an entire Active Traffic ATM Cell. For the specified Active cell (cellnum), all of the parameters will be changed as specified.

'cellnum':	1 to Total Active Cells (see active_cnt)
'gfc':	0 to 15 (ignored if ATM cell format is NNI)
'vpi':	0 to 4095 (up to 255 if cell format is UNI)
'vci':	0 to 65535
'pti':	0 to 7
'clp':	0 to 1

Example: active_cell 4 , 15 , 255 , 65535 , 7 , 1

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---

active_cell? [cellnum]

ACTION: Returns the entire Active Traffic ATM Cell, specified by 'cellnum'. Note that the GFC field in the response will be 0 when the ATM cell format is NNI.

'cellnum': 1 to Total Active Cells (see active_cnt)

Response: <6 NR1 Numerics>

Example: active_cell? 4
ACTIVE_CELL 4 , 0 , 4095 , 65535 , 7 , 1

==========

active_clp [cellnum],[clp]

ACTION: Modifies the Cell Loss Priority (CLP) of the specified Active Traffic ATM Cell specified by 'cellnum'.

'cellnum': 1 to Total Active Cells (see active_cnt)
'clp': 0 to 1

Example: active_clp 9 , 1

---

active_clp? [cellnum]

ACTION: Returns the Cell Loss Priority (CLP) of the specified Active Traffic ATM Cell.

'cellnum': 1 to Total Active Cells (see active_cnt)

Response: two number values

Example: active_clp? 4

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ACTIVE_CLP 4 , 1

==========

active_cnt?

ACTION: Returns the current count of Active Traffic ATM Cells.

Response: number value

Example: active_cnt?
ACTIVE_CNT 16

==========

active_frq?

ACTION: Returns the available frequency of the specified Active Traffic ATM Cell.

Response: number value

Example: active_frq?
ACTIVE_FRQ 0.25

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==========

active_gfc [cellnum],[gfc]

ACTION: Modifies the Generic Flow Control (CLP) of the specified Active Traffic ATM Cell specified by 'cellnum'. This command is only valid if the ATM Cell Format is UNI.

'cellnum': 1 to Total Active Cells (see active_cnt)

'gfc': 0 to 15

Example: active_gfc 1 , 12

---

active_gfc? [cellnum]

ACTION: Returns the Generic Flow Control (GFC) of the specified Active Traffic ATM Cell. This command is only valid if the ATM Cell Format is UNI.

'cellnum': 1 to Total Active Cells (see active_cnt)

Response: two number values

Example: active_gfc? 1

ACTIVE_GFC 1 , 12

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==========

active_pti [cellnum],[pti]

ACTION: Modifies the Payload Type Identifier (PTI) of the specified Active Traffic ATM Cell specified by 'cellnum'.

'cellnum': 1 to Total Active Cells (see active_cnt)

'pti': 0 to 7

Example: active_pti 2 , 0

---

active_pti? [cellnum]

ACTION: Returns the Payload Type Identifier (PTI) of the specified Active Traffic ATM Cell.

'cellnum': 1 to Total Active Cells (see active_cnt)

Response: two number values

Example: active_pti? 16

ACTIVE_PTI 16 , 7

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==========

active_vci [cellnum],[vci]

ACTION: Modifies the Virtual Channel Identifier (VCI) of the specified Active Traffic ATM Cell specified by 'cellnum'.

'cellnum': 1 to Total Active Cells (see active_cnt)
'vci': 0 to 65535

Example: active_vci 7 , 65535

---

active_vci? [cellnum]

ACTION: Returns the Virtual Channel Identifier (VCI) of the specified Active Traffic ATM Cell.

'cellnum': 1 to Total Active Cells (see active_cnt)

Response: two number values

Example: active_vci? 6
ACTIVE_VCI 6 , 0

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==========

active_vpi [cellnum],[vpi]

ACTION: Modifies the Virtual Path Identifier (VPI) of the specified Active Traffic ATM Cell specified by 'cellnum'.

'cellnum': 1 to Total Active Cells (see active_cnt)
'vpi': 0 to 4095 (up to 255 if cell format is UNI)

Example: active_vpi 10 , 4095

---

active_vpi? [cellnum]

ACTION: Returns the Virtual Path Identifier (VPI) of the specified Active Traffic ATM Cell.

'cellnum': 1 to Total Active Cells (see active_cnt)

Response: two number values

Example: active_vpi? 16
ACTIVE_VPI 16 , 255

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==========

alarms_ds1 [los,lof,ais,rai,plcp_lof,plcp_par,plcp_rai,plcp_febe,plcp_b1] , [on,off]

ACTION: Controls the Generation of the DS1 Physical Layer ALARMS. Each alarm is controlled independently.

los	This controls the output of DS1 Loss Of Signal (LOS).
lof	This controls the output of DS1 Loss Of Frame (LOF) using both M-bit and F-bit framing errors.
ais	This controls the DS1 Alarm Indication Signal (AIS) output.
rai	This controls the DS1 yellow alarm signal (RAI).
plcp_lof	This controls the insertion of frame alignment pattern errors (A1 and A2) in the PLCP frame.
plcp_par	This controls the insertion of Parity errors in the PLCP frame.
plcp_rai	This controls the generation of the DS1 PLCP yellow alarm signal (RAI).
plcp_febe	This controls the insertion of Far End Block Errors (FEBE) in the PLCP frame.
plcp_b1	This controls the insertion of bit interleaved parity (BIP) errors in the PLCP frame.
on	This enables the individual Alarm.
off	This disables the individual Alarm.

Example: alarms_ds1 lof , on

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---

alarms_ds1? [los,lof,ais,rai ,plcp_lof,plcp_par,plcp_rai,plcp_febe,plcp_b1]

ACTION: Returns the current DS1 Alarm setting for the specified Alarm type.

Response: LOS , LOF , AIS ,RAI, PCLP_LOF , PLCP_PAR ,
PLCP_RAI , PLCP_FEBE or PLCP_B1
ON or OFF

Example: alarms_ds1? ais
ALARMS_DS1 AIS , OFF.

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==========

alarms_ds3 [los,lof,ais,lcv,idle,parity,ds3_ferf,ds3_febe,plcp_lof,
plcp_par,plcp_rai,plcp_febe,plcp_b1] , [on,off]

ACTION: Controls the Generation of the DS3 Physical Layer ALARMS. Each alarm is controlled independently.

los	This controls the output of DS3 Loss Of Signal (LOS).
lof	This controls the output of DS3 Loss Of Frame (LOF) using both M-bit and F-bit framing errors.
ais	This controls the DS3 Alarm Indication Signal (AIS) output.
lcv	This controls the insertion of DS3 Line Code Violations (LCV).
idle	This controls the output of the DS3 Idle Maintenance signal.
parity	This controls the insertion of DS3 Parity errors (P-bits errors).
ds3_ferf	This controls the output of the Far End Receive Failure maintenance signal (FERF) in the DS3 output.
ds3_febe	This controls the insertion of Far End Block Errors (FEBE) in the DS3 output.
plcp_lof	This controls the insertion of frame alignment pattern errors (A1 and A2) in the PLCP frame.
plcp_par	This controls the insertion of Parity errors in the PLCP frame.
plcp_rai	This controls the generation of the DS3 PLCP yellow alarm signal (RAI).
plcp_febe	This controls the insertion of Far End Block Errors (FEBE) in the PLCP frame.
plcp_b1	This controls the insertion of bit interleaved parity (BIP) errors in the PLCP frame.
on	This enables the individual Alarm.
off	This disables the individual Alarm.

Example: alarms_ds3 lof , on

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---

alarms_ds3? [los,lof,ais,lcv,idle,parity,ds3_ferf,ds3_febe,plcp_lof,
plcp_par,plcp_rai,plcp_febe,plcp_b1]

ACTION: Returns the current DS3 Alarm setting for the specified Alarm type.

Response: LOS , LOF , AIS , LCV , IDLE , PARITY , DS3_FERF , DS3_FEBE ,
PCLP_LOF , PLCP_PAR , PLCP_RAI , PLCP_FEBE or PLCP_B1
ON or OFF

Example: alarms_ds3? ais
ALARMS_DS3 AIS , OFF

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==========

alarms_e1 [lof,ais,remote,plcp_lof,plcp_par,plcp_rai,plcp_febe,plcp_b1] , [on,off]

ACTION: Controls the Generation of the E1 Physical Layer ALARMS. Each alarm is controlled independently.

lof	This controls the output of E1 Loss Of Frame (LOF) using both M-bit and F-bit framing errors.
ais	This controls the E1 Alarm Indication Signal (AIS) output.
remote	This controls E1 remote alarm.
plcp_lof	This controls the insertion of frame alignment pattern errors (A1 and A2) in the PLCP frame.
plcp_par	This controls the insertion of Parity errors in the PLCP frame.
plcp_rai	This controls the generation of the E1 PLCP yellow alarm signal (RAI).
plcp_febe	This controls the insertion of Far End Block Errors (FEBE) in the PLCP frame.
plcp_b1	This controls the insertion of bit interleaved parity (BIP) errors in the PLCP frame.
on	This enables the individual Alarm.
off	This disables the individual Alarm.

Example: alarms_e1 lof , on

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---

alarms_e1? [lof,ais,remote,plcp_lof,plcp_par,plcp_rai,plcp_febe,plcp_b1]

ACTION: Returns the current E1 Alarm setting for the specified Alarm type.

Response: LOF , AIS , REMOTE, PCLP_LOF , PLCP_PAR , PLCP_RAI ,
PLCP_FEBE or PLCP_B1
ON or OFF

Example: alarms_E1? ais
ALARMS_E1 AIS , OFF

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==========

alarms_e3 [los,oof,lcv,e3_ferf_rai,e3_febe,plcp_lof,plcp_par,plcp_rai, plcp_febe,plcp_b1] , [on,off]

ACTION: Controls the Generation of the E3 Physical Layer ALARMS. Each alarm is controlled independently.

los	This controls the output of E3 Loss of Signal (LOS)
oof	This controls the output of E3 Out-of-Frame (OOF).
lcv	This controls the insertion of E3 Line Code Violations (LCV).
e3_ferf_rai	This controls the output of the Far End Receive Failure maintenance signal and the E3 yellow alarm signal.
e3_febe	This controls the insertion of Far End Block Errors (FEBE) in E3 output.
plcp_lof	This controls the insertion of frame alignment pattern errors (A1 and A2) in the PLCP frame.
plcp_par	This controls the insertion of Parity errors in the PLCP frame.
plcp_rai	This controls the generation of the E3 PLCP yellow alarm signal (RAI).
plcp_febe	This controls the insertion of Far End Block Errors (FEBE) in the PLCP frame.
plcp_b1	This controls the insertion of bit interleaved parity (BIP) errors in the PLCP frame.
on	This enables the individual Alarm.
off	This disables the individual Alarm.

Example: alarms_E3 los` , on

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---

alarms_e3? [Los,oof, lcv,e3_ferf_rai, e3_febe,plcp_lof,plcp_par,plcp_rai,plcp_febe,plcp_b1]

ACTION: Returns the current E3 Alarm setting for the specified Alarm type.

Response: LOS, OOF, LCV, E3_FERF_RAI, E3_FEBE, PCLP_LOF,
PLCP_PAR, PLCP_RAI, PLCP_FEBE or PLCP_B1
ON or OFF

Example: alarms_E3? los
ALARMS_E3 LOS , OFF

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==========

alarms_oc3c [los,lof,b1,l_ais,l_ferf,lop,b2,p_ais,p_ferf,p_febe,p_rai,b3] ,
[on,off]

ACTION: Controls the Generation of the OC-3c Physical Layer ALARMS. Each alarm is controlled independently.

los	This controls the output of OC-3c Loss Of Signal (LOS).
lof	This controls the output of OC-3c Loss Of Frame (LOF) by altering the A1 section overhead framing byte to 0x76.
b1	This controls the insertion of bit errors in the section BIP-8 byte (B1) by inverting the byte.
l_ais	This controls the insertion of the Line Alarm Indication Signal (Line AIS) into the SONET stream.
l_ferf	This controls the insertion of Line Far End Receive Failure (Line FERF) into the K2 byte of the SONET stream.
lop	This controls the output of Loss Of Pointer (LOP) by setting the SONET pointer to an invalid value.
b2	This controls the insertion of bit errors in the line BIP-24 byte (B2) by inverting the bytes.
p_ais	This controls the insertion of the STS Path Alarm Indication Signal (Path AIS) into the SONET stream.
p_ferf	This controls the insertion of Path Far End Receive Failure (Path FERF) into the G1 byte of the SONET stream.
p_febe	This controls the insertion of Path Far End Block Errors (Path FEBE) in the Path status byte G1. Eight errors are inserted every 100 milliseconds.
p_rai	This controls the output of the STS Path yellow alarm (Path RAI) into the SONET stream.
b3	This controls the insertion of bit errors in the path BIP-8 byte (B3) by inverting the byte.
on	This enables the individual Alarm.
off	This disables the individual Alarm.

Example: alarms_oc3c lof , on

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---

alarms_oc3c? [los,lof,b1,l_ais,l_ferf,lop,b2,p_ais,p_ferf,p_febe,p_rai,b3]

ACTION: Returns the current OC-3c Alarm setting for the specified Alarm type.

Response: LOS , LOF , B1 , L_AIS , L_FERF , LOP , B2 , P_AIS , P_FERF ,
P_FEBE , P_RAI or B3
ON or OFF

Example: alarms_oc3c? b3
ALARMS_OC3C B3 , OFF

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==========

alarms_stm1 [los,lof,b1,ms_ais,ms_rdi,lop,b2,au_ais,hp_rei,hp_rdi,b3],
[on,off]

ACTION: Controls the Generation of the STM-1 Physical Layer ALARMS. Each alarm is controlled independently.

los	This controls the output of STM-1 Loss Of Signal (LOS).
lof	This controls the output of STM-1 Loss Of Frame (LOF) by inverting a bit in all A1 bytes.
b1	This controls the insertion of bit errors in the Regenerator section BIP-8 byte (B1) by inverting the byte.
ms_ais	This sets the signal, except the section overhead, to ones before scrambling. This alarm overrides MS-RDI, LOP and all AU alarms
ms_rdi	This forces a 110 code in bits 6-8 of the K2 byte.
lop	This controls the output of Loss Of Pointer (LOP) by setting the SONET pointer to an out-of-range value.
b2	This controls the insertion of bit errors in the Multiplex Section BIP-24 byte (B2) by inverting the bytes.
au_ais	This sets the payload and H1-H3 pointer bytes to all ones before scrambling.
hp_rei	This sets bits 1-4 of the G1 byte to 0001 ten times every second, causing ten path FEBE every second.
hp_rdi	This sets bit 5,6, and 7 of the G1 byte to one.
b3	This controls the insertion of bit errors in the path BIP-8 byte (B3) by inverting the byte.
on	This enables the individual Alarm.
off	This disables the individual Alarm.

Example: alarms_oc3c lof , on

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---

alarms_stm1? [los,lof,b1,ms_ais,ms_rdi,lop,b2,au_ais,hp_rei,hp_rdi,b3],

ACTION: Returns the current STM-1 Alarm setting for the specified Alarm type.

Response: LOS , LOF , B1 , MS_AIS , MS_RDI , LOP , B2 , AU_AIS , HP_REI, HP_RDI, or B3
ON or OFF

Example: alarms_stm1? b3
ALARMS_STM1 B3 , OFF

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==========

an_cellfrmt [uni,nni]

ACTION: Controls the Analyzer ATM Cell Format. See graphical representations of the ATM Cell Formats in the ATM Basics appendix (Appendix A).

uni	The ATM cell format will be the User-Network Interface (UNI), which includes the GFC and a smaller VPI.
nni	The ATM cell format will be the Network-Network Interface (NNI), which does not include the GFC.

Example: an_cellfrmt uni

---

an_cellfrmt?

ACTION: Returns the current ATM Cell Format expected by the Analyzer.

Response: UNI or NNI

Example: an_cellfrmt?
AN_CELLFRMT NNI

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==========

an_coset [disable,enable]

ACTION: Controls the use of the COSET in the ATM HEC calculations for the Analyzer.

disable The HEC calculation is completed without the XOR of the COSET pattern 01010101. This calculation is not defined.

enable The HEC calculation includes the XOR of the COSET pattern 01010101, as defined by the ATM Forum, UNI 3.0 specification.

Example: an_coset enable

---

an_coset?

ACTION: Returns the current Analyzer COSET mode.

Response: ENABLE or DISABLE

Example: an_coset?
AN_COSET DISABLE

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==========

an_crc_e1 [on, off]

ACTION: This is a query and action command. Upon query, it will return the current state of the analyzer e1 mode, either on or off. As an action command, it sets the current analyzer e1 mode.

Example: an_crc_e1 on

==========

an_ds1frame [sf, esf]

ACTION: Controls the Analyzer DS1 frame format.

sf	The DS1 SF format will be expected.
esf	The DS1 ESF format will be expected.

Example: an_ds1frame sf

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---

an_ds1frame?

ACTION: Returns the current Analyzer DS1 frame format.

Response: SF or ESF

Example: an_ds1frame?
AN_DS1FRAME SF

==========

an_ds3frame [cbit,mx3]

ACTION: Controls the Analyzer DS3 frame format.

cbit The DS3 C-BIT format will be expected.
mx3 The DS3 MX3 format will be expected.

Example: an_ds3frame cbit

---

an_ds3frame?

ACTION: Returns the current Analyzer DS3 frame format.

Response: CBIT or MX3

Example: an_ds3frame?
AN_DS3FRAME MX3

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==========

an_e3frame [G.751, G.832]

ACTION: Controls the Analyzer E3 frame format.

G.751 The E3 G.751 format will be expected.

G.832 The E3 G.832 format will be expected.

Example: an_e3frame G.751

---

an_e3frame?

ACTION: Returns the current Analyzer E3 frame format.

Response: G.751 or G.832

Example: an_e3frame?
AN_E3FRAME G.751

==========

an_plcp_ds1 [on,off]

ACTION: Controls the use of Analyzer DS1 PLCP framing.

on The ATM Cells carried by the DS1 signal will be expected in the PLCP format.

off The ATM Cells carried by the DS1 signal will not be expected in the PLCP format.

Example: an_plcp_ds1 on

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---

an_plcp_ds1?

ACTION: Returns the current Analyzer DS1 PLCP mode.

Response: ON or OFF

Example: an_plcp_d1?
AN_PLCP_DS1 OFF

==========

an_plcp [on,off]

ACTION: Controls the use of Analyzer DS3 PLCP framing.

on The ATM Cells carried by the DS3 signal will be expected in the PLCP format.

off The ATM Cells carried by the DS3 signal will not be expected in the PLCP format.

Example: an_plcp on

---

an_plcp?

ACTION: Returns the current Analyzer DS3 PLCP mode.

Response: ON or OFF

Example: an_plcp?
AN_PLCP OFF

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==========

an_plcp_e1 [on,off]

ACTION: Controls the use of Analyzer E1 PLCP framing.

on	The ATM Cells carried by the E1 signal will be expected in the PLCP format.
off	The ATM Cells carried by the E1 signal will not be expected in the PLCP format.

Example: an_plcp_e1 on

---

an_plcp_e1?

ACTION: Returns the current Analyzer E1 PLCP mode.

Response: ON or OFF

Example: an_plcp_e1?
AN_PLCP_E1 OFF

==========

an_plcp_e3 [on,off]

ACTION: Controls the use of Analyzer E3 PLCP framing.

on	The ATM Cells carried by the E3 signal will be expected in the PLCP format.
off	The ATM Cells carried by the E3 signal will not be expected in the PLCP format.

Example: an_plcp_e3 on

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---

an_plcp_e3?

ACTION: Returns the current Analyzer E3 PLCP mode.

Response: ON or OFF

Example: an_plcp_e3?
AN_PLCP_E3 OFF

==========

an_pps [ext,gen]

ACTION: Controls the source of the one Pulse Per Second (1PPS) timing used for the the cell delay measurements.

For proper delay measurements, the Generator and corresponding Analyzer should use the same source for the 1PPS.

ext The Analyzer external rear-panel 1PPS will be used.

gen The Generator 1PPS will be used by the Analyzer.

Example: an_pps gen

---

an_pps?

ACTION: Returns the current Analyzer 1PPS source.

Response: EXT or GEN

Example: an_pps?
AN_PPS EXT

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==========

an_scram [on, off]

ACTION: Controls the use of analyzer payload scrambing modes (for DS1 and DS3)

on	Turns on scrambling of payload cells.
off	Turn off scrambling of payload cells.

Example: an_scram on

---

an_scram?

ACTION: Returns the current analyzer scrambling (for DS1 and DS3).

Response: ON or OFF

Example: an_scram?
AN_SCRAM ON

==========

an_scram_ex [on, off]

ACTION: Controls the use of analyzer payload scrambing modes (for E1 and E3)

on	Turns on scrambling of payload cells.
off	Turn off scrambling of payload cells.

Example: an_scram_ex on

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---

an_scram_ex?

ACTION: Returns the current analyzer scrambling (for E1 and E3).

Response: ON or OFF

Example: an_scram_ex?
AN_SCRAM_EX ON

==========

an_signal [oc3c, stm1,ds3, ds1,e1, e3, t100]

ACTION: Selects the input signal to test.

oc3c	The Analyzer tests the OC-3c input.
stm1	The Analyzer tests the STM-1 input.
ds3	The Analyzer tests the DS3 input.
ds1	The Analyzer tests the DS1 input.
e1	The Analyzer tests the E1 input.
e3	The Analyzer tests the E3 input.
t100	The Analyzer tests the 100 Mbps input.

Example: an_signal oc3c

---

an_signal?

ACTION: Returns the currently selected Analyzer input.

Response: OC3C, STM1 , DS3, DS1, E1, E3 or T100

Example: an_signal?
AN_SIGNAL T100

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==========

an_sync [atm,physical]

ACTION: Selects the source for the front panel ANALYZER SYNC OUT signal.

atm	The sync pulse will be generated at the start of each received ATM cell.
physical	The sync pulse will be generated according to the physical layer framing.

Example: an_sync physical

---

an_sync?

ACTION: Returns the current ANALYZER SYNC OUT signal source.

Response: ATM or PHYSICAL

Example: an_sync?
AN_SYNC ATM

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==========

atm_error? [win,test] , [test,idle,mis,hec,cell,pyld]

ACTION: Returns the Analyzer ATM Data Count of the specified data type for either the Sliding Window or the Analyzer Test period.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).

test	Total count for ATM TEST Cells received.
idle	Total count for Idle Cells received.
mis	Total count for Misinserted ATM Cells received.
hec	Total count for ATM Cells received with HEC errors.
cell	Total count for Cell Loss (ATM TEST Cells not received).
pyld	Total count for ATM TEST Cells received with payload bit errors.

Response: WIN or TEST ,
TEST , IDLE , MIS , HEC , CELL or PYLD ,
number value

Example: atm_error? win , hec
ATM_ERROR WIN , HEC , 256000

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==========

atm_rate? [win,test] , [test,test_mhz,idle,idle_mhz,mis,mis_mhz,hec,cell,pyld]

ACTION: Returns the Analyzer ATM Data Rate of the specified data type for either the Sliding Window or the Analyzer Test period.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).

test	Bandwidth of the ATM TEST Cells received.
test_mhz	Bandwidth of the ATM TEST Cells received in mhz.
idle	Bandwidth of the Idle Cells received.
idle_mhz	Bandwidth of the Idle Cells received in mhz.
mis	Bandwidth of the Misinserted ATM Cells received.
mis_mhz	Bandwidth of the Misinserted ATM Cells received.
hec	Error Rate for ATM Cells received with HEC errors.
cell	Error Rate for Cell Loss (ATM TEST Cells not received).
pyld	Error Rate for ATM TEST Cells received with payload bit errors.

Response: WIN or TEST ,TEST , IDLE , MIS , HEC , CELL or PYLD , TEST_MHZ, IDLE_MHZ, MIS_MHZ
number value

Example: atm_rate? test , test
ATM_RATE TEST , TEST , 0.500

==========

bw_cntrl [frq, perc]

ACTION: Sets the Bandwidth Control menu on the Generator side of the ATM150.

frq	Sets the bandwidth in freqency (Mpbs).
perc	Sets the bandwidth in percentages.

Example: bw_cntrl FRQ
BW_CNTRL FRQ

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==========

calibrate

ACTION: Calibrate the propagation delay to the current minimum delay. A test must be running.

Response: none

Example:

```
ATM150>   CELL_RUN RUN
ATM150>   RTEST_RUN RUN
ATM150>   delay_min?
      >   150E-6
ATM150>   ref_value?
      >   46E-6
ATM150>   CALIBRATE
ATM150>   ref_value?
      >   196E-6
ATM150>   RTEST_RUN RUN
ATM150>   delay_min?
      >   0E-6
```

==========

cell_run [run,stop]

ACTION: Controls the Generator Cell Run function.

run	The programmed Test Cells will be transmitted according to the specified bandwidths and distributions.
stop	The output of Test Cells are terminated and only the IDLE cells are transmitted.

Example: cell_run run

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---

cell_run?

ACTION: Returns the current state of the Generator Cell Run.

Response: RUN or STOP

Example: cell_run?
CELL_RUN STOP

==========

contrast [n]

ACTION: Controls the display contrast of the flat panel LCD display on the front of the ATM150.

'n': 0 to 9

Example: contrast 5

---

contrast?

ACTION: Returns the current LCD display contrast.

Response: number value

Example: contrast?
CONTRAST 5

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cust_hdr_fl

ACTION: Header and Distribution Remote Command. This is an action remote command the expects the filename of the Header and Distribution configuration to be loaded as a parameter. The passed-in filename must be eight characters long. The .HDR extension is added and the current selected drive will be searched for this file. If the file is found, the Header and Distribution configuration information stored in the file is loaded into the ATM150 unit.

As a query, it returns the currently selected filename. If no valid filename is current, it send back "..No..Files..".

Example: cust_hdr_fl

==========

date ["mm/dd/yy"]

ACTION: Sets the date.

Example: date "mm/dd/yy"

---

date?

ACTION: Returns the current date.

Response: mm/dd/yy

Example: date?
DATE 12/30/95

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==========

del_hdr_fl

ACTION: Header and Distribution Remote Command. This is an action remote command that expects the filename of the configuration to be loaded as a parameter. The passed-in filename must be eight characters long. The .HDR extension is added and the current selected disk is searched for this file. If the file is found, the file is deleted.

Example: del_hdr_fl

==========

del_srm_fl

ACTION: Store and Recall Remote Command. This is an action remote command that expects the filename of the configuration to be loaded as a parameter. The passed-in filename must be eight characters long. The .SRM extension is added and the current selected disk is searched for this file. If the file is found, the file is deleted.

Example: del_srm_fl "filename"

==========

delay_end [bin],[delay]

ACTION: Controls the End Cell delay value used for the individual cell

delay bin specified by 'bin'.

There are 10 cell delay bins. Each accumulates the number of received ATM Test Cells which have a delay that falls within the range of the bin. The cell delay bins are specified by 11 delay values. There is one Start delay value and 10 End delay values. See the following chart.

'bin': 1 to 10

'delay': 0.000000 to 0.999999 Seconds

Example: delay_end 4 , 0.0012

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---

delay_end? [bin]

ACTION: Returns the End Cell delay value of the specified bin.

'bin': 1 to 10

Response: number value ,
number value

Example: delay_end? 3
DELAY_END 3 , 300E-6

==========

delay_max [delay]

ACTION: Controls the Maximum delay used for the automatic cell delay configuration function. Automatically configures the 10 cell delay bins using the configurable Minimum and Maximum cell delays (delay_min and delay_max). The range will be evenly divided into the 10 cell delay bins.

'delay': 0.000010 to 0.999999 Seconds

Example: delay_max 1000E-6

---

delay_max?

ACTION: Returns the current Maximum delay to be used for the automatic cell delay configuration function.

Response: number value

Example: delay_max?
DELAY_MAX 999999E-6

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==========

delay_min [delay]

ACTION: Controls the Minimum delay used for the automatic cell delay configuration function. Automatically configures the 10 cell delay bins using the configurable Minimum and Maximum cell delays (delay_min and delay_max). The range will be evenly divided into the 10 cell delay bins.

'delay': 0.000001 to 0.999989 Seconds

Example: delay_min 1000E-6

---

delay_min?

ACTION: Returns the current Minimum delay to be used for the automatic cell delay configuration function.

Response: number value

Example: delay_min?
DELAY_MIN 0E-6

==========

delay_mode [inter, prop]

ACTION: Controls the Analyzer delay mode. This mode control is the data used by the front panel and by the remote commands. Both sets of data (intercell delay and propagation delay) are accumulated simutaneously by the Analyzer.

inter The intercell delay mode. The front panel delay bin enters and results will be for the intercell delay. The remote commands (delay_xxx and res_delxxx) will be for the intercell delay.

prop The propagation delay mode. The front panel delay bin enters and results will be for the propagation delay. The remote commands (delay_xxx and res_delxxx) will be for the propagation delay.

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---

delay_mode?

ACTION: Returns the Analyzer delay mode.

Response: number value

Example: delay_mode?
DELAY_MODE

==========

delay_start [delay]

ACTION: Controls the Start Cell delay value used for the first cell delay bin.

There are 10 cell delay bins. Each accumulates the number of received ATM Test Cells which have a delay that falls within the range of the bin. The cell delay bins are specified by 11 delay values. There is one Start delay value and 10 End delay values.

'delay': 0.000000 to 0.999989 Seconds

Example: delay_start 0.001

---

delay_start?

ACTION: Returns the Start Cell delay value for the first bin.

Response: number value

Example: delay_start?
DELAY_START 15E-6

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==========

disk_to_sram

ACTION: Store and Recall Remote Command. This is an action remote that expects the filename of the configuration to be loaded as a parameter. The passed-in filename must be eight characters long. The .SRM extension is added and the current selected disk is searched for this file. If the file is found, the configuration information stored in the file is loaded into the ATM150 unit.

Example: disk_to_sram "filename"

==========

dist_count [active,idle],[count]

ACTION: Controls the Burst Count size, in terms of the number of ATM cells.

This is only valid for CONSTANT Distributions.

active This affects the Test and Active Traffic Cells.

idle This affects the Idle Cells.

'count': 0 to 65535

Example: dist_count active , 256

---

dist_count? [active,idle]

ACTION: Returns the Burst Count size. This is only valid for CONSTANT Distributions.

Response: ACTIVE or IDLE , number value

Example: dist_count? idle

DIST_COUNT IDLE , 12

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==========

dist_max [active,idle],[max]

ACTION: Controls the Maximum Burst. This is only valid for UNIFORM , GAUSSIAN , POISSON and RAMP Distributions. For the RAMP distribution, this will be in terms of percent. For the remaining distributions, this will be in terms of cell counts.

active This affects the Test and Active Traffic Cells.

idle This affects the Idle Cells.

'max': 1 to 65535 (up to 100 if distribution is RAMP)

Example: dist_max idle , 50

---

dist_max? [active,idle]

ACTION: Returns the Maximum Burst. This is only valid for UNIFORM , GAUSSIAN , POISSON and RAMP Distributions.

Response: ACTIVE or IDLE , number value

Example: dist_max? idle

DIST_MAX IDLE , 100

==========

dist_mean [active,idle],[mean]

ACTION: Controls the Mean Burst Count, in terms of the number of ATM cells. This is only valid for GAUSSIAN and POISSON Distributions.

active This affects the Test and Active Traffic Cells.

idle This affects the Idle Cells.

'mean': 1 to 65535

Example: dist_mean active , 100

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---

dist_mean? [active,idle]

ACTION: Returns the Mean Burst Count. This is only valid for GAUSSIAN and POISSON Distributions.

Response: ACTIVE or IDLE , number value

Example: dist_mean? idle
DIST_MEAN IDLE , 600

==========

dist_min [active,idle],[min]

ACTION: Controls the Minimum Burst. This is only valid for UNIFORM , GAUSSIAN , POISSON and RAMP Distributions. For the RAMP distribution, this will be in terms of percent. For the remaining distributions, this will be in terms of cell counts.

active This affects the Test and Active Traffic Cells.

idle This affects the Idle Cells.

'min': 0 to 65534 (up to 98 if distribution is RAMP)

Example: dist_min idle , 50

---

dist_min? [active,idle]

ACTION: Returns the Minimum Burst. This is only valid for UNIFORM , GAUSSIAN , POISSON and RAMP Distributions.

Response: ACTIVE or IDLE , number value

Example: dist_min? active
DIST_MIN ACTIVE , 0

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==========

dist_mode [active,idle],[constant,uniform,gaussian,poisson,ramp,custom]

ACTION: Controls the distribution mode for either the Active or Idle ATM cells. These are independently controlled, except for the RAMP selection, which controls both Active and Idle through the Active parameters.

The basic concept behind the ATM Cell distributions is that a number of Active cells are transmitted, and then a number of Idle cells are transmitted. These groups of cells are the Burst counts. This process is continued such that there are a series of Active and Idle Bursts. The distributions consist of the series of Active and Idle Burst counts.

active	This affects the Test and Active Traffic Cells.
idle	This affects the Idle Cells.
constant	The entire distribution consists of a single Burst count (dist_count).
uniform	The Uniform distribution consists of Burst counts that vary in size from the minimum count (dist_min) to the maximum count (dist_max) in increments based on the Burst Step size (dist_step). The occurance rate for each of the Burst counts will be the same, making a uniform distribution of ATM cell bursts.
gaussian	This distribution simulates a Gaussian distribution of Burst counts. The Gaussian curve is defined by the Mean Burst count (dist_mean) and the Standard Deviation from the mean in terms of cells (dist_std_dev). From this curve, the burst counts used for the distribution are limited by the Minimum (dist_min) and Maximum (dist_max) specified and the Burst Step size (dist_step).

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poisson — This distribution simulates a Poisson distribution of Burst counts. The Poisson curve is defined by the Mean Burst count (dist_mean). From this curve, the burst counts used for the distribution are limited by the Minimum (dist_min) and Maximum (dist_max) specified and the Burst Step size (dist_step).

ramp — This distribution is intended to ramp up and down the Active ATM cell load being transmitted. By means of controlling the pairs of Active/Idle Burst counts, the percent of Active bandwidth can be controlled over time. Starting at the minimum percentage (dist_min), the percent is increased up to the maximum percentage (dist_max) and then back down to the minimum. This is done is such that the increase and decrease are linear over time. The time it takes to go from the minimum to maximum and back to minimum is the period (dist_period).

custom — This is the User Specified distribution. It is input through remote commands or through the front panel diskette.

Example: dist_mode active , uniform

---

dist_mode? [active,idle]

ACTION: Returns the current Distribution mode.

Response: ACTIVE or IDLE ,
CONSTANT , UNIFORM , GAUSSIAN , POISSON , RAMP or CUSTOM

Example: dist_mode? idle
DIST_MODE IDLE , GAUSSIAN

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==========

dist_period [active,idle],[period]

ACTION: Controls the RAMP Distribution Period. This is only valid for the RAMP Distribution. This will be in terms of seconds.

active This affects the Test and Active Traffic Cells.
idle This affects the Idle Cells.

'period': 1 to 60

Example: dist_period active , 10

---

dist_period? [active,idle]

ACTION: Returns the RAMP Distribution Period. This is only valid for the RAMP Distribution.

Response: ACTIVE or IDLE , number value

Example: dist_period? active
DIST_PERIOD ACTIVE , 60

==========

dist_program

ACTION: Programs the Active and Idle Cell Distributions. Using all of the Cell Distribution parameters (dist_xxxx), the Distributions are programmed into the Hardware for use with the next Generator Cell Run (cell_run).

Example: dist_program

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==========

dist_random [on,off]

ACTION: Controls the randomizing of the loading of all of the Cell Distribution Burst counts into the Hardware.

'on': The Cell Burst counts will be randomized during the download to the Hardware, so as to randomly distribute the different Cell Burst counts over time.

'off': The download of the Cell Burst counts will be non-random. It will be done in an easily predictable manner. All of the minimum burst counts will be loaded first, and so on, until the maximum burst counts are loaded last.

Example: dist_random on

---

dist_random?

ACTION: Returns the current Cell Distribution Randomize mode.

Response: ON or OFF

Example: dist_random?
DIST_RANDOM ON

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==========

dist_std_dev [active,idle],[std_dev]

ACTION: Controls the Standard Deviation for the Burst Counts, in terms of the number of ATM cells. This is only valid for GAUSSIAN Distributions.

active	This affects the Test and Active Traffic Cells.
idle	This affects the Idle Cells.

'std_dev': 1 to 65535

Example: dist_std_dev active , 20

---

dist_std_dev? [active,idle]

ACTION: Returns the Standard Deviation. This is only valid for GAUSSIAN Distributions.

Response: ACTIVE or IDLE , number value

Example: dist_std_dev? active
DIST_STD_DEV ACTIVE , 60

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==========

dist_step [active,idle],[step]

ACTION: Controls the Burst count Step size. This is valid for UNIFORM , GAUSSIAN and POISSON Distributions. This controls which Burst counts will be used between the minimum and maximum Burst counts specified.

active This affects the Test and Active Traffic Cells.

idle This affects the Idle Cells.

'step': 1 to 65535

Example: dist_step active , 10

---

dist_step? [active,idle]

ACTION: Returns the Burst count Step size. This is only valid for UNIFORM , GAUSSIAN and POISSON Distributions.

Response: ACTIVE or IDLE , number value

Example: dist_step? active

DIST_STEP ACTIVE , 500

==========

drive

ACTION: Store and Recall Remote Command. This remote command can be a query or a command. As query (drive?), it returns the current selected drive that .SRM extension and .HDR extension files read from or written to. This is either the hard drive or floppy drive. As a set remote command, it selects the hard drive or floppy drive that the .SRM and .HDR files are read from or written to. This command is also used to query/command where test data is written to.

Example: drive hard-disk or

floppy-disk

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==========

ds1_alarms? [win,test] , [los,lof,ais,plcp_lof,plcp_rai,rai]

ACTION: Returns the Analyzer Physical Layer Alarm data for the DS1 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the DS1 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
los	DS1 Loss Of Signal (LOS).
lof	DS1 Loss Of Frame (LOF).
ais	DS1 Alarm Indication Signal (AIS).
plcp_lof	PLCP Loss Of Frame (LOF).
plcp_rai	DS1 PLCP yellow alarm signal (RAI).
rai	Remote Alarm Indication (RAI)

Response: WIN or TEST ,
LOS, LOF, AIS, FERF, PLCP_LOF or PLCP_RAI, RAI
CLEAR , CUR or HIST

Example: ds1_alarms? win , plcp_lof
DS1_ALARMS WIN , PLCP_LOF , HIST

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==========

ds1_error? [win,test] , [crc6,lcv,frame,p_b1,p_febe]

ACTION: Returns the Analyzer Physical Layer Data Count for the DS1 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the DS1 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
crc6	Total count for DS1 CRC6 errors.
lcv	Total count for DS1 Line Code Violations (LCV).
p_b1	Total count for PLCP Frame bit interleaved parity errors (BIP).
p_febe	Total count for PLCP Far End Block Errors (FEBE).
frame	Total count for frame errors.

Response: WIN or TEST ,
PARITY , LCV , FRAME , P_B1 or P_FEBE ,
number value

Example: ds1_error? test , p_febe
DS1_ERROR TEST , P_FEBE , 9

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==========

ds1_rate? [win,test] , [frame,crc6,p_b1]

ACTION: Returns the Analyzer Physical Layer Data Rate for the DS1 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the DS1 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).

frame	Error Rate for DS1 frame errors.
crc6	Error Rate for DS1 CRC6 errors.
p_b1	Error Rate for PLCP Frame bit interleaved parity errors (BIP).

Response: WIN or TEST ,
FRAME, CRC6, P_B1 ,
number value

Example: ds1_rate? test , frame
DS1_RATE TEST ,frame , 3.66E-03

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==========

ds3_alarms? [win,test] , [los,lof,ais,idle,ferf,plcp_lof,plcp_rai]

ACTION: Returns the Analyzer Physical Layer Alarm data for the DS3 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the DS3 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).

los	DS3 Loss Of Signal (LOS).
lof	DS3 Loss Of Frame (LOF).
ais	DS3 Alarm Indication Signal (AIS).
idle	DS3 Idle Maintenance signal.
ferf	Far End Receive Failure maintenance signal (FERF).
plcp_lof	PLCP Loss Of Frame (LOF).
plcp_rai	DS3 PLCP yellow alarm signal (RAI).

Response: WIN or TEST ,
LOS , LOF , AIS , IDLE , FERF , PLCP_LOF or PLCP_RAI ,
CLEAR , CUR or HIST

Example: ds3_alarms? win , plcp_lof
DS3_ALARMS WIN , PLCP_LOF , HIST

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==========

ds3_error? [win,test] , [parity,lcv,febe,p_b1,p_febe]

ACTION: Returns the Analyzer Physical Layer Data Count for the DS3 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the DS3 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
parity	Total count for DS3 Parity errors (P-bits errors).
lcv	Total count for DS3 Line Code Violations (LCV).
febe	Total count for Far End Block Errors (FEBE).
p_b1	Total count for PLCP Frame bit interleaved parity errors (BIP).
p_febe	Total count for PLCP Far End Block Errors (FEBE).

Response: WIN or TEST ,
PARITY , LCV , FEBE , P_B1 or P_FEBE ,
number value

Example: ds3_error? test , p_febe
DS3_ERROR TEST , P_FEBE , 9

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==========

ds3_rate? [win,test] , [parity,p_b1]

ACTION: Returns the Analyzer Physical Layer Data Rate for the DS3 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the DS3 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
parity	Error Rate for DS3 Parity errors (P-bits errors).
p_b1	Error Rate for PLCP Frame bit interleaved parity errors (BIP).

Response: WIN or TEST ,
PARITY or P_B1 ,
number value

Example: ds3_rate? test , parity
DS3_RATE TEST , PARITY , 3.66E-03

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==========

e1_alarms? [win,test] , [los,oof,ais,remote,plcp_lof,plcp_rai]

ACTION: Returns the Analyzer Physical Layer Alarm data for the E1 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the E1 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
los	E1 Loss Of Signal (LOS).
oof	E1 Out of Frame (OOF).
ais	E1 Alarm Indication Signal (AIS).
plcp_lof	PLCP Loss Of Frame (LOF).
plcp_rai	E1 PLCP yellow alarm signal (RAI).

Response: WIN or TEST ,
LOS, OOF, AIS, PLCP_LOF or PLCP_RAI,
CLEAR , CUR or HIST

Example:
e1_alarms? win , plcp_lof
E1_ALARMS WIN , PLCP_LOF , HIST

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==========

e1_error? [win,test] , [crc,lcv,frame,p_b1,p_febe]

ACTION: Returns the Analyzer Physical Layer Data Count for the E1 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the E1 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).

crc	Total count for E1 CRC errors.
lcv	Total count for E1 Line Code Violations (LCV).
frame	Total count for E1 frame errors.
p_b1	Total count for PLCP Frame bit interleaved parity errors (BIP).
p_febe	Total count for PLCP Far End Block Errors (FEBE).

Response: WIN or TEST ,
CRC, LCV, FRAME, P_B1 or P_FEBE,
number value

Example: e1_error? test , p_febe
E1_ERROR TEST , P_FEBE , 9

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==========

e1_rate? [win,test] , [frame,lcv,febe,crc,p_b1,p_febe]

ACTION: Returns the Analyzer Physical Layer Data Rate for the E1 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the E1 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
crc	Error rate for E1 CRC errors.
lcv	Error rate for E1 Line Code Violations (LCV).
frame	Error rate for E1 frame errors.
p_febe	Error rate for PLCP Far End Block Errors (FEBE).
p_b1	Error Rate for PLCP Frame bit interleaved parity errors (BIP).

Response: WIN or TEST ,
number value

Example: e1_rate? test , crc
E1_RATE TEST , CRC, 3.66E-03

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==========

e3_alarms? [win,test] , [los,oof,ais,ferf_rai,plcp_lof,plcp_rai]

ACTION: Returns the Analyzer Physical Layer Alarm data for the E3 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the E3 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).

los	E3 Loss Of Signal (LOS).
oof	E3 Out of Frame (OOF).
ais	E3 Alarm Indication Signal (AIS).
plcp_lof	PLCP Loss Of Frame (LOF).
plcp_rai	E3 PLCP yellow alarm signal (RAI).

Response: WIN or TEST ,
LOS, OOF, AIS, PLCP_LOF or PLCP_RAI,
CLEAR , CUR or HIST

Example: e3_alarms? win , plcp_lof
E3_ALARMS WIN , PLCP_LOF , HIST

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==========

e3_error? [win,test] , [parity,lcv,febe,p_b1,p_febe]

ACTION: Returns the Analyzer Physical Layer Data Count for the E3 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the E3 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
lcv	Total count for E3 Line Code Violations (LCV).
febe	Total count for E3 Far End Block Errors (FEBE).
p_b1	Total count for PLCP Frame bit interleaved parity errors (BIP).
p_febe	Total count for PLCP Far End Block Errors (FEBE).

Response: WIN or TEST ,
LCV, FEBE, P_B1 or P_FEBE,
number value

Example: e3_error? test , p_febe
E3_ERROR TEST , P_FEBE , 9

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==========

e3_rate? [win,test] , [parity,lcv,febe,p_b1,p_febe]

ACTION: Returns the Analyzer Physical Layer Data Rate for the E3 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the E3 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
lcv	Error rate for E3 Line Code Violations (LCV).
p_febe	Error rate for PLCP Far End Block Errors (FEBE).
p_b1	Error Rate for PLCP Frame bit interleaved parity errors (BIP).

Response: WIN or TEST ,
number value

Example: e3_rate? test ,lcv
E3_RATE TEST ,LCV, 3.66E-03

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==========

err_mode [hec,pyld]

ACTION: Controls the Mode of the ATM Error output.

hec	ATM Errors will consist of ATM Cell HEC errors.
pyld	ATM Errors will consist of ATM Cell Payload errors.

Example: err_mode hec

---

err_mode?

ACTION: Returns the current ATM Error mode.

Response: HEC or PYLD

Example: err_mode?
ERR_MODE PYLD

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==========

err_rate [n]

ACTION: Controls the ATM Error Rate. The rate will be specified in terms of an exponent 'n', such that the rate will be 10 to the negative 'n'.

'n': 2 to 9

Example: err_rate 5

---

err_rate?

ACTION: Returns the current ATM Error Rate exponent.

Response: number value

Example: err_rate?
ERR_RATE 8

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==========

frst_hdr_fl

ACTION: Header and Distribution Remote Command. This remote command is a query. It returns the first file name that ends with a ".HDR" extension and is in the current selected drive, either the hard drive or the floppy drive.

Example: frst_hdr_fl

==========

frst_srm_fl

ACTION: Store and Recall Remote Command. This remote command is a query. It returns the first file name that ends with a ".SRM" extension that is in the current selected drive, either the hard drive or the floppy drive.

Example: frst_srm_fl

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==========

gen_100mbps [safe,normal]

ACTION: Controls the Generator IDLE Byte mode used for the 100Mbps signal interface.

safe	There will be an IDLE Byte transmitted prior to every ATM cell transmitted. This is in addition to the IDLE Bytes transmitted in place of the programmed IDLE Cells.
normal	The only IDLE Bytes transmitted will be those done in place of the programmed IDLE Cells.

Example: gen_100mbps safe

---

gen_100mbps?

ACTION: Returns the current state of the Generator 100Mbps IDLE Byte mode.

Response: SAFE or NORMAL

Example: gen_100mbps?
GEN_100MBPS NORMAL

==========

gen_act_clp [clp]

ACTION: Modifies the Cell Loss Priority (CLP) for the Active Header Generation function.

'clp': 0 to 1

Example: gen_act_clp 0

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---

gen_act_clp?

ACTION: Returns the Cell Loss Priority (CLP) which will be used for the Active Header Generation function.

Response: number value

Example: gen_act_clp?
GEN_ACT_CLP 1

==========

gen_act_cnt [num_cells]

ACTION: Controls the number of Active Traffic ATM Cells to generate for the Active Header Generation function.

'num_cells': 1 to 8191

Example: gen_act_cnt 256

---

gen_act_cnt?

ACTION: Returns the number of Active Traffic ATM Cells that will be generated by the next Active Header Generation function.

Response: number value

Example: gen_act_cnt?
GEN_ACT_CNT 8191

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==========

gen_act_gfc [gfc]

ACTION: Modifies the Generic Flow Control (GFC) for the Active Header Generation function.

'gfc': 0 to 15

Example: gen_act_gfc 12

---

gen_act_gfc?

ACTION: Returns the Generic Flow Control (GFC) which will be used for the Active Header Generation function.

Response: number value

Example: gen_act_gfc?
GEN_ACT_GFC 0

==========

gen_act_hdrs

ACTION: Performs the Active Header Generation function. This will create the Active Traffic ATM Cells based on the 'gen_act_xxx' parameters. The old Active Traffic cells will be discarded and replaced by the newly created ones.

Example: gen_act_hdrs

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==========

gen_act_inc [vci_inc]

ACTION: Controls the increment value of the VCI for the Active Header Generation function. The VCI (gen_act_vci) will be used for the first generated cell. Each subsequent cell will be identical except it will have its VCI incremented by the specified 'vci_inc' value.

'vci_inc': 1 to 65535 (Maximum dependent upon number of cells to generate, 'gen_act_cnt', and the starting vci value, 'gen_act_vci')

Example: gen_act_inc 16

---

gen_act_inc?

ACTION: Returns the increment value of the VCI which will be used for the Active Header Generation function.

Response: number value

Example: gen_act_inc?
GEN_ACT_INC 1

==========

gen_act_pti [pti]

ACTION: Modifies the Payload Type Indicator (PTI) for the Active Header Generation function.

'pti': 0 to 7

Example: gen_act_pti 0

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---

gen_act_pti?

ACTION: Returns the Payload Type Indicator (PTI) which will be used for the Active Header Generation function.

Response: number value

Example: gen_act_pti?
GEN_ACT_PTI 7

==========

gen_act_vci [vci]

ACTION: Modifies the Virtual Channel Indicator (VCI) for the Active Header Generation function.

'vci': 0 to 65535

Example: gen_act_vci 0

---

gen_act_vci?

ACTION: Returns the Virtual Channel Indicator (VCI) which will be used for the Active Header Generation function.

Response: number value

Example: gen_act_vci?
GEN_ACT_VCI 65535

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==========

gen_act_vpi [vpi]

ACTION: Modifies the Virtual Path Indicator (VPI) for the Active Header Generation function.

'vpi': 0 to 4095 (up to 255 if cell format is UNI)

Example: gen_act_vpi 0

---

gen_act_vpi?

ACTION: Returns the Virtual Path Indicator (VPI) which will be used for the Active Header Generation function.

Response: number value

Example: gen_act_vpi?
GEN_ACT_VPI 255

==========

gen_cellfrmt [uni,nni]

ACTION: Controls the Generator ATM Cell Format. . See graphical representations of the ATM Cell Formats in the ATM Basics appendix (Appendix A).

uni The ATM cell format will be the User-Network Interface (UNI), which includes the GFC and a smaller VPI.

nni The ATM cell format will be the Network-Network Interface (NNI), which does not include the GFC.

Example: gen_cellfrmt uni

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---

gen_cellfrmt?

ACTION: Returns the current ATM Cell Format transmitted by the Generator.

Response: UNI or NNI

Example: gen_cellfrmt?
GEN_CELLFRMT NNI

==========

gen_clk [int,rec]

ACTION: Controls the clock timing for the Generator.

int The timing will be based on an internal crystal.
rec The timing will be recovered from the Analyzer input.

Example: gen_clk rec

---

gen_clk?

ACTION: Returns the current Generator clock timing.

Response: INT or REC

Example: gen_clk?
GEN_CLK INT

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==========

gen_coset [disable,enable]

ACTION: Controls the use of the COSET in the ATM HEC calculations for the Generator.

disable The HEC calculation is completed without the XOR of the COSET pattern 01010101. This calculation is not defined.

enable The HEC calculation includes the XOR of the COSET pattern 01010101, as defined by the ATM Forum, UNI 3.0 specification.

Example: gen_coset enable

---

gen_coset?

ACTION: Returns the current Generator COSET mode.

Response: ENABLE or DISABLE

Example: gen_coset?
GEN_COSET DISABLE

==========

gen_crc_e1 [on, off]

ACTION: This is a query and action command. Upon query, it will return the current state of the generator e1 mode, either on or off. As an action command, it sets the current generator e1 mode.

Example: gen_crc_e1 on

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==========

gen_ds1frame [esf, sf]

ACTION: Controls the Generator DS1 frame format.

esf	The DS1 ESF format will be used.
sf	The DS1 SF format will be used.

Example: gen_ds1frame cbit

---

gen_ds1frame?

ACTION: Returns the current Generator DS1 frame format.

Response: ESF or SF

Example: gen_ds1frame?
GEN_DS1FRAME ESF

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==========

gen_ds3frame [cbit,mx3]

ACTION: Controls the Generator DS3 frame format.

cbit	The DS3 C-BIT format will be used.
mx3	The DS3 MX3 format will be used.

Example: gen_ds3frame cbit

---

gen_ds3frame?

ACTION: Returns the current Generator DS3 frame format.

Response: CBIT or MX3

Example: gen_ds3frame?
GEN_DS3FRAME MX3

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==========

gen_e3frame [G751, G852]

ACTION: Controls the Generator E3 frame format.

G751	The E3 G.751 format will be used.
G852	The E3 G.852 format will be used.

Example: gen_e3frame cbit

---

gen_e3frame?

ACTION: Returns the current Generator E3 frame format.

Response: G.751 or G.852

Example: gen_e3frame?
GEN_E3FRAME G751

==========

gen_laser [on,off]

ACTION: Controls the Generator LASER output.

NOTE: On power-up, this defaults to OFF.

NOTE: On any Generator signal change, this switches to OFF.

on	The appropriate LASER will be turned on, depending on the selected signal.
off	The LASER will be turned off.

Example: gen_laser on

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---

gen_laser?

ACTION: Returns the current LASER setting.

Response: ON or OFF

Example: gen_laser?
GEN_LASER OFF

==========

gen_plcp_ds1 [on,off]

ACTION: Controls the use of Generator DS1 PLCP framing.

on The ATM Cells carried by the DS1 signal will be sent in the PLCP format.

off The ATM Cells carried by the DS1 signal will not be sent in the PLCP format.

Example: gen_plcp_ds1 on

---

gen_plcp_ds1?

ACTION: Returns the current Generator DS1 PLCP mode.

Response: ON or OFF

Example: gen_plcp_ds1?
GEN_PLCP_DS1 OFF

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==========

gen_plcp [on,off]

ACTION: Controls the use of Generator DS3 PLCP framing.

on	The ATM Cells carried by the DS3 signal will be sent in the PLCP format.
off	The ATM Cells carried by the DS3 signal will not be sent in the PLCP format.

Example: gen_plcp on

---

gen_plcp?

ACTION: Returns the current Generator DS3 PLCP mode.

Response: ON or OFF

Example: gen_plcp?
GEN_PLCP OFF

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==========

gen_plcp_e1 [on,off]

ACTION: Controls the use of Generator E1 PLCP framing.

on	The ATM Cells carried by the E1 signal will be sent in the PLCP format.
off	The ATM Cells carried by the E1 signal will not be sent in the PLCP format.

Example: gen_plcp_e1 on

---

gen_plcp_e1?

ACTION: Returns the current Generator E1 PLCP mode.

Response: ON or OFF

Example: gen_plcp_e1?
GEN_PLCP_E1 OFF

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==========

gen_plcp_e3 [on,off]

ACTION: Controls the use of Generator E3 PLCP framing.

on	The ATM Cells carried by the E3 signal will be sent in the PLCP format.
off	The ATM Cells carried by the E3 signal will not be sent in the PLCP format.

Example: gen_plcp_e3 on

---

gen_plcp_e3?

ACTION: Returns the current Generator E3 PLCP mode.

Response: ON or OFF

Example: gen_plcp_e3?
GEN_PLCP_E3 OFF

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==========

gen_pps [int,ext]

ACTION: Controls the source of the one Pulse Per Second (1PPS) timing used for the the cell delay measurements.

For proper delay measurements, the Generator and corresponding Analyzer should use the same source for the 1PPS.

int The internally generated 1PPS will be used.

ext The Generator external rear-panel 1PPS will be used.

Example: gen_pps int

---

gen_pps?

ACTION: Returns the current Generator 1PPS source.

Response: INT or EXT

Example: gen_pps?

GEN_PPS EXT

==========

gen_scram [on, off]

ACTION: Controls the use of generator payload scrambing modes (for DS1 and DS3)

on Turns on scrambling of payload cells.

off Turn off scrambling of payload cells.

Example: gen_scram on

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---

gen_scram?

ACTION: Returns the current generator scrambling (for DS1 and DS3).

Response: ON or OFF

Example: gen_scram?
GEN_SCRAM ON

==========

gen_scram_ex [on, off]

ACTION: Controls the use of generator payload scrambing modes (for E1 and E3)

on Turns on scrambling of payload cells.
off Turn off scrambling of payload cells.

Example: gen_scram_ex on

---

gen_scram_ex?

ACTION: Returns the current generator scrambling (for E1 and E3).

Response: ON or OFF

Example: gen_scram_ex?
GEN_SCRAM_EX ON

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==========

gen_signal [oc3c, stm1,ds3, ds1, e1, e3,t100]

ACTION: Selects the Generator output signal.

oc3c	Selects the OC-3c output.
stm1	Selects the STM-1 output.
ds3	Selects the DS3 output.
ds1	Selects the DS1 output.
e1	Selects the E1 output.
e3	Selects the E3 output.
t100	Selects the 100 Mbps output.

Example: gen_signal oc3c

---

gen_signal?

ACTION: Returns the currently selected Generator output.

Response: OC3C, STM1, DS3, DS1, E1, E3 or T100

Example: gen_signal?
GEN_SIGNAL DS3

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==========

gen_sync [atm,physical]

ACTION: Selects the source for the front panel GENERATOR SYNC OUT signal.

atm	The sync pulse will be generated at the start of each transmitted ATM cell
physical	The sync pulse will be generated according to the physical layer framing

Example: gen_sync physical

---

gen_sync?

ACTION: Returns the current GENERATOR SYNC OUT signal source.

Response: ATM or PHYSICAL

Example: gen_sync?
GEN_SYNC ATM

==========

hdr_program

ACTION: Programs the Test and Active Cell Headers. Using all of the Test cell parameters (test_xxxx) and Active Traffic cell parameters (active_xxxx), the Cell Headers are programmed into the Hardware for use with the next Generator Cell Run (cell_run).

Example: hdr_program

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==========

hdr_random [on,off]

ACTION: Controls the randomizing of the loading of all of the Test and Active ATM Cell Headers into the Hardware.

'on': The Test and Active Cells will be randomized during the download to the Hardware, so as to randomly distribute the different type of cell output over time.

'off': The download of the Test and Active cells will be non-random. It will be done in an easily predictable manner. All of the Test Cells will be loaded first, and then the remaining storage will be used by the Active Traffic Cells.

Example: hdr_random on

---

hdr_random?

ACTION: Returns the current Cell Header Randomize mode.

Response: ON or OFF

Example: hdr_random?
HDR_RANDOM ON

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==========

header [on,off]

ACTION: Sets the remote command response header mode.

on Command responses include the command header (command name).

off Command responses do not include the command header.

Example: header on

---

header?

ACTION: Returns the remote command response header mode.

Response: ON or OFF

Example: header?
OFF
header on
header?
HEADER ON

==========

hist_cell?

ACTION: Returns the current History Cell Loss indicator, as shown by the front panel CELL history LED.

Response: ON or OFF

Example: hist_cell?
HIST_CELL OFF

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==========

hist_clear

ACTION: Clears the History Indicators. This includes the front panel Error History LEDs.

Example: hist_clear

==========

hist_delin?

ACTION: Returns the current History Cell Delineation Error indicator, as shown by the front panel DELIN history LED.

Response: ON or OFF

Example: hist_delin?
HIST_DELIN OFF

==========

hist_hec?

ACTION: Returns the current History HEC Error indicator, as shown by the front panel HEC history LED.

Response: ON or OFF

Example: hist_hec?
HIST_HEC OFF

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==========

hist_input?

ACTION: Returns the current Input Loss indicator, as shown by the front panel NO INPUT LED.

Response: ON or OFF

Example: hist_input?
HIST_INPUT OFF

==========

hist_phys?

ACTION: Returns the current History Physical Layer Error/Alarm indicator, as shown by the front panel PHYSICAL history LED.

Response: ON or OFF

Example: hist_phys?
HIST_PHYS OFF

==========

hist_sync?

ACTION: Returns the current Synchronization indicator, as shown by the front panel SYNC LED.

Response: ON or OFF

Example: hist_sync?
HIST_SYNC ON

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==========

id_interface?

ACTION: Returns the current signal

Response: "x1/x3 E1/E3", "STM1 OPTICAL", "x1/x3 DS1/DS3", "EMPTY", "EMPTY", "TAXI

Example: id_interface?
ID_INTERFACE x1/x3 DS1/DS3

==========

id_options? [n]

ACTION: Returns all of the options for the passed module, specified by 'n'.
For the correlation between 'n' and the modules, see the System ID query (id_system?).

'n': 0 to 9

Response: number value ,
Option text mnenomics

Example: id_options? 2
ID_OPTIONS 2 , NONE

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==========

id_serial? [n]

ACTION: Returns the serial number for the passed module, specified by 'n'. For the correlation between 'n' and the modules, see the System ID query (id_system?).

'n': 0 to 9

Response: number value ,
<String Response>

Example: id_serial? 2
ID_SERIAL 2 , "12345678"

==========

id_system?

ACTION: Returns all of the modules within the unit. For each module, there will be a number corresponding to the module in the system, along with a text description of each module. The correlation between the numbers and modules is as follows:

Number	Module
0	Unit Model (Ex: ATM150)
1	Module 1
2	Module 2
3	Module 3
4	Module 4
5	Module 5
6	Module 6
7	Module 7
8	Front Panel
9	Mother Board

Response: <10 String Responses>

Example: id_system?
ID_SYSTEM "ATM150","ATM150 EOI","ATM150 TCG",
"ATM150 TCR","","","","","ATM150 FP","200MB"

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==========

id_version? [n]

ACTION: Returns the revision number for the passed module, specified by 'n'. For the correlation between 'n' and the modules, see the System ID query (id_system?).

'n': 0 to 9

Response: number value ,
<String Response>

Example: id_version? 2
ID_VERSION 2 , "REV A2"

==========

idle_bw?

ACTION: Returns the bandwidth of the idle cells as determined by the current cell distributions.

Response number value

Example: idle_bw?
IDLE_BW 5.00E-3

==========

idle_frq?

ACTION: Returns the frequency of the idle cells as determined by the current cell distributions.

Response: number value

Example: idle_frq?
IDLE_FRQ 1.500 Mbps

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==========

logo?

ACTION: Returns the ATM150 RS-232 power on logo.

NOTE: This commmand is only valid by RS-232.

Example: logo?

*** Tektronix atm150 1.5 04-15-96

==========

loopback [enable, disable]

ACTION: Controls the Analyzer loopback function.

enable The incoming signal to the Analyzer will be looped back through the Generator output.

disable The Generator and Analyzer will operate normally.

---

loopback? [enable, disable]

ACTION: Returns the Analyzer loopback function.

Response: ENABLE or DISABLE

Example: loopback?

LOOPBACK ENABLE

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==========

mon_avg? [win,mon],[cell_num]

ACTION: Returns the Average Bandwidth for the specified ATM Test Cell (cell_num) for either the Sliding Window or the Generator Monitor period. This is the current result of the Generator Monitoring of the Test Cell output bandwidth.

win	Results are from the Sliding Window period (see mon_win_len).
mon	Results are from the Generator Monitor period (see mon_length and mon_type).

'cell_num': 1 to 4

Response: WIN or MON ,
number value ,
number value

Example: mon_avg? win , 2
MON_AVG WIN , 2 , 0.00E-07

==========

mon_disp [win,mon]

ACTION: Controls the Front Panel display of the Generator Monitor results.

win	The front panel will display the Sliding Window results.
mon	The front panel will display the Monitor period results.

Example: mon_disp mon

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---

mon_disp?

ACTION: Returns the Generator Front Panel Monitor results display mode.

Response: WIN or MON

Example: mon_disp?
MON_DISP WIN

==========

mon_elap? [win,mon]

ACTION: Returns the Elapsed time into the Generator Sliding Window or Monitor period.

win The Sliding Window elapsed time will be returned.
mon The Generator Monitor elapsed time will be returned.

Response: WIN or MON ,
<String Response> in the format of "DDD-HH:MM:SS.T"

Example: mon_elap? mon
MON_ELAP MON , "365-23:59:59.9"

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==========

mon_freq? [win, test]

ACTION:. Returns the monitor setting and the current value that appears in the monitor.

Response: WIN or TEST, number value

Example: mon_freq? 1
MON_FREQ WIN, 1, 1, 536E6

==========

mon_length [sec]

ACTION: Controls the length of time for the Generator Monitor period. It is used by the Monitor in the TIMED, REPEAT and SWEEP modes (mon_type). This is the period referenced by the Monitor result commands as 'mon'.

'sec': 1 to 99999 seconds

Example: mon_length 45

---

mon_length?

ACTION: Returns the length of time that the Generator Monitor will run before it will stop when it is in the TIMED, REPEAT and SWEEP modes.

Response: number value

Example: mon_length?
MON_LENGTH 10

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==========

mon_peak? [win,mon],[cell_num]

ACTION: Returns the Peak Bandwidth for the specified ATM Test Cell (cell_num) for either the Sliding Window or the Generator Monitor period. The peak bandwidth is the highest cell bandwidth over a 100 milliseconds during the sliding window or monitor period. This is the current result of the Generator Monitoring of the Test Cell output bandwidth.

win	Results are from the Sliding Window period (see mon_win_len).
mon	Results are from the Generator Monitor period (see mon_length and mon_type).

'cell_num': 1 to 4

Response: WIN or MON ,
number value ,
number value

Example: mon_peak? mon , 3
MON_PEAK MON , 3 , 1.23E-10

==========

mon_reset

ACTION: Resets the Generator Monitor measurements. This is for both the Sliding Window and the Generator Monitor.

Example: mon_reset

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==========

mon_signal?

ACTION: Returns the Output Signal state as set during period of the available Generator Monitor results.

Response: OC3C , T100 , DS3 or DS3PLCP

Example: mon_signal?
MON_SIGNAL DS3PLCP

==========

mon_sweep [sweep]

ACTION: Controls the number of Sweep periods (sweep) for the Generator Monitor function. It is used by the Monitor only in the SWEEP mode (mon_type).

'sweep':1 to 99

Example: mon_sweep 10

---

mon_sweep?

ACTION: Returns the Sweep count for the Generator Monitor.

Response: number value

Example: mon_sweep?
MON_SWEEP 10

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==========

mon_total? [win,mon],[cell_num]

ACTION: Returns the Total Cells output for the specified ATM Test Cell (cell_num) for either the Sliding Window or the Generator Monitor period. This is the current result of the Generator Monitoring of the Test Cell output.

win	Results are from the Sliding Window period (see mon_win_len).
mon	Results are from the Generator Monitor period (see mon_length and mon_type).

'cell_num': 1 to 4

Response: WIN or MON ,
number value ,
number value

Example: mon_total? mon , 3
MON_TOTAL MON , 3 , 123456789

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==========

mon_type [untimed,timed]

ACTIONL Controls the timing mode for Generator Monitor function.

untimed — In this mode, the Generator Monitor function will continue running independent of the monitor period length (mon_length). It will continue until it is explicitly stopped (remote command 'cell_run stop' or the front panel key CELL RUN), or power off.

timed — In this mode, the Generator Monitor function will continue running until the Monitor elapsed time reaches the monitor period length (mon_length). It will also stop by means of remote command (cell_run), front panel key, or power loss.

(The following will be implemented in the future)

repeat — This mode is identical to TIMED, except that when the elapsed time reaches the period length, the Monitor function restarts. This will continue indefinitley, until it is stopped by means of remote command, front panel key, or power loss.

(The following will be implemented in the future)

sweep — This mode is identical to REPEAT, except for two things. First at the start of each successive Monitor period, the VCI of each Test Cell will be incremented by the VCI Increment (mon_vci_inc). Second, there will be a maximum number of repeat periods, for total monitor periods equal to the sweep count (mon_sweep).

Example: mon_type untimed

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---

mon_type?

ACTION: Returns the current timing mode for the Generator Monitor function.

Response: UNTIMED or TIMED

Example: mon_type?
MON_TYPE TIMED

==========

mon_vci? [cell_num]

ACTION: Returns the VCI for the specified Test Cell (cell_num) as set during period of the available Generator Monitor results.

'cell_num': 1 to 4

Response: number value ,
number value

Example: mon_vci? 2
MON_VCI 2 , 10000

==========

mon_vci_inc [vci_inc]

ACTION: Controls the VCI Increment value used for the Generator Monitor function when used in the SWEEP mode. This is the number added to each of the VCIs of the Test Cells at the start of each successive Monitor Sweep.

'vci_inc': 1 to 65535

Example: mon_vci_inc 12

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---

mon_vci_inc?

ACTION: Returns the current VCI Increment setting for the Generator Monitor function (SWEEP mode only).

Response: number value

Example: mon_vci_inc?
MON_VCI_INC 64

==========

mon_vpi? [cell_num]

ACTION: Returns the VPI for the specified Test Cell (cell_num) as set during period of the available Generator Monitor results.

'cell_num': 1 to 4

Response: number value ,
number value

Example: mon_vpi? 2
MON_VPI 2 , 4095

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==========

mon_win_len [sec]

ACTION: Controls the length of time for the Generator Sliding Window. This is maximum accumulated time in the sliding window. When the window elapsed time reaches the specified time, the sliding window will continue adding the new data, but will drop the oldest data.

'sec': 1 to 10 seconds

Example: mon_win_len 1

---

mon_win_len?

ACTION: Returns the length of time over which the Generator Sliding Window will accumulate data.

Response: number value

Example: mon_win_len?
MON_WIN_LEN 10

==========

monitor [vga,lcd]

ACTION: Controls the video monitor selection between the front panel LCD and the rear panel VGA.

lcd The front panel LCD screen will be enabled and the rear panel VGA will be disabled.

vga The rear panel VGA screen will be enabled and the front panel LCD will be disabled.

Example: monitor vga

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---

monitor?

ACTION: Returns the current monitor selection.

Response: LCD or VGA

Example: monitor?
MONITOR VGA

==========

new_ptr [n]

ACTION: For Oc-3c signal only. Controls the New Pointer value which may be used for the SONET Pointer. When a NEW POINTER is issued ("set_new_ptr"), this value will be used.

'n': 0 to 782

Example: new_ptr 522

---

new_ptr?

ACTION: For Oc-3c signal only. Returns the value of the SONET New Pointer.

Response: number value

Example: new_ptr?
NEW_PTR 522

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==========

next_hdr_fl

ACTION: Header and Distribution Remote Command. This remote command is a query. It returns the next file name that ends with a ".HDR" extension that is in the current selected drive, either the hard drive or the floppy drive. When the last file has been found, the next call to NEXT_HDR_FL returns a filename of "..No.. Files..".

Example: next_hdr_fl

==========

next_srm_fl

ACTION: Store and Recall Remote Command. This remote command is a query. It returns the next file name that ends with a ".SRM" extension that is in the current selected drive, either the hard drive or the floppy drive. When the last file has been found, the next call to NEXT_SRM_FL returns a filename of "..No.. Files..".

Example: next_srm_fl

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==========

oc3_alarms? [win,test] , [los,lof,lop,l_ais,p_ais,l_ferf,p_ferf,rai]

ACTION: Returns the Analyzer Physical Layer Alarm data for the OC-3c input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the OC-3c interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).

los	OC-3c Loss Of Signal (LOS).
lof	OC-3c Loss Of Frame (LOF).
lop	OC-3c Loss Of Pointer (LOP).
l_ais	OC-3c Line Alarm Indication Signal (AIS).
p_ais	OC-3c Path Alarm Indication Signal (AIS).
l_ferf	OC-3c Line Far End Receive Failure maintenance signal (FERF).
p_ferf	OC-3c Path Far End Receive Failure maintenance signal (FERF).
rai	OC-3c yellow alarm signal (RAI).

Response: WIN or TEST ,
LOS , LOF , LOP , L_AIS , P_AIS , L_FERF , P_FERF or RAI ,
CLEAR , CUR or HIST

Example: oc3_alarms? win , l_ferf
OC3_ALARMS WIN , L_FERF , CUR

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==========

oc3_error? [win,test] , [b1,b2,b3,l_febe,p_febe]

ACTION: Returns the Analyzer Physical Layer Data Count for the OC-3c input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the OC-3c interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
b1	Total count for bit errors in the section BIP-8 byte (B1).
b2	Total count for bit errors in the line BIP-24 byte (B2).
b3	Total count for bit errors in the path BIP-8 byte (B3).
l_febe	Total count for Line Far End Block Errors (FEBE).
p_febe	Total count for Path Far End Block Errors (FEBE).

Response: WIN or TEST ,
B1 , B2 , B3 , L_FEBE or P_FEBE ,
number value

Example: oc3_error? test , b1
OC3_ERROR TEST , B1 , 123456

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==========

oc3_rate? [win,test],[b1,b2,b3]

ACTION: Returns the Analyzer Physical Layer Data Rate for the OC-3c input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the OC-3c interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
b1	Error Rate for bit errors in the section BIP-8 byte (B1).
b2	Error Rate for bit errors in the line BIP-24 byte (B2).
b3	Error Rate for bit errors in the path BIP-8 byte (B3).

Response: WIN or TEST ,
B1 , B2 or B3 ,
number value

Example: oc3_rate? test , b3
OC3_RATE TEST , B3 , 1.03E-09

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==========

output_ctl? [off, win, test, both]

ACTION: Prints results.

off	none
win	End of window period
test	End of test.
both	End of window and end of test.

Example: output_ctl?
OUTPUT_CTL TEST

==========

output_file? "name"

ACTION: Name must be eight characters long with no spaces. Valid characters are "ABCDEF and 0123456789.

Example: output_file?
OUTPUT_FILE "TEST"

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==========

output_flop

ACTION: Command only. Output resultsl to the floppy with output_file? named file with extension .txt.

Example: output_flop
OUTPUT_FLOP

==========

output_print [win, test]

ACTION: Prints results to printer..

win End of window period

test End of test.

Example: output_print
OUTPUT_PRINT TEST

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==========

pj_neg

ACTION: For Oc-3c signal only. Performs a SONET Negative Justification (-PJ). This decreases the current SONET Pointer by one. NOTE: This is only valid for SONET interfaces.

Example: pj_neg

==========

pj_pos

ACTION: For Oc-3c signal only. Performs a SONET Positive Justification (+PJ). This increases the current SONET Pointer by one. NOTE: This is only valid for SONET interfaces.

Example: pj_pos

==========

print_rem [on, off]

ACTION: Selects the printer output port.

LPT Printer output is sent to the parallel port.
RS232 Printer output is sent to the serial (RS232) port..

Example: print_rem rs232

---

print_rem?

ACTION: Returns the current output printer port.

Response: LPT or RS232

Example: print_rem?
PRINT_REM RS232

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==========

ref_value?

ACTION: Return the current propagation delay reference value.

Example: ref_value?
46E-6

==========

rem_debug [on,off]

ACTION: Controls the Remote Debug functionality. Remote commands will appear on the top left of the screen. The responses will appear on the top right.

on The remote debugging function is allowed.
off The remote debugginf function is off.

Example: rem_debug off

---

rem_debug?

ACTION: Returns the current Remote Debug mode.

Response: ON or OFF

Example: rem_debug?
REM_DEBUG ON

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==========

remain_bw?

ACTION: Returns the remaining available bandwidth based for the test cells based on the bandwidth used by the idle cells (idle_bw?) with the four Test Cells (test_bw).

Response: number value

Example: remain_bw?

REMAIN_BW 0.25

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==========

remain_frq?

ACTION: Returns the remaining available frequency based for the test cells based on the frequency used by the idle cells (idle_bw?) with the four Test Cells (test_bw).

Response: number value

Example: remain_frq?
REMAIN_FRQ 0.25

==========

res_delbin? [win,test] , [bin]

ACTION: Returns the Number of ATM Test Cells received that have a propagation or intercell delay (see delay_mode) that corresponds to the specified Cell Delay Bin. This is for either the Sliding Window or the Analyzer Test period.

win Results are from the Sliding Window period (see tst_win_len).

test Results are from the Analyzer Test period (see tst_length and tst_type).

'bin': 1 to 10

Response: WIN or TEST ,
number value ,
number value

Example: res_delbin? win , 10
RES_DELBIN WIN , 10 , 600000

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==========

res_delend? [bin]

ACTION: Returns the Analyzer Cell Delay Bin End value for the specified bin as set during period of the available Analyzer Test results. This is for the propagation or intercell delay (see delay_mode).

'bin': 1 to 10

Response: number value ,
number value

Example: res_delend? 4
RES_DELEND 4 , 400E-6

==========

res_delmax? [win,test]

ACTION: Returns the Maximum propagation or intercell delay (see delay_mode) received for either the Sliding Window or the Analyzer Test period.

win Results are from the Sliding Window period (see tst_win_len).

test Results are from the Analyzer Test period (see tst_length and tst_type).

Response: WIN or TEST ,
number value

Example: res_delmax? win
RES_DELMAX WIN , 53E-6

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==========

res_delmin? [win,test]

ACTION: Returns the Minimum propagation or intercell delay (see delay_mode) received for either the Sliding Window or the Analyzer Test period.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).

Response: WIN or TEST ,
number value

Example:
res_delmin? win
RES_DELMIN WIN , 3E-6

==========

res_delover? [win,test]

ACTION: Returns the Number of ATM Test Cells received that have a propagation or intercell delay (see delay_mode) larger than allowed for the Cell Delay Bins. This is for either the Sliding Window or the Analyzer Test period.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).

Response: WIN or TEST ,
number value

Example:
res_delover? win
RES_DELOVER WIN , 1200

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==========

res_delstart?

ACTION: Returns the Analyzer Cell Delay Bin Start value for the First Bin

as set during period of the available Analyzer Test results. This is for the propagation or intercell delay (see delay_mode).

Response: number value

Example: res_delstart?

RES_DELSTART 0E-6

==========

res_delunder? [win,test]

ACTION: Returns the Number of ATM Test Cells received that have a propagation or intercell delay (see delay_mode) smaller than allowed for the Cell Delay Bins. This is for either the Sliding Window or the Analyzer Test period.

win Results are from the Sliding Window period (see tst_win_len).

test Results are from the Analyzer Test period (see tst_length and tst_type).

Response: WIN or TEST ,

number value

Example: res_delunder? win

RES_DELUNDER WIN , 0

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==========

res_disp [atm1, atm2, phys1, phys2]

ACTION: Controls the Front Panel display of the Analyzer Test results.

atm1	The front panel will display ATM test results - screen 1.
atm2	The front panel will display ATM test results - screen 2.
phys1	The front panel will display Physical Layer test results - screen 2.
phys2	The front panel will display Physical Layer test results - screen 2.

Example: res_disp atm1

---

res_disp?

ACTION: Returns the Analyzer Front Panel test results display mode.

Response: ATM1, ATM2, PHYS1 or PHYS2

Example: res_disp?
RES_DISP ATM1

==========

res_elap? [win,test]

ACTION: Returns the Elapsed time into the Analyzer Sliding Window or Test period.

win	The Sliding Window elapsed time will be returned.
test	The Analyzer Test elapsed time will be returned.

Response: WIN or TEST ,
<String Response> in the format of "DDD-HH:MM:SS.T"

Example: res_elap? test
RES_ELAP TEST , "365-23:59:59.9"

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==========

res_link?

ACTION: Returns the Analyzer Test Cell Link mode as set during period of the available Analyzer Test results. To control the Analyzer Test Cell link, refer to the command 'rtest_link'.

Response: ENABLE or DISABLE

Example: res_link?
RES_LINK ENABLE

==========

res_num?

ACTION: Returns the Generator Test Cell number for use as the Analyzer Test Cell when the Link mode is enable as set during period of the available Analyzer Test results.

Response: number value

Example: res_num?
RES_NUM 4

==========

res_signal?

ACTION: Returns the Input Signal state as set during period of the available Analyzer Test results.

Response: OC3C, T100, DS3, DS3PLCP, DS1, DS1PLCP, E1, E1PLCP, E3, E3PLCP

Example: res_signal?
RES_SIGNAL DS3PLCP

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==========

res_vci?

ACTION: Returns the Analyzer Test Cell VCI as set during period of the available Analyzer Test results.

Response: number value

Example: res_vci?
RES_VCI 400

==========

res_vpi?

ACTION: Returns the Analyzer Test Cell VPI as set during period of the available Analyzer Test results.

Response: number value

Example: res_vpi?
RES_VPI 4

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==========

rtest_cell [gfc],[vpi],[vci],[pti],[clp]

ACTION: Controls the Analyzer specified ATM Test Cell. All 5 ATM Header parameters will be accepted in one command. Note, if the Analyzer Test Cell link is enabled (rtest_link), these values will not be used during the Test. If the ATM Cell format is NNI (an_cellfrmt), the GFC will be set, but not used during the Test.

'gfc':	0 to 15 (ignored if ATM cell format is NNI)
'vpi':	0 to 4095 (up to 255 if cell format is UNI)
'vci':	0 to 65535
'pti':	0 to 7
'clp':	0 to 1

Example: rtest_cell 0 , 100 , 100 , 0 , 0

---

rtest_cell?

ACTION: Returns the current Analyzer specified ATM Test Cell. Note, if the Analyzer Test Cell link is enabled (rtest_link), these values will not be used. If the ATM Cell format is NNI (an_cellfrmt), the GFC should be ignored.

Response: <5 NR1 Numerics>, in the order of GFC, VPI, VCI, PTI, CLP

Example: rtest_cell?
RTEST_CELL 15 , 255 , 65535 , 7 , 1

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==========

rtest_clp [clp]

ACTION: Modifies the Cell Loss Priority (CLP) of the Analyzer specified ATM Test Cell.

'clp': 0 to 1

Example: rtest_clp 1

---

rtest_clp?

ACTION: Returns the Cell Loss Priority (CLP) of the Analyzer specified ATM Test Cell.

Response: number value

Example: rtest_clp?
RTEST_CLP 0

==========

rtest_gfc [gfc]

ACTION: Modifies the Generic Flow Control (CLP) of the Analyzer specified ATM Test Cell. This command is only valid if the ATM Cell Format is UNI.

'gfc': 0 to 15

Example: rtest_gfc 0

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---

rtest_gfc?

ACTION: Returns the Generic Flow Control (GFC) of the Analyzer specified ATM Test Cell. This command is only valid if the ATM Cell Format is UNI.

Response: number value

Example: rtest_gfc?
RTEST_GFC 15

==========

rtest_link [enable,disable]

ACTION: Controls the Link functionality for the Analyzer ATM Test Cell.

enable	The Analyzer Test Cell is linked to one of the Generator Test Cells, as specified by 'rtest_num'. The exact same ATM Cell header is used by the Analyzer.
disable	The Analyzer Test Cell is specified by the analyzer test cell parameters (rtest_xxx).

Example: rtest_link enable

---

rtest_link?

ACTION: Returns the Analyzer Link mode.

Response: ENABLE or DISABLE

Example: rtest_link?
RTEST_LINK DISABLE

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==========

rtest_num [cell_num]

ACTION: Controls which of the Generator Test Cells will be used as the Analyzer Test Cell. This cell number is used only when the Analyzer Link functionality is enabled (rtest_link).

'cell_num': 1 to 4

Example: rtest_num 3

---

rtest_num?

ACTION: Returns the Generator Test Cell number which wil be used as the Analyzer Test Cell if the Link functionality is enabled.

Response: number value

Example: rtest_num?
RTEST_NUM 1

==========

rtest_pti [pti]

ACTION: Modifies the Payload Type Identifier (PTI) of the Analyzer specified ATM Test Cell.

'pti': 0 to 7

Example: rtest_pti 7

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---

rtest_pti?

ACTION: Returns the Payload Type Identifier (PTI) of the Analyzer specified ATM Test Cell.

Response: number value

Example: rtest_pti?
RTEST_PTI 4

==========

rtest_run [run,stop]

ACTION: Controls the Analyzer Test Run function.

run Starts the test of the selected input signal.
stop Stops the test.

Example: rtest_run run

---

rtest_run?

ACTION: Returns the current state of the Analyzer Test Run.

Response: RUN or STOP

Example: rtest_run?
RTEST_RUN STOP

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==========

rtest_vci [vci]

ACTION: Modifies the Virtual Channel Identifier (VCI) of the Analyzer specified ATM Test Cell.

'vci': 0 to 65535

Example: rtest_vci 12345

---

rtest_vci?

ACTION: Returns the Virtual Channel Identifier (VCI) of the Analyzer specified ATM Test Cell.

Response: number value

Example: rtest_vci?
RTEST_VCI 65500

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==========

rtest_vpi [vpi]

ACTION: Modifies the Virtual Path Identifier (VPI) of the Analyzer specified ATM Test Cell.

'vpi': 0 to 4095 (up to 255 if cell format is UNI)

Example: rtest_vpi 4095

---

rtest_vpi?

ACTION: Returns the Virtual Path Identifier (VPI) of the Analyzer specified ATM Test Cell.

Response: number value

Example: rtest_vpi?
RTEST_VPI 4095

==========

set_new_ptr

ACTION: For Oc-3c signal only. Controls the use of the New SONET Pointer. This issues a New Data Flag (NDF) and uses the New SONET Pointer ("new_ptr").

NOTE: This is only valid for SONET interfaces.

Example: set_new_ptr

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==========

single_hec

ACTION: Generates a single ATM HEC error. This also disables the ATM Error injection (err_enab) if currently enabled. There is an overall Alarm/Error enable control (all_error) which must be enabled to allow any Error Injection.

Example: single_hec

==========

single_pyld

ACTION: Generates a single ATM Cell Payload error. This also disables the ATM Error injection (err_enab) if currently enabled. There is an overall Alarm/Error enable control (all_error) which must be enabled to allow any Error Injection.

Example: single_pyld

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==========

sonet_ptr?

ACTION: For Oc-3c signal only. Returns the current SONET Pointer transmitted by the Generator.

Response: number value

Example: sonet_ptr?
SONET_PTR 522

==========

sram_to_disk

ACTION: Store and Recall Remote Command. This remote command is similar to the disk_to_sram command except that the filename supplied with the command is used to store all of the sram values. . The passed-in filename must be eight characters long. The .SRM extension is added. The file is stored in the current selected drive, either the internal hard drive or the floppy drive.

Example: sram_to_disk "filename"

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==========

stm1_alarms? [win,test] , [los,lof,ms_ais,ms_rdi,lop,au_ais,hp_rdi]

ACTION: Returns the Analyzer Physical Layer Alarm data for the STM-1 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the STM-1 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).

los	STM-1 Loss Of Signal (LOS).
lof	STM-1 Loss Of Frame (LOF).
ms_ais	Signal set to ones before scrambling
ms_rdi	A 110 code in bits 6-8 of the K2 byte
lop	STM-1 Loss Of Pointer (LOP).
au_ais	STM-1 Path Alarm Indication Signal (AIS).
hp_rdi	STM-1 yellow alarm signal (RAI).

Response: WIN or TEST ,
LOS, LOF, MS_AIS, MS_RDI, LOP, AU_AIS,
HP_REI, HP_RDI
CLEAR , CUR or HIST

Example: stm1_alarms? win , los
STM1_ALARMS WIN , LOS , CUR

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==========

stm1_error? [win,test] , [b1,b2,hp_rei,b3]

ACTION: Returns the Analyzer Physical Layer Data Count for the STM-1 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the STM-1 interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
b1	STM-1 Regenerator Section BIP-8 byte (B1)
b2	Errors in Multiplex Section BIP-24 byte (B2)
hp_rei	STM-1 Line Far End Receive Failure maintenance signal (FERF)
b3	Bit errors in the path BIP-8 byte (B3)

Response: WIN or TEST ,
B1, B2, B3
number value

Example:
stm1_error? test , b1
STM1_ERROR TEST , B1 , 123456

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==========

stm1_rate? [win,test],[b1,b2,b3]

ACTION: Returns the Analyzer Physical Layer Data Rate for the STM-1 input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the OC-3c interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
b1	STM-1 Regenerator Section BIP-8 byte (B1)
b2	Errors in Multiplex Section BIP-24 byte (B2)
b3	Bit errors in the path BIP-8 byte (B3)

Response: WIN or TEST ,
B1, B2, B3
number value

Example: stm1_rate? test , b3
STM1_RATE TEST , B3 , 1.03E-09

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==========

t100_alarms? [win,test] , [los,lcv]

ACTION: Returns the Analyzer Physical Layer Alarm data for the 100Mbps input. This is for the specified data type for either the Sliding Window or the Analyzer Test period. Note, this command is only valid for test data accumulated at the 100Mbps interface.

win	Results are from the Sliding Window period (see tst_win_len).
test	Results are from the Analyzer Test period (see tst_length and tst_type).
los	100Mbps Loss Of Signal (LOS).
lcv	100Mbps Line Code Violation (LCV).

Response: WIN or TEST ,
LOS or LCV ,
CLEAR , CUR or HIST

Example: t100_alarms? win , los
t100_ALARMS WIN , LOS , CLEAR

==========

test_bw [cell_num],[bw]

ACTION: Controls the output bandwidth of the specified Test Cell. The total bandwidth of all of the cells cannot exceed the active bandwidth (active_bw).

'cellnum':	1 to 4
'bw':	0.000 to 1.000

Example: test_bw 1 , 0.25

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---

test_bw? [cell_num]

ACTION: Returns the bandwidth setting of the specified Test Cell.

Response: number value

Example: test_bw? 1
TEST_BW 1 , 1000E-3

==========

test_cell [cellnum],[gfc],[vpi],[vci],[pti],[clp]

ACTION: Modifies an entire contents of the Test Cell. For the specified Test Cell (cellnum), all of the parameters will be changed as specified.

'cellnum': 1 to 4
'gfc': 0 to 15 (ignored if ATM cell format is NNI)
'vpi': 0 to 4095 (up to 255 if cell format is UNI)
'vci': 0 to 65535
'pti': 0 to 7
'clp': 0 to 1

Example: test_cell 1 , 0 , 255 , 65535 , 0 , 0

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---

test_cell? [cellnum]

ACTION: Returns the entire ATM Test Cell, specified by 'cellnum'. Note that the GFC field in the response will be 0 when the ATM cell format is NNI.

'cellnum': 1 to 4

Response: <6 NR1 Numerics>

Example: test_cell? 4
TEST_CELL 4 , 0 , 1 , 1 , 0 , 0

==========

test_clp [cellnum],[clp]

ACTION: Modifies the Cell Loss Priority (CLP) of the specified ATM Test Cell specified by 'cellnum'.

'cellnum': 1 to 4
'clp': 0 to 1

Example: test_clp 1 , 0

---

test_clp? [cellnum]

ACTION: Returns the Cell Loss Priority (CLP) of the specified ATM Test Cell.

'cellnum': 1 to 4

Response: two number values

Example: test_clp? 4
TEST_CLP 4 , 1

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==========

test_gfc [cellnum],[gfc]

ACTION: Modifies the Generic Flow Control (CLP) of the specified ATM Test Cell specified by 'cellnum'. This command is only valid if the ATM Cell Format is UNI.

'cellnum': 1 to 4
'gfc': 0 to 15

Example: test_gfc 1 , 0

---

test_gfc? [cellnum]

ACTION: Returns the Generic Flow Control (GFC) of the specified ATM Test Cell. This command is only valid if the ATM Cell Format is UNI.

'cellnum': 1 to 4

Response: two number values

Example: test_gfc? 4
TEST_GFC 4 , 15

==========

test_pti [cellnum],[pti]

ACTION: Modifies the Payload Type Identifier (PTI) of the specified ATM Test Cell specified by 'cellnum'.

'cellnum': 1 to 4
'pti': 0 to 7

Example: test_pti 1 , 0

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---

test_pti? [cellnum]

ACTION: Returns the Payload Type Identifier (PTI) of the specified ATM Test Cell.

'cellnum': 1 to 4

Response: two number values

Example: test_pti? 4
TEST_PTI 4 , 7

==========

test_vci [cellnum],[vci]

ACTION: Modifies the Virtual Channel Identifier (VCI) of the specified ATM Test Cell specified by 'cellnum'.

'cellnum': 1 to 4
'vci': 0 to 65535

Example: test_vci 1 , 123

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---

test_vci? [cellnum]

ACTION: Returns the Virtual Channel Identifier (VCI) of the specified ATM Test Cell.

'cellnum': 1 to 4

Response: two number values

Example: test_vci? 4
TEST_VCI 4 , 65500

==========

test_vpi [cellnum],[vpi]

ACTION: Modifies the Virtual Path Identifier (VPI) of the specified ATM Test Cell specified by 'cellnum'.

'cellnum': 1 to 4
'vpi': 0 to 4095 (up to 255 if cell format is UNI)

Example: test_vpi 1 , 1

---

test_vpi? [cellnum]

ACTION: Returns the Virtual Path Identifier (VPI) of the specified ATM Test Cell.

'cellnum': 1 to 4

Response: two number values

Example: test_vpi? 4
TEST_VPI 4 , 4095

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==========

time ["hh:mm:ss AM or PM"]

ACTION: Sets the time.

Example: time "hh:mm:ss AM or PM"

---

time?

ACTION: Returns the current time.

Response: hh:mm:ss AM or PM

Example: time?
TIME HH:MM:SS AM or PM

==========

tse [n]

ACTION: Controls the Test Status Enable register. This register is used to mask conditions that will occur in the Test Status Register (tsr) to allow certain test conditions to set GPIB SRQs.

'n': 0 to 255

NOTE: For details on this and other registers used for GPIB SRQs, refer the GPIB Appendix.

Example: tse 255

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---

tse?

ACTION: Returns the current Test Status Enable register.

NOTE: For details on this and other registers used for GPIB SRQs,
refer the GPIB Appendix.

Response: number value

Example: tse?
TSE 255

==========

tsr?

ACTION: Returns the current Test Status Register.

NOTE: For details on this and other registers used for GPIB SRQs,
refer the GPIB Appendix.

Response: number value

Example: tsr?
TSR 1

==========

tst_disp [win,test]

ACTION: Controls the Front Panel display of the Analyzer Test results.

win The front panel will display the Sliding Window results.
test The front panel will display the Analyzer Test period results.

Example: tst_disp test

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---

tst_disp?

ACTION: Returns the Analyzer Front Panel Test results display mode.

Response: WIN or TEST

Example: tst_disp?
TST_DISP WIN

==========

tst_length [sec]

ACTION: Controls the length of time for the Analyzer Test period. It is used by the Test in the TIMED, REPEAT and SWEEP modes (tst_type). This is the period referenced by the Analyzer Test result commands as 'test'.

'sec': 1 to 99999 seconds

Example: tst_length 60

---

tst_length?

ACTION: Returns the length of time that the Analyzer Test will run before it will stop when it is in the TIMED, REPEAT and SWEEP modes.

Response: number value

Example: tst_length?
TST_LENGTH 10

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==========

tst_sweep [sweep]

ACTION: Controls the number of Sweep periods (sweep) for the Analyzer Test function. It is used by the Test only in the SWEEP mode (tst_type).

'sweep':1 to 99

Example: tst_sweep 10

---

tst_sweep?

ACTION: Returns the Sweep count for the Analyzer Test.

Response: number value

Example: tst_sweep?
TST_SWEEP 10

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==========

tst_type [untimed,timed]

ACTIONL Controls the timing mode for the Analyzer Test function.

untimed — In this mode, the Analyzer Test function will continue running independent of the test period length (tst_length). It will continue until it is explicitly stopped (remote command 'rtest_run stop' or the front panel key TEST RUN), or power off.

timed — In this mode, the Analyzer Test function will continue running until the Test elapsed time reaches the test period length (tst_length). It will also stop by means of remote command (rtest_run), front panel key, or power loss.

(The following will be implemented in the future)

repeat — This mode is identical to TIMED, except that when the elapsed time reaches the period length, the Test function restarts. This will continue indefinitley, until it is stopped by means of remote command, front panel key, or power loss.

(The following will be implemented in the future)

sweep — This mode is identical to REPEAT, except for two things. First at the start of each successive Test period, the VCI of the Test Cell will be incremented by the VCI Increment (tst_vci_inc). Second, there will be a maximum number of repeat periods, for total test periods equal to the sweep count (tst_sweep).

Example: tst_type untimed

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---

tst_type?

ACTION: Returns the current timing mode for the Analyzer Test function.

Response: UNTIMED or TIMED

Example: tst_type?
TST_TYPE TIMED

==========

tst_vci_inc [vci_inc]

ACTION: Controls the VCI Increment value used for the Analyzer Test function when used in the SWEEP mode. This is the number added to each of the VCIs of the Test Cells at the start of each successive Test Sweep.

'vci_inc': 1 to 65535

Example: tst_vci_inc 12

---

tst_vci_inc?

ACTION: Returns the current VCI Increment setting for the Analyzer Test function (SWEEP mode only).

Response: number value

Example: tst_vci_inc?
TST_VCI_INC 64

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==========

tst_win_len [sec]

ACTION: Controls the length of time for the Analyzer Sliding Window. This is maximum accumulated time in the sliding window. When the window elapsed time reaches the specified time, the sliding window will continue adding the new data, but will drop the oldest data.

'sec': 1 to 10 seconds

Example: tst_win_len 1

---

tst_win_len?

ACTION: Returns the length of time over which the Analyzer Sliding Window will accumulate data.

Response: number value

Example: tst_win_len?
TST_WIN_LEN 10

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Alphabetical

Page

*cls E-2
*ese E-2
*esr? E-3
*idn? E-3
*lrn? E-3
*opc E-4
*rst E-4
*sre E-4
*stb? E-5
*tst? E-5
*wai E-6
active_bw? E-7
active_cell E-7
active_clp E-8
active_cnt? E-9
active_frq? E-9
active_gfc E-10
active_pti E-11
active_vci E-12
active_vpi E-13
alarms_ds1 ..... E-14
alarms_ds3 ..... E-16
alarms_e1 ..... E-18
alarms_e3 ..... E-20
alarms_oc3c E-22
alarms_stm1 ..... E-24
an_cellfrmt E-26
an_coset E-27
an_crc_e1 ..... E-28
an_ds1frame E-28
an_ds3frame E-29
an_e3frame E-30
an_plcp_ds1 ..... E-30
an_plcp E-31
an_plcp_e1 ..... E-32
an_plcp_e3 ..... E-32
an_pps E-32
an_scram E-34
an_scram_ex E-34
an_signal E-35
an_sync E-36
atm_error? E-37
atm_rate? E-38
bw_cntrl E-38
calibrate E-39
cell_run E-39
contrast E-40
cust_hdr_fl E-41
date E-41
del_hdr_fl E-42
del_srm_fl E-42
delay_end E-42
delay_max E-43
delay_min E-44
delay_mode E-44
delay_start E-45
disk_to_sram E-46
dist_count E-46
dist_max E-47
dist_mean E-47
dist_min E-48
dist_mode E-49
dist_period E-51
dist_program E-51
dist_random E-52
dist_std_dev E-53
dist_step E-54
drive E-54
ds1_alarms? E-55
ds1_error? E-56
ds1_rate? E-57
ds3_alarms? E-58
ds3_error? E-59
ds3_rate? E-60
e1_alarms? E-61
e1_error? E-62
e1_rate? E-63
e3_alarms? E-64
e3_error? E-65
e3_rate? E-66
err_mode E-67
err_rate E-68
frst_hdr_fl E-69
frst_srm_fl E-69
gen_100mbps E-70
gen_act_clp E-70
gen_act_cnt E-71
gen_act_gfc E-72
gen_act_hdrs E-72
gen_act_inc E-73
gen_act_pti E-73
gen_act_vci E-74
gen_act_vpi E-75
gen_cellfrmt E-75
gen_clk E-76
gen_coset E-77
gen_crc_e1 ..... E-77
gen_ds1frame E-78
gen_ds3frame E-79
gen_e3frame E-80

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

gen_laser..... E-80
gen_plcp_ds1..... E-81
gen_plcp..... E-82
gen_plcp_e1 ..... E-83
gen_plcp_e3 ..... E-84
gen_pps..... E-85
gen_scram..... E-85
gen_scram_ex E-86
gen_signal..... E-87
gen_sync E-88
hdr_program..... E-88
hdr_random E-89
header..... E-90
hist_cell?..... E-90
hist_clear E-91
hist_delin? E-91
hist_hec?..... E-91
hist_input?..... E-92
hist_phys?..... E-92
hist_sync? E-92
id_interface? E-93
id_options?..... E-93
id_serial?..... E-94
id_system? E-94
id_version?..... E-95
idle_bw? E-95
idle_frq? E-95
logo?..... E-96
loopback..... E-96
mon_avg?..... E-97
mon_disp..... E-97
mon_elap?..... E-98
mon_freq? E-99
mon_length..... E-99
mon_peak?..... E-100
mon_reset.....E-100
mon_signal? E-101
mon_sweep E-101
mon_total?.....E-102
mon_type.....E-103
mon_vci?.....E-104
mon_vci_inc.....E-104
mon_vpi? E-105
mon_win_len E-106
monitor.....E-106
new_ptr E-107
next_hdr_fl.....E-108
next_srm_fl E-108
oc3_alarms?.....E-109
oc3_error?.....E-110
oc3_rate? E-111
output_ctl? E-112
output_file? E-112
output_flop E-113
output_print.....E-113
pj_neg.....E-114
pj_pos E-114
print_rem E-114
ref_value?.....E-115
rem_debug.....E-115
remain_bw?.....E-116
remain_frq?.....E-117
res_delbin? E-117
res_delend?.....E-118
res_delmax?.....E-118
res_delmin?.....E-119
res_delover? E-119
res_delstart?.....E-120
res_delunder?.....E-120
res_disp E-121
res_elap? E-121
res_link? E-122
res_num? E-122
res_signal?..... E-122
res_vci? E-123
res_vpi?..... E-123
rtest_cell E-124
rtest_clp E-125
rtest_gfc E-125
rtest_link E-126
rtest_num E-127
rtest_pti E-127
rtest_run..... E-128
rtest_vci E-129
rtest_vpi..... E-130
set_new_ptr E-130
single_hec E-131
single_pyld..... E-131
sonet_ptr? E-132
srm_to_disk E-132
stm1_alarms E-133
stm1_error E-134
stm1_rate..... E-135
t100_alarms? E-136
test_bw..... E-136
test_cell..... E-137
test_clp..... E-138
test_gfc..... E-139
test_pti..... E-139
test_vci..... E-140
test_vpi E-141
time..... E-142
tse E-142
tsr?..... E-143
tst_disp E-143

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tst_length..... E-144
tst_sweep E-145
tst_type E-146
tst_vci_inc..... E-147
tst_win_len E-148

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Appendix F

Service Information/ Warranty

How to Reach Tektronix, Microwave Logic Products Customer Service

If you have any questions about the ATM150 regarding the operation, maintenance, or application, contact our Customer Service Department as follows:

Address	Tektronix, Microwave Logic Products 285 Mill Road Chelmsford, MA 01824 USA	Attn. Customer Service
Telephones	1-508-256-6800 or 1-800-643-2167	Press "0" and ask for Customer Service 9:00 AM to 5:00 PM, Eastern Time
FAX	1-508-256-2038	Attn. Customer Service

Service Shipments

If the unit must be returned to the factory for service, please do the following:

- Contact the factory at (508) 256-6800 or 1-800-643-2167, press "0", and ask for a Return Authorization Number (RAN). The use of a RAN will ensure prompt service, and ease tracking of your unit.

- Pack the unit in its original packing materials or other suitable material, such as foam or bubblewrap, to safely ship the unit. Pack unit in a double-walled carton, and seal the carton with suitable tape. Display the Return Authorization Number (RAN) on the outside of the carton.

- Ship unit to Tektronix, Microwave Logic Products, 285 Mill Road, Chelmsford, MA 01824.

Warranty

All Tektronix, Microwave Logic Products are warranted against any defects in material and workmanship for the period of one year from the date of delivery. Microwave Logic will repair or replace products which prove to be defective during the warranty period.

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NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING FITNESS FOR PURPOSE, MERCHANTABILITY OR OTHERWISE, IS GIVEN.

Warnings

The following warnings must be observed before and during all uses of this equipment. Failure to follow these and other specific warnings contained elsewhere in the this user manual may cause physical harm to the user and/or damage to the equipment.

Use an optical attenuator

The ATM150 test set is equipped with optical test capability. Use an optical patch cord with a 7 to 10 dB optical attenuator when testing the optical interfaces.

Ground the equipment

To minimize shock hazard, the equipment chassis must be connected to an approved 3-contact electrical outlet.

Keep away from the equipment's live voltages

Do not remove the top cover or insert fingers or other objects through the rear panel holes or ventilation holes while power is ON.

Do not operate in an ambient temperature above 122 degrees F (50 degrees C)

Operating this equipment in temperatures above 122 degrees F (50 degrees C) can cause damage.

Replace blown AC fuse with a properly rated fuse

Do not operate the instrument with an improperly fated AC fuse. Consult the rear panel for the correct fuse for this equipment.

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Appendix G

RS-232 Remote Interface Capabilities

The ATM150 supports remote control through the RS-232C interface bus connector on the rear panel. The unit can be operated from the front panel and over the remote interface simultaneousl. Any unit status changes made remotely will be displayed on the front panel. All of the front panel functions can be controlled over the RS-232C interface, except 'Power'.

The remote commands sent to the ATM150 differ from front panel control - the current operating mode is entered directly rather than through sub-menus.

Commands are provided to read back stored Data Memory contents. Memory contents can be read back and printed out for hardcopy archiving. A list of remote commands is listed in an appendix.

RS-232 Interface Device Settings

The RS-232C interface device settings are programmable through the front panel. The following RS-232C parameters are programmable, along with the possible selections and the default selections and the default setting in parentheses.

Parameter	Default	Values
Baud, Bps rate	9600	4800, 2400, 1200, 600, 300
Parity	Even	None, Odd
Data Size	7	8
Stop Bits	1	2
Echo	ON	OFF
XON/XOFF	OFF	ON
EOL	CR/LF	LF/CR, CR, LF

To change an RS-232C setting through the front panel, refer to the section with this manual on "Utility".

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RS-232 Interface Hardware/ Handshaking Considerations

The remote interface consists of a 9-pin male D-type connector located on the rear panel. When using the RS-232C interface, connect the controller to the ATM150 with an appropriate 9-pin cable. The ATM150 is configured as an RS-232C Data Terminal Equipment (DTE). For a connection to DTE device (most RS-232C controllers), connect the the controller to the ATM150 with a null-modem.

Refer to the following table for RS-232C signal names, pinouts and functional descriptions.

Pin	Name	Function
1	DCD	Data Carrier Detect
2	RxD	Received Data Input. Data send to the ATM150 is received on this input
3	TxD	Transmitted Data Output. Data sent to the ATM150 is transmitted on this input
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator

RS-232 Interface Testing

To test that the RS-232C interface is properly connected, attach a standard 9-pin D-type connector cable between the RS-232C rear panel connector and the controller, with the ATM150 turned off. Turn on the ATM150 - the following message should appear on the RS-232C controller's screen, followed by the prompt "ATM150>":

*****Tektronix ATM150 1.5 04-15-96*****

ATM150>

If the message does not appear, check the following:

- the cable may be defective
- the controller may be configured as DCE equipment; a null modem may be required
- the controller signal format, or bps rate may not match the ATM150's settings. Refer to the first part of this appendix for interface setting information.

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Programming RS-232C Remote Commands

There are two types of remote commands for the ATM150:

- set commands (or commands)
- queries commands (or queries).

The set commands force the ATM150 to take a specific action. The query commands direct the ATM150 to return status information.

Commands are entered one line at a time. Errors may be corrected while entering a line, with the backspace key. A command string is terminated by a carriage return, which transmits the string to the ATM150 and executes the command string. All valid commands are executed. Incorrect or unsupported commands are responded to by an error message. RS-232C error messages follow at the end of this appendix.

Command lines may contain a single command or multiple commands. The command line may contain both queries and commands. Individual commands within the command line must be separated by semi-colons (;), parameters must be separated by commas (,). Non-decimal numeric parameters, Hexadecimal, Octal, and Binary must be preceded by a '#H', '#Q', or '#B' respectively. The entire command name does not have to be completely entered for the command to be recognized as valid. There is a minimum valid length associated with each command, which is the length that makes it unique from all other commands.

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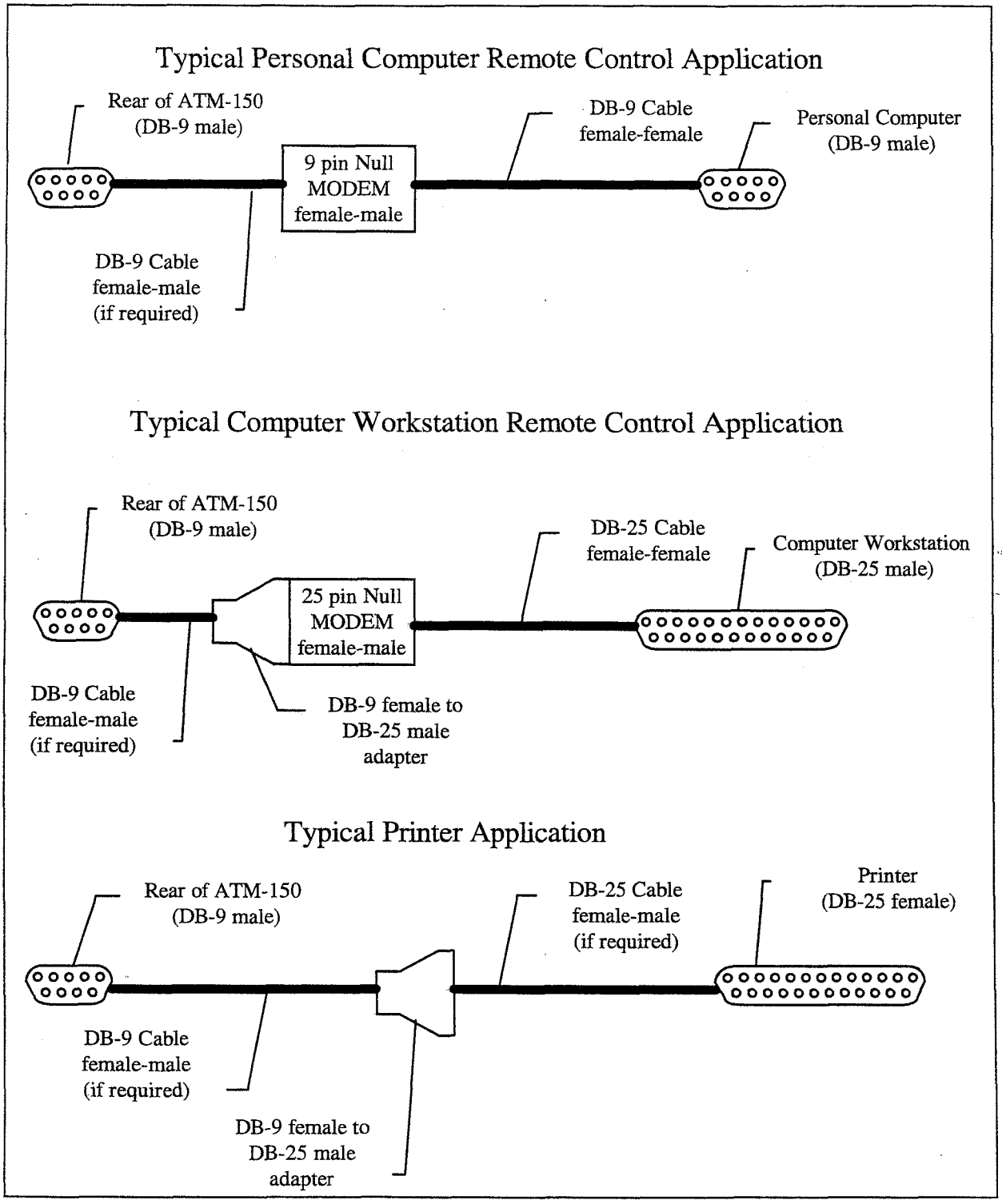
RS-232C Error Messages

All RS-232C remote commands received by the ATM150 are checked for command validity, and appropriate parameters (parameters listed with commands within brackets[]). All valid command strings are executed. Incorrect command strings are responded to with error messages.

Error Message		Error
"***	Input Lost"	Input data lost over interface
"***	Input Buffer Overflow"	Input buffer overflow, command line too long without terminator
"***	Command Mnemonic Not Found"	Command not found
"***	Invalid Command for Interface"	Command found, but not valid for this inferface
"***	Invalid Command Type"	Command mnemonic found, but command issued incorrectly: missing, or added, '?' on end of command
"***	Too Few Parameters"	Missing Parameter
"***	Too Many Parameters"	Too many parameters
"***	Invalid Parameter"	Parameter invalid
"***	Parameter Out of Range"	Parameter out of range
"***	Parameter Not in Set"	Parameter not one of values specified for the command
"***	Invalid String Length"	
"***	Parameter Separator"	Parameter separator, ';', is missing or command line is terminated following separator
"***	Invalid Non-decimal Parameter"	Parameter not in on-decimal format
"***	Command Execution Error"	Command not executed properly
"***	Out of Memory"	Processor out of memory

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Diagram – Connecting RS-232 cables to the ATM150



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Appendix H

GPIB Remote Interface Capabilities

The ATM-150 supports remote control through the GPIB interface bus connector on the rear panel. The unit can be operated from the front panel and over the remote interface simultaneously. Any unit status changes made remotely will be displayed on the front panel. All of the front panel functions can be controlled over the GPIB interface, except 'POWER'. The remote commands sent to the ATM-150 different from front panel control; the current operating mode is entered directly rather than through sub-menus.

GPIB Interface Device Settings

For proper GPIB interface communication and handshaking, the GPIB controller (computer or other controller) and device (ATM-150) must have their addresses and terminating characters set up prior to use. To change these GPIB parameters, refer to the section in this manual on "Utility".

Each instrument on the GPIB interface bus must have unique INSTRUMENT address. The INSTRUMENT address range for the ATM-150 is 0 to 30 decimals. The GPIB Message Terminator is set to either EOI or EOI/LF. For EOI, the EOI line will be asserted when the last byte of a message is transmitted. For EOI/LF, the last byte of the message will be the line feed character, and the EOI line will be asserted with its transmission.

ATM-150 GPIB Interface Functions

The ATM-150 is configured as a talker/listener. No controller functions are implemented. As described in the IEEE-488 GPIB standards, the ATM-150 supports the following implementation:

SH1	Complete source handshake
AH1	Complete acceptor handshake
T6	Basic talker; serial poll, no talk only, unaddressed if addressed to listen, no extended talker
L4	Basic listener, no listen only, unaddressed if addressed to talk, no extended listener
SR1	Complete service request
RL1	Complete remote/ local capability including local lockout
PP0	No parellel poll capability
DC1	Complete device clear capability
DT0	No device trigger capability
C0	No controller capability
E2	Tri-state drivers used on DI0 lines for maximum data transfer rate

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GPIB Connector Pin-Outs

The ATM-150 uses the standard D-type 24-pin GPIB connector located on the rear panel. All signals and pins conform to standard GPIB pin-out protocol.

Programming GPIB Remote Commands

There are two types of remote commands for the ATM-150:

- set commands (or commands)
- queries commands (or queries).

The set commands force the ATM-150 to take a specific action. The query commands direct the ATM-150 to return status information. The controller send commands to the ATM-150 as strings terminated by EOI or EOI/LF characters. These command lines can contain a single command or multiple commands. The command line may contain both queries and commands. Each individual command within the command line must be separated by semi-colons (;), parameters must be separated by commas (,). Hexadecimal parameters must be preceded by a '#H'.

Each query command sent to the ATM-150 will return one response. The response may contain multiple response units (separated by semi-colons), however only one EOI or EOI/LF character is sent by the ATM-150 to the controller for each query command. The responses for the ATM-150 commands will be either character mnemonics (Example; INT or EXT) or numerics (Example; 200.0). An appendix lists all queries and and specifies the query response format the command will return. If the query returns a mnemonic, the valid mnemonics will be listed.

GPIB Numeric Responses

If the query responds with numeric, it will be specified as one of the following types:

<NR1 Numeric>	decimal integer
<NR2 Numeric>	decimal real number without exponent
<NR3 Numeric>	decimal real number with exponent
<Non-decimal Numeric>	non-decimal number with leading '#H' (Hex), '#Q' (Octal), or '#b' (Binary) and always in the range 0 to 255 decimal

An appendix defines all of the GPIB commands, along with a brief description of each command, the valid parameters, and the basic response format. The parameters shown within brackets '[]' following the command name are required.

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GPIB Status Reporting

There is status reporting functionality provided for the GPIB interface, which is based on the service request (SRQ) and is fully defined in the ANSI/ IEEE standard 488.2 - 1987. the implementation used by the ATM-150 for status reporting includes one additional register from what is specified within the IEEE-488.2 standard.

STATUS BYTE

There is a status byte which is used to determine the SRQ status. The individual bits within the status byte represent the different conditions which might cause the request for service, defined as follows:

Bits 1 to 3	Unused	
Bit 4	(TSB) Test Event Status Bit	This is a summary of Test Status Event Status Byte. It will be set whenever an enabled Test event condition occurs
Bit 5	(MAV) Message Available Bit	Set whenever there is output available for the controller
Bit 6	(ESB) Standard Event Status Bit	This the summary of the Standard Event Status Byte. It will be set whenever an enabled standard event condition occurs
Bit 7	(MSS) Master Summary Status Bit	This is the Master Summary Status. It is a summary of the status byte, so that whenever one of the bits (TSB. MAV or ESB) is set and it is also enabled (by the Service Request Enable byte), the MSS bit will be set
Bit 8	Unused	

SERVICE REQUEST ENABLE

The different conditions for a service request can be individually enabled. The Service Request Enable byte contains the enabling bits for the status byte. For a service request to occur, either the TSB, MAV or ESB bit must be enabled. Each time the ATM-150 is powered oon, this byte is reset so that no bits are enabled. The bit definition is the same as the status byte, except bit 7 is undefined.

SRQ

The status byte is used to create a service request. Whenever a condition occurs in the ATM-150 which requires service from the controller, the SRQ (Service Request) line will be set. The SRQ will be reset after the controller finished a serial poll of the ATM-150 or when all of the service request conditions have stopped.

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STANDARD EVENT STATUS REGISTER

The ESB bit is the summary of the Standard Event Status Register. This byte has an enabling byte which works in a similar manner to the above Status Byte. The individual bits within the Standard Event Status Register represent the different conditions which might cause a Standard Event. The bit definitions for the Standard Event Status Register are as follows:

Bit 1	Operation Complete	Only set following an *OPC command
Bit 2	Request Control	Not used
Bit 3	Query Error	Set under the following conditions • when output has been requested from the ATM-150 and none is available • when a command is sent to the ATM-150 and the ATM-150 still has a message available • when output has been requested from the ATM-150 and an unterminated command has been sent to the ATM-150
Bit 4	Device Dependent Error	Set under the following conditions: • when input data is lost over the interface • when the input buffer overflows due to a too long command line without a terminator
Bit 5	Execution Error	Set under the following conditions: • when a command parameter is out of range • when the command has too many or too few parameters • when the command cannot be properly executed due to a device condition
Bit 6	Command Error	Set whenever the ATM-150 receives an unrecognized command, or invalid GPIB command
Bit 7	User Request	Not used
Bit 8	Power On	Set whenever the ATM-150 is powered on

STANDARD EVENT STATUS ENABLE REGISTER

The different conditions within the Standard Event Status Register can be individually enabled and disabled. The Standard Event Status Register contains enabling hits. Each time one of the event conditions or one of the enabling bits change, the status of the ESB bit is re-evaluated. If any status bit is set and its corresponding enable bit is set, the ESB bit will be set. Each time the ATM-150 is powered on, this byte is reset so that no bits are enabled. The bit definition for the Standard Event Status Enable Register is the same as for the Standard Event Status Register.

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TEST STATUS EVENT ENABLE REGISTER

The different conditions within the Test Status Event Register can be individually enabled and disabled. The Test Status Event Enable Regiter contains enabling bits. Each time one of the event conditions or one of the enabling bits change, the status of the TSB bit is re-evaluated. If any status bit is set and its corresponding enable bit is set, the TSB bit will set. Each time the ATM-150 is powered-on, this byte is reset so that no bits are enabled. The bit definiton for the Test Status Event Enable Register is the same as for the Test Status Event Register.

GPIB Common Commands

The following commands are provided to use with the GPIB status reporting, as defined by IEEE-488.2 for service request:

*STB? *SRE *SRE? *ESR? *ESE *ESE? *CLS

Additional SRQ GPIB Commands

The following commands are provided to use with the Test Status SRQ feature:

TSE TSE? TSR?

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IEEE-488.2 Programming Manual Requirements

Certain programming requirements are specified for GPIB interfaces by the American National Standard Institutute (ANSI) document, ANSI/IEEE Std 488.2-1987, which are detailed in this section.

Power-on Settings

The ATM-150 will restore the device settings to their values from when it was last powered-off. There are no remote commands which will affect this. The only exceptioni to this is when the non-volatile RAM becomes corrupted (which should never happen during normal unit operation). RAM corruption, if it occurs will be displayed on the unit's LCD display. When this happens, the ATM-150 will revert to its factory default settings.

Message Exchange

The following message exchange options are as follows:

- The input buffer is command-line oriented. There will be a new input buffer for each command line, or program message. The input buffer has a maximum length of 80 characters
- The only remote command which will return more than one response message unit (responses separated by semi-colons) is as follows: *lrn?
- All queries (commands) generate their response messages immediately when they are parsed. No queries are held until the responses are read for them to be generated.
- No commands are coupled.

Functional Elements

A list of the functional elements which are used by the ATM-150 is required by the IEEE-488.2 standard. These are the functional elements used in constructing the remote commands that control the ATM-150. For further details, refer to the IEEE-488.2 standard, sections 4.3, 7.1.1, and 7.3.3. From tables 4.2 and 4.3 of the standard, the ATM-150 performs the following:

<PROGRAM MESSAGE>	<PROGRAM MESSAGE TERMINATOR>
<PROGRAM MESSAGE TERMINATOR>	<PROGRAM MESSAGE TERMINATOR>
<PROGRAM MESSAGE UNIT>	<PROGRAM MESSAGE UNIT SEPARATOR>
<COMMAND MESSAGE UNIT>	<QUERY MESSAGE UNIT>
<COMMAND PROGRAM HEADER> *	<QUERY PROGRAM SEPARATOR> *
<PROGRAM HEADER SEPARATOR>	<PROGRAM DATA SEPARATOR>
<PROGRAM DATA>	<DECIMAL NUMERIC PROGRAM DATA>
<CHARACTER PROGRAM DATA>	<NON-DECIMAL NUMBERIC PROGRAM DATA>

* <COMPOUND COMMAND PROGRAM HEADER> AND <COMPOUND QUERY PROGRAM HEADER> are not handled.

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Specific Command Implementation

Reset Command

The reset command "*rst" performs a device reset. As defined in the IEEE-488.2 standard, it will:

- Reset the device settings to default settings, with the exception of stored memory locations and any remote interface settings
- Macros are not implemented in the ATM-150, thus macros are ignored
- Force the ATM-150 into Operation Complete Command Idle State (OCIS) and Operation Complete Query Idle State (OQIS)

Self-Test Query

The scope of the self-test function is limited - it tests the basic ATM-150 functionality.

Overlapped vs. Sequential Commands

All commands are seqential commands.

Operation Complete Message

All command actions are immediate (no overlapped commands).
Operation Complete is immediate.

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Appendix I

Options and Accessories

The following are some of the accessories available with the ATM-150:

Accessory Model Number	Description
Ac-RM1	Rackmount adapter (TX or RX)
Ac-CC1	Soft carrying case (TX or RX)
Ac-SC1	Transit (hard) carrying case (TX or RX)
Ac-LPC	486/66 Laptop PC (call main sales office for features details and options)
Ac-BNSM	BNC (f) to SMA (m)
Ac-RS6	RS-232 cable, 6-ft. length, 25-pin, male-male
Ac-4886	IEEE-488 (GPIB) cable - 6-ft. length
Ac-SMSM	SMA to SMA, 3-foot
Ac-FC/ST	Optical cable - 3-meter jumper cable
Ac-FC/D4	Optical cable - 3-meter jumper cable
Ac-FC/FC	Optical cable - 3-meter jumper cable
Ac-50/50-xx*	1-to-2 Optical Splitter (1300 nm)
Ac-90/10-xx*	1-to-2 Optical Splitter (1300 nm)
Manuals	Order by Unit Model Number (Standard order includes one operating manual)
	Optical patch cord - 3 meters, PC to FC

* Must specify optical connector - FC, ST or SC. Consult main sales office for other connector types.

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Glossary of Terms & Acronyms

- A -	- A -
AAL	ATM Adaption Layer
ABR	Available Bit Rate
AIS	Alarm Indication Signal
AL	Access Link
ANSI	American National Standards Institute
Asynchronous	Signals that are sourced from independent clocks. These signals generally have no relationship to each other and so have different frequencies and phase relationships.
ATM	Asynchronous Transfer Mode. A transfer mode in which the information is organized into cells. It is asynchronous in the sense that the recurrence of cells containing information from an individual user is not necessarily periodic.
- B -	**- B -**
BA	Buffer Allocation
BER	Bit Error Rate (ratio) of errors to bits)
BIP	Bit Interleaved Parity
B-ISDN	Broadband (aspects of) Integrated Services Digital Network
BOM	Beginning of Message
BT	Burst Tolerance
- C -	**- C -**
CC	Call Control
CCITT	International Telegraph and Telephone Consultative Committee
CBR	Constant Bit Rate
CDV	Cell Delay Variation
CE	Connection Element
Cell transfer delay	The transit delay of an ATM cell successfully passed between two designated boundaries.
CEP	Connection End Point
CI	Continuation Indicator
CIR	Cell Insertion Ratio
CLP	Cell Loss Priority (as in CLP bit)
CLR	Cell Loss Ratio

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CL	Connectionless Service
CO	Connection-Oriented Service
COM	Continuation of Message
CPCS	Common Part Convergence Sublayer
CPE	Customer Premises Equipment
CPN	Customer Premises Network
CRC	Cyclic Redundancy Check
CRF	Connection-Related Function
CS	Convergence Sublayer
- D -	**- D -**
DCC	Data Communications Channel
DS1	Digital Signal Level 1 (1.544 Mbps)
DS3	Digital Signal Level 3 (44.736 Mbps)
DXI	Data Exchange Interface
- E -	**- E -**
EOM	End of Message
ESF	Extended Superframe
ET	Exchange Termination
- F -	**- F -**
FEBE	Far-End Block Error
FERF	Far-End Receive Failure
- G -	**- G -**
GFC	Generic Flow Control
- H -	**- H -**
HEC	Header Error Control
histogram	An imaging term. A display plotting the density of values in an image
HLF	Higher Layer Functions
- I -	**- I -**
Isochronous	Signals which are dependent on some uniform timing or carry their own timing information embedded as part of the signal.
IWU	Interworking Unit
- L -	**- L -**
LAN	Local Area Network
LCD	Liquid Crystal Display
LE	Local Exchange

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LED	Light Emitting Diode
LFC	Local Functional Capabilities
LOF	Loss of Frame
LOP	Loss of Pointer
LOS	Loss of Signal
LT	Line Termination
- M -	**- M -**
MID	Message Identifier
MSB	Most Significant Bit
MSP	Maintenance Service Provider
- N -	**- N -**
NNI	Network-Network Interface ; Network Node Interface
NS	Network Supervision
NT	Network Termination
- O -	**- O -**
OAM	Operation and Maintenance
OC-1	Optical Carrier Level 1 (optical 51.84 Mbps)
OC-3	Optical Carrier Level 3 (optical 155.52 Mbps)
OC-12	Optical Carrier Level 12 (optical 622.08 Mbps)
OOF	Out of Frame
OSI	Open Systems Interconnection
- P -	**- P -**
PCI	Protocol Control Information
PCR	Peak Cell Rate
PDU	Protocol Data Unit
PHY	Physical Layer
PL	Payload Length
PLCP	Physical Layer Convergence Procedure
PMD	Physical Medium Dependent (layer)
POH	Path Overhead
POI	Path Overhead Indicator
PRM	Protocol Reference Model
PRBS	Pseudo-Random Bit Sequence
Protocol	A set of rules and formats (semantic and syntactic) that determines the communication behavior of layer entities in the performance of the layer functions.

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PS	Protection Switching
PT	Payload Type
PTE	Path Terminating Equipment
PTI	Payload Type Identifer
PVC	Permanent Virtual Connection
- Q -	**- Q -**
QoS	Quality of Service
- R-	**- R-**
REM	Remote
RMI	Rackmount Interface
Rx	Receiver or Receive
- S -	**- S -**
SAAL	Signaling ATM Adaptation Layer
SAR	Segmentation and Re-assembly (layer)
SAP	Service Access Point
SDH	Synchronous Digital Hierarchy
SDU	Service Data Unit
SEF	Severely-Errored Frame
SEP	Signalling Endpoint
SES	Severely-Errored Second
SF	Superframe
SOH	Section Overhead
SONET	Synchronous Optical Network
SP	Service Provider
SPE	Synchronous Payload Envelope
SPN	Subscriber Premises Network
STM-1, -4, -4c, -N	Synchronous Transport Module (STM-1, -4, -4c, -N)
STS-1	Synchronous Transport Signal Level 1 (51.84 Mbps line)
STS-3	Synchronous Transport Signal Level 3 (155.52 Mbps line)
STS-3c	Synchronous Transport Signal Level 3 concatenated (155.52 Mbps line)
SVC	Signalling Virtual Channel; or Switched Virtual Circuit
Synchronous	Signals that are sourced from the same timing reference. These have the same frequency.
- T -	**- T -**
TOH	Transport Overhead

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- U -	- U -
UNI	User to Network Interface
- V -	**- V -**
VBR	Variable Bit Rate
VC	Virtual Channel (not circuit). A communication channel that provides for the sequential unidirectional transport of ATM cells.
VCC	Virtual Channel Connection
VCI	Virtual Channel Identifier
VCL	Virtual Channel Link
VP	Virtual Path
VPC	Virtual Path Connection
VPI	Virtual Path Identifier
VPL	Virtual Path Link
VPT	Virtual Path Terminator
- X -	**- X -**
XC	Cross-connect

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ATM- 150 Index

100 Mbps, 1-1, 3-32

1PPS, 3-11, 3-32

-A-

AAL (ATM Adaptation Layer), A-1

ABR (Available Bit Rate), 4-3

Active cells, 4-6, 3-15

AIS (Alarm Indication Signal), 3-20

Analyzer, 1-2, 3-3, 2-9

- Analyzer Inputs, 3-4
- Analyzer Softkeys, 3-22
- Analyzer SYNC, 3-32

ATM

- ATM Basics, A-1
- ATM Cell Structure, A-3
- ATM Errors, 3-21

Attenuator, 2-3, 3-4

-B-

Bandwidth Control, 3-18, 2-8

BER (Bit Error Rate), 1-2

Block Diagram, D-1

Burst, 1-1, 3-15 to 3-18

-C-

Calibrate 3-30

Cal Prop, 3-30

CBR (Constant Bit Rate), 1-1,4-3

CDV (Cell Delay Variation), 4-4

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Cell

Cell Delay, 3-29

Cell Distribution, 3-15, 2-7

Cell Error Ratio, 4-1

Cell transfer delay, 4-1, 3-29

CLP (Cell Loss Priority), A-4, 3-14, 3-28, 2-5

CLR (Cell Loss Ratio), 1-2, 4-1

Constant Distribution, 1-1, 3-15, 3-16

Contrast, 2-12, 3-6, 3-8

Cross Network Testing, 4-2

Custom File Transfer, 3-15, 2-7

-D-

Default Settings, C-1, 3-6, 3-7

Distributions

Constant Distribution, 1-1, 3-15, 3-16

Uniform distribution, 1-1, 4-4, 3-15, 3-16

Gaussian Distribution, 1-1, 4-4, 3-15, 3-17

Poisson Distribution, 1-1, 4-4, 3-15, 3-17

Ramp distribution, 4-4, 3-15, 3-18

Statistical distributions, 4-4

DS1, 1-1, 3-5, 3-11

transmitter & receiver circuitry, 2-4, 2-9, 3-10, 3-24

DS3, 1-1, 3-4, 3-5, 3-10

transmitter & receiver circuitry, 2-4, 2-9, 3-10, 3-24

DSP (Digital Signal Processor), 1-2

-E-

E1, 1-1, 3-5, 3-12

transmitter & receiver circuitry, 2-4, 2-9, 3-10, 3-24

E3, 1-1, 3-5, 3-12,

transmitter & receiver circuitry, 2-4, 2-9, 3-10, 3-24

Enter key, 2-2, 3-2

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-F-

Factory Default, 3-6, C-1

FEBE (Far-End Block Error), 3-19

FERF (Far-End Receive Failure), 3-19

Flexibility (ATM Basics), A-2

Floppy drive, 3-8

Framing, 3-11, 3-25

Frequency (bandwidth control), 3-18

Front Panel, 1-3, 3-2

Front panel, diagram, 1-3, 3-1

Functional Description of ATM-150, 1-1

Fuse, 3-32, vii

-G-

Gaussian Distribution, 1-1, 4-6, 3-15, 3-17

Generator, 1-1, 3-3, 2-4

Generator Output, 3-4

Generator Softkeys, 3-9

Generator SYNC, 3-32

Getting Started, 2-1

GFC (Generic Flow Control), A-3, 3-14

GPIB Interface, 3-6, H-1, 2-12

Granularity (ATM Basics), A-2

-H-

Header Control, 3-14, 2-5

Header generation, active, 3-14, 2-6

Header parameters, 3-14

HEC (Header Error Control), 1-2, 3-11, A-4

Histogram, 1-1, 3-23, 4-12

-I-

Idle cells, 4-6

Instrument Test, 2-13

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-L-

Laser Safety, vii, viii

Load Testing, 4-5

LOF (Loss of Frame), 3-19

Loopback, 3-25, 2-9

LOS (Loss of Signal), 3-19

-M-

Monitor

- Monitor control, 3-21, 3-8
- Monitor mode, 3-10
- Monitor reset, 3-10
- Monitor settings, 3-6, 3-8

-N-

NNI (Network-Network Interface), A-5, 3-11

-O-

OC-3c, 1-1, 3-13, 3-27

Operating Basics, 2-1

Options, I-1

Output Results Control, 3-31

-P-

Parity, 3-19

Percentage (bandwidth control), 3-18

Physical Alarms, 3-19

PLCP (Phy. Layer Convergence Proc.), 1-2, 3-10

Pointer justification, 3-13

Poisson Distribution, 1-1, 4-6, 3-15, 3-17

Propagation Calibration, 3-30

PT (Payload Type), A-4

PTI (Payload Type Identifier), 3-14

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-Q-

QoS (Quality of Service), 1-1, 4-1

Quick Setup, Store & Recall, 3-9

Quick Start, 2-3

-R-

Ramp distribution, 4-4, 3-15, 3-18

Randomize, 2-6, 3-14, 4-3

Rear Panel, 1-4, 3-32

  Rear panel, diagram, 1-4, 3-32

Remote Commands, E-1

Remote Interface, 3-6, 3-8

Result screen, 3-22, 2-11

Results control, 3-31

RS-232 Interface, 2-12, G-1, 3-6, 3-7

-S-

Safety Practices, vii

Scalability (ATM Basics), A-1

Service Information/ Warranty, F-1

Setup

  Generator, 3-11

  Analyzer, 3-24

Softkeys, 2-1, 3-2, 3-22

SONET Pointer, 3-13

SONET, 1-2

Specifications, B-1

Statistical distributions, 4-4

STM-1, 1-1, 3-13, 3-28

System Performance Verification, 2-13

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-T-

Test Cell, 3-28, 2-10

Test Mode, 3-23

Time/ Date, 3-6, 3-8

Traffic Emulation, 4-3

Transparency (ATM Basics), A-1

-U-

UNI (User to Network Interface), A-5, 3-10

Uniform distribution, 1-1, 4-4, 3-15, 3-16

Utility, 3-6, 2-12

-V-

VBR (Variable Bit Rate), 1-1, 4-7

VCI (Virtual Channel Identifier), 1-2, A-3

VCI/VPI, 3-14

VPI (Virtual Path Identifier), 1-2, A-3

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