T1 E1 TESTERS



Front Panel



PCIe Based Octal and Quad T1 E1 Boards

USB Based T1 E1 VF FXO FXS and Serial Datacom Analyzer Unit



Dual T1 E1 PCIe Express Card

GL Communications Inc.

T1 E1 Analyzers

(Available in two form-factors – PCI Boards or USB-based portable units)

Overview

T1 E1 carriers are used extensively throughout the world for carrying large volumes of call containing both voice and data. Their popularity can be attributed to their high reliability, manageability and flexibility. The available digitized channels, 24 for T1 and 32 for E1 can be used for carrying voice and/or data. Regardless of the form-factor you choose, GL's T1 E1 Analyzers provide a wide range of functionalities and testing capabilities.

GL's <u>tScan16™</u> is a high-density T1 E1 board with 16 ports and the newer PCIe (x1) bus interface. The sixteen T1 E1 ports are **Receive-only** ports optimized for high performance voice and data capture, monitoring, and analysis requirements. GL's <u>Octal & Quad T1 E1</u> <u>Analyzer Boards</u> are high-density boards that provide Four (4) or Eight (8) RJ-48 T1 E1 ports and multiples thereof. With this, configurations of 8, 12, 16, ... 64 T1 E1s in a single rack are possible. It's designed for the newer PCIe lanes for faster processing and scalability.

The USB-based tProbe[™] T1 E1 VF and Serial Data Analyzer units add new functionality and features not available with the "portable" T1 E1 USB-based Analyzer. The enhanced features and capabilities include pulse mask and jitter measurement and analysis, cross-port through and transmit modes, enhanced VF drop and insert capabilities. GL's tProbe[™] also includes ability to add optional boards such as the <u>tProbe[™] Datacom Analyzer</u>, and <u>tProbe[™] FXO-FXS Board</u>.

GL's new <u>Dual T1 E1 Express (PCIe) Cards</u> are high-density boards with newer PCIe bus interface. These cards are identical to the portable tProbe[™] units, except for FXO FXS and Datacom functionality. Visit <u>T1 E1 Testing</u> for more details.

Main Features

- Software Selectable T1 or E1 interfacing along with Drop and Insert
- Ability to monitor Power, Frequency, Signaling, Binary Byte Values, and DC Offset
- Monitor the T1 E1 line conditions such as frame errors, violations, alarms, frequency, power level, and clock (or frame/bit) slips
- Time and spectral graphical views of any channel or timeslot can be monitored
- Internal speaker for DS0 Monitoring, Data, Four Wire VF-Interface, Drop and Insertion of Analog and Digital Signals, Real-time Monitor and Time-Stamped Log of all alarms and abnormal events
- Comprehensive Analysis / Emulation of Voice, Data, Fax, Protocol, Analog, and Digital signals, including Echo and Voice Quality testing
- Call Recording, Generation, & Monitoring hundreds to thousands of calls in one platform
- Supports pulse mask compliance testing, jitter generation, and analysis
- Precision Delay Measurement, Unframed/Framed, Transmit/Receive Tone and signaling bits at user-defined frequency and power in one (or all) channels, and Tx/Rx loopback applications are provided for intrusive testing
- Supports Full/Fractional T1 E1 Bit Error Rate Testing with detailed logging
- Routing and Bridging emulation over Multi T1 E1 WAN interfaces using MLPPP (Multi Link PPP) and MFR (Multi Link Frame relay) protocols
- DTE-DCE Simulation to test and verify data communications equipment and circuits specifically serial interfaces V.24, V.35, V.36, RS-449, RS-485, EIA-530 and EIA-530A interfaces
- Compatible with Windows® 10 operating systems and user friendly real-time software

For more details, visit <u>T1 E1 Applications</u> webpage.

GL Communications Inc.

T1 E1 Basic Applications

- Framing Formats
- Tx Rx Configurations
- Clock options: Internal, External, & Recovered
- Loop-backs: Framer, Driver, & Remote-loopback
- Connection Options: Terminate, Bridge, Monitor
- Cross-port Through and Transmit Mode

Monitor Applications

- Monitor T1 E1 Line Status
- Monitoring VF Interfaces
 - VF Input/Output Interfaces for T1 E1 Products
 - 4-Wire VF Interface with Drop & Insert
- Bytes Values Display for all time slots
- Binary Byte Values Display for all time slots
- Monitor signaling bits
- Power Level Display for all time slots
- DC Offset Display for all time slots
- Frequency Display for all time slots
- Multiframe Byte Display
- Real Time Multiframe Monitoring
- Real Time Bitmap Monitoring
- Time Slot Byte Display
- ASCII Timeslot Display
- Signaling Transitions Recording
- Real Time Oscilloscope Display of DS0
- Real Time Power Spectral Display of DS0
- Real-time strip chart software
- Active Voice Level Monitoring
- Pulse Mask Compliance Testing
- Jitter Measurement
- Physical Layer Analysis
- Audio Monitoring
- Real-time Multi-Channel Audio Bridge
- Capture Dial Digits

Intrusive Applications

- Bit Error Rate Test
- Enhanced BERT
- ATM BERT
- Transmit Tone
- Transmit Gaussian Noise
- Transmit Multiframe
- Transmit Signaling Bits
- Precision Delay Measurement
- Rx-to-Tx-Loopback
- Error Insertion
- Precision Loopback, Broadcast
- 23 Test Tone Director (Tx) and Responder (Tx)
- Software Delay Measurement



Monitoring Applications

Multiple applications are offered to monitor information received over T1 E1 lines. They cover information such as **Byte Values**, **Binary Byte Values**, **DC Offset**, **Timeslot Displays**, **ASCII Timeslot Display**. **Oscilloscope**, **Power Spectral**, **Audio Monitoring**, and **Active Voice Level**. **Oscilloscope** and **Spectral Displays** provide graphical analysis of signals. The T1 (E1) analyzer emulates and decodes all 24 (32) channels simultaneously for **Signaling Bits**, **Power Level**, **Frequency**, and **Multi-Frame** data. **VF Interface** for monitoring and inserting audio with Drop and Insert are also provided.

Monitor Byte, Binary Byte, and Signaling Bits

Displays the data values for each time slot in HEX and binary data format. Signaling bits associated with each timeslot are displayed in real-time

🎽 Displa	y Byte				×	J			
		Card	#1	-					
TS 0	7F	🌌 Displa	ay Binary By	te					×
TS 1	BD		<u>с</u>	ard #1 😹 Signa	▼ ing Bits				×
TS 2	BD	TS O	10101010		-	Card #1	1	_	
TS 3	BD	TS 1	10101011	TOO	1111			Te ie	1111
TS A	BD	TS 2	10101010	15.0		15.0		12.10	
10 4		TS 3	10101010	TS 1	1111	TS 9	1111	TS 17	1111
18.5	BD	TS 4	10101010	TS 2	1111	TS 10	1111	TS 18	1111
TS 6	BD	тег	10101010	TS 3	1111	TS 11	1111	TS 19	1111
TS 7	BD	100		TS 4	1111	TS 12	1111	TS 20	
		15.6	10101011	TOT		TO IL		TOLO	
		TS 7	10101010	18.5	1111	15/13	1111	18/21	1111
				TS 6	1111	TS 14	1111	TS 22	1111
				TS 7	1111	TS 15	1111	TS 23	1111

Monitor Byte, Binary Byte, and Signaling Bits

Power Level, Frequency, and DC Offset

In Power Level for each timeslot is computed and continuously displayed in dBm. In frequency, a continuous display of the signal frequency in each timeslot is displayed. The DC Offset provides the capability to measure and display DC offsets for all timeslots.

🎽 Power	r (dBr	n)					×				
		Ca	rd #1		•						
TS 0	-20	🌌 Frequ	ency	(Hz)				×			
TS 1	-20			Car	d #1	•					
TS 2	-20	TS U	100	🌌 DC Off	set (m¥))					X
TS 3	-20	TS I				Card #1	•	·			
TS 4	-20	10 Z	100	TS 0	264	TS 8	264	TS 16	264	TS 24	264
TS 5	-20	TS A	100	TC 2	264	TC 10	264	TC 10	264	TS 25	264
TS 6	-20	TS 5		TS 3	264	TS 11	264	TS 19	264	TS 27	264
TS 7	-20	TS 6	10(TS 4	264	TS 12	264	TS 20	264	TS 28	264
101		TS 7	10(TS 5	264	TS 13	264	TS 21	264	TS 29	264
r	_			TS 6	264	TS 14	264	TS 22	264	TS 30	264
				TS 7	264	TS 15	264	TS 23	264	TS 31	264
TS 6 TS 7	-20 -20	TS 5 TS 6 TS 7	10(10(10(TS 3 TS 4 TS 5 TS 6 TS 7	264 264 264 264 264	TS 11 TS 12 TS 13 TS 14 TS 15	264 264 264 264 264	TS 19 TS 20 TS 21 TS 22 TS 23	264 264 264 264 264	TS 27 TS 28 TS 29 TS 30 TS 31	264 264 264 264 264

Power Level, Frequency, and DC Offset

Multi-frames and Real-time Multi-frames

This application permits monitoring of multiframes for all timeslots and permits viewing of multi-frames in real-time.



Monitor Multiframes and Realtime Multiframes

Realtime Bitmap, Timeslot, ASCII Timeslot, Signaling Transitions

The Realtime Bitmap permits a graphical view of complete multi-frames. Timeslot window displays the timeslot value for about '2' second duration for a desired timeslot. ASCII Timeslot application permits viewing of real-time ASCII events that are present on the T1 or E1. The **Signaling Transitions** application display records of all signaling bit changes along with the time-stamped indications for each bit.



Bitmap, Timeslot, ASCII Timeslot, Signaling Transitions



Oscilloscope and Spectral Display

The linear codes and the data received on a specified timeslot can be viewed in the Oscilloscope and spectral domain.



Monitoring Applications

Real-time Strip Chart (XX024 Included with Basic Analyzer)

This application is used for analysis of CAS signaling, non-intrusive capturing of PCM data and signaling, and subsequent plotting of the same onto a strip chart format.



Real-time Strip Chart

Active Voice level

This application computes the active voice level of a signal according to the ITU-T P.56 specification. Users can obtain and analyze the source signal in real-time or can process signal data captured to files as an offline process.

Ts	AVL	Act%	Max	Min		Linelr	n Data	
0	-15.33	99.92	187.35	-187.35			MONITOR E1 (#	1)
1	-3.92	99.90	1547	-1547		1		WALC LOCC
2	-4.01	99.91	1547	-1547			UNE -	MONITOD
3	-3.99	99.89	1547	·1547			HDB3	MUNITURE
4	-4.05	99.90	1547	-1547			CARF	• •
5	-3.99	99.91	1547	-1547			FRAM	1 2 5
6	-3.94	99.90	1547	-1547			BEMO	
7	-3.95	99.90	1547	-1547			O DIST	j 🕑 G
8	-4.01	99.90	1547	-1547			01517	💽 F
9	-3.96	99.91	1547	-1547			U AIS	🛛 🖲 R
10	-3.96	99.91	1547	-1547			🕗 ES O:	🛛 🗩 D
11	-4.00	99.91	1547	-1547			🕖 ES Ur	
12	-4.07	99.90	1547	-1547			- Legends	1 22
13	-3.91	99.90	1547	-1547			History	
14	-4.02	99.91	1547	-1547			Not Active	. 💌 E
15	-3.87	99.90	1547	-1547		- File D	- Horribure	Legends
16	-3.86	99.90	1547	-1547			Signal Input-	🖸 🖸 Histor
17	-3.94	99.90	1547	-1547			Freq (Hz)	🚺 🚺 Not A
18	-3.93	99.90	1547	-1547			2048000	- Cign al Inc
19	-3.97	99.90	1547	-1547			- Error Counter:	Freq (Hz)
20	-3.99	99.90	1547	-1547		Mum	BPV Fran	2049000
21	-3.98	99.90	1547	-1547		Num	0 5	12048000
22	-3.99	99.90	1547	-1547		Diab	10	Error Cou
23	-3.88	99.91	1547	-1547		Dak	Beep ON	BPV
24	-3.97	99.91	1547	-1547	-		TxUr= 0 Bx0r=	0
•				•			TxMi= 0 RxMi=	
				_			Beset All	T Beep U
1.0		0 dB Refere	nce An	nplitude Ur	nits		THESECAL	TvMi= 0 Bv
LO	gging	dBm		livalts	-	Re	361 Ja	Tamle Onx
_		1				_		Becel A

Active Voice Level and Monitoring Cards

Audio Monitoring

This application is used for analysis of CAS signaling, non-intrusive capturing of PCM data and signaling, and subsequent plotting of the same onto a strip chart format.

Non-Intrusive Aud	io Monitoring	
-Audio Monitoring	00 01 02 03 04 05 06 07 08 05 10 11 12 13 14 15 15 17 18 15 20 21 22 23 ▲ ▲ ▲ LOCK Both Cards to Same: ▼ Timeslot Selection	Gain(dB) [18.1 Set 0-dB
Card #2 💌	Gain Setting 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 ∢	Gain(dB) 18.1 Set 0-dB Speaker

Audio Monitoring

Real-time Multi-Channel Audio Bridge (XX017 Included with Basic Analyzer)

This ingenious software allows sound aware applications such as Goldwave, Matlab, Adobe Audition, Cool Edit, Audacity, and others to send and receive data to / from a T1 E1 timeslot or VF channel. It also sound card input to be connected to a timeslot.

	Real-time Multi-Channel Audio Bridge 🛛 🗕 🗖									
ile <u>H</u> elp										
e 📕										
Action	Sound Device	Audio Mode	Channel	Codec	Samples (sec)	Port	Start TS	Start SC	Start	
DROP	Speakers (Realtek High Definiti	Stereo	L	G.726 40 Kbps	8000	1	1	4	Start	1
		Stereo	B	Ulaw	8000	1	1	1	Start	
DROP	Speakers (Realtek High Definiti	Stereo	L	G.726 40 Kbps	8000	2	1	4	Start	
		Stereo	B	Ulaw	8000	2	1	1	Start	
DROP	Realtek Digital Output (Realtek	Stereo	L	Alaw	8000	1	0	1	Start	
		Stereo	R	16-Bits Linear PCM	8000	1	0	1	Start	
			Start All	Stop All						

Real-time Multi-Channel Audio Bridge

Capture DTMF/MF (MFR2-F, MFR2-B) Digits (XX022 Included with Basic Analyzer)

The capture application includes Manual and Scan for offhook modes. In manual mode, the capture operation simply stays on the selected time slot, displaying the digits received. In scan for offhook mode, the scanning of successive time slots takes place; detection of an onhook to offhook transition at a time slot would mark the beginning of the capture activity.

Capture DTMF/MF D	igits - Ver. 2.1		
┌ Mode Select		Options	
<u>M</u> anual	Scan for <u>O</u> ffhook	Digits Only	All Activity
Timeslot 1 🚍	Timeout 1	 ✓ Detailed A ✓ Time-stam 	nalysis P
+40.522 DTMF-6: 50n +40.572 Idle: 50ms +40.622 DTMF-7: 50n +40.672 Idle: 50ms +40.722 DTMF-1: 50n +40.772 Idle: 50ms +40.822 DTMF-2: 50n +40.872 Idle: 50ms	ns/-10.0dBm (T1)77 ns/-10.0dBm (T1)85 ns/-10.0dBm (T1)69 ns/-10.0dBm (T1)69	17-13.0 [T2]1478 37-13.0 [T2]1210 37-13.0 [T2]1210 37-13.0 [T2]1210 37-13.0 [T2]1337	/-13.0 /-13.0 /-13.0 /-13.0
Card #1 💌 💿	<u>S</u> top Saj	<u>v</u> e C <u>l</u> ear	Options

Realtime Multi-Channel Audio Bridge

Jitter and Pulse Mask Measurement XX012 Included with Basic Analyzer)

Pulse shape measurement software has been developed to determine if the pulse shape fits within a "pulse mask" as specified by standards ITU G.703 and ANSI T1.102-1993. The software is available in both visual and tabular formats. Tabular formats are convenient for automation and scripted test environments. Pulse Mask image can be saved to a file.

Jitter Measurement software allows one to accurately measure jitter associated with T1 or E1 signals. It also allows evaluation of the jitter on either a tick-by-tick or a cumulative basis.

The application recognizes the following groupings of clock deviations – Drift (Very slow variations in a clock signal (below 1 Hz), and Frequency Deviation (A permanent or steady-state difference in clock rates.



Jitter Measurement, and Pulse Shape

Monitor T1 E1 Lines

Provides a detail description of all alarms and line conditions in the 'Monitor' panel for all the available T1 E1 Cards installed on local PC.

							T1/E	1 Alarms									
Reset	All Ports	#1	\$2	#3	\$4	#5	#6	\$7	#8	#9	#10	#11	#12	#13	\$14	\$15	#16
Sync Loss	×	×	×	. H	. H	X	X	X	X	X	X	X	X	×	X	X	×
HDB3 Violation	. H	~		. H	. H	~	~	~	~	~	~	~	~	~	~	~	-
Carrier Loss	×	×	×	. H	. H	×	×	×	×	×	×	×	×	×	×	×	×
Frame Error		~		~	~	~	~	~	~	~	~	~	~	~	 Image: A second s	~	-
Remote	. H	~	-	. H	. H	~	~	~	~	~	~	~	~	~	~	~	-
Distant MF	. H	~		. H	. H	~	~	~	~	~	~	~	~	~	~	~	-
AIS	 Image: A second s	 Image: A second s	 Image: A second s	 Image: A second s	~	 Image: A second s	 Image: A second s	 Image: A second s	 Image: A second s	 Image: A second s	 Image: A second s	 Image: A second s	 Image: A second s	 Image: A second s	 Image: A second s	 Image: A second s	-
							T1/E1	Statistics	9								2
Frequency (Hz)				2048003	2048003												
Level (dBdsx)				0.000	0.000												
BPV Errors		0	0	267989	204551	0	0	0	0	0	0	0	0	0	0	0	
ORC Errors		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
Frame Errors		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Transmit Under Run		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Receive Over Run		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BR/Frame Clock Sip	•																
Pearly			_														

Monitoring T1 E1 Lines

Physical Layer Analysis

Used to monitor T1 E1 and T3 E3 line alarms. Helps to track the time at which alarms (T1 Alarms) occurred periodically and send this information to the central database over TCP/IP. GL's NetSurveryorWeb[™] can fetch these records from the central database and allows centralized monitoring of physical layer status of T1 E1 line via simple web based clients.

Further, alarms monitored at the DS3 level and at the DS1 level can also be packetized and sent via SNMP to the network operation centers.

1100000											
PA				T1/E	1 Physical Layer	Protocol Analysis Alarms	and Counters				×
Eile V	iew Capture	e <u>S</u> tatisti	ics <u>D</u> atabase <u>C</u> i	onfigure <u>H</u> elp							
1					* **		GoTo				
Dev	TScount	Frame#	TIME (Relative)	Len Error	Type T1/E1 Physical	T1 Blue/E1 Remote Alarm Status T1/E1 Physical	AIS Alarm Status T1/E1 Physical	AIS Alarm T1/E1 Physical	Carrier Loss Alarm Status T1/E1 Physical	Carrier Loss Alam T1/E1 Physical	m ^
1	0	497	00:04:09.036000	19	Counters						_
12		498	00:04:10.042000	12	Alarms	off	off	4	off	1	
12	0	499	00:04:10.042000	19	Counters						
1	0	500	00:04:11.048000	12	Alarms	off	off	4	off	1	
1	0	501	00:04:11.048000	19	Counters						
12	0	502	00:04:12.054000	12	Alarms	off	off	4	off	1	~
< 1<											>
0000 7	Type Counter Sync Loss Carrier Carrier Ti Blue/ Ti Blue/ Ti Yello Ti Yello AIS Alar: AIS Alar:	s Alarn s Alarn Loss Al Loss Al El Remc V/El Di v/El Di n n Statu	a Status arn arn Status ite Alarm stant Alarn stant Alarn is	tus Status	- 00000001 - 00000101 - 0000000 - 0000000 - 0000000 - 00000010 - 00000001 - 00000000 - 00000000 - 00000000 - 00000000 - 00000000	Alerns (5) (6) (7) (1) (1) (2) (2) (2) (3) (3) (4) (4) (4)					
<											>
Hex Du + 01 05	ump of the 00 00 01	e Frame 00 02	Data 00 03 00 04	00		-++					
Running	. Utilization 0	.00%		C	Program Files (x86)\GL Communications Captured	d 880 frames				1

T1 E1 Physical Layer Analysis

VF Options

When "Drop" option is enabled, the signal on the selected timeslot is dropped on to the VF Out port on the selected port. When the "Insert" option is enabled, the incoming VF signal from the selected port is inserted to the selected timeslot.



Configuration

Configuration functionality provides various options to configure the Tx/Rx parameters of the low level chip functions for dual T1/E1 framers and drivers. The **Encoding Option** in T1 E1 Analyzer software permits encoding and decoding using either a-law or u-law formats.

T1 E1 Encoding (XX023 Included with Basic Analyzer)

The companding (A and μ) laws are used for Audio level compression, which is used for many purposes. The mu-law algorithm (μ -law) is a companding algorithm, primarily used in the digital telecommunication systems of North America and Japan. An a-law algorithm is a standard companding algorithm, used in European digital communications systems.





Cross Port Transmit and Through Mode

In cross-port transmit mode, the data that would normally be transmitted on Card 1 (Port 1) is diverted and transmitted on Card 2 (Port 2) and the data that would normally be transmitted on Card 2 (Port 2) is diverted and transmitted on Card 1 (Port 1). The receive paths are completely unaffected. This feature also eliminates complex cabling.

In cross-port through mode data is passed thru seamlessly and monitored simultaneously. It acts like outward loopback on the different port. Signal received on port 1 is transmitted out on thru port 2 and vice versa. Irrespective of the interface setting (Terminate, Monitor, Bridge), data is passed thru. Connection is not disrupted even if the PC looses power.



Cross Port Transmit and Through Mode

Framing Formats for T1 E1 Systems

Provides options to select D4, ESF, CAS, CCS, CAS & CRC, CCS & CRC, and Unframed T1 E1 framing formats.



T1 and E1 Framing Format

Loopbacks

Three separate hardware loopbacks are provided on the T1 E1 Cards:

- Inward framer loopback (Inward Loopback (F))
- Inward driver loopback (Inward Loopback (D))
- Outward driver loopback (Outward Loopback (D))
- An additional software loopback called "Rx-to-Tx Loopback" is also provided. In software loopback, the received data is looped back to transmit data by the PC software

E:	I - Analy	/zer							
Eile	⊆onfig	⊻iew	Monitor	IntrusiveTest	Spec	ial Applications	<u>W</u> indow	Help	
CAS	s & CRC	-	No Lo	opback	-	Terminate 💌	Int Clk	Card #1	•
			Inward Inward Outwa No Lo	l Loopback(F) l Loopback(D rd Loopback(opback] D]				

Loopback Settings

Terminate, Bridge, and Monitor Modes

The T1 E1 input signal may be terminated using impedance, monitored, or bridged depending on user requirements.

Eile	<u>⊂</u> onfig	<u>V</u> iew	<u>M</u> onitor	IntrusiveTest	Special Applications	<u>W</u> indow	Help		
CAS	5 & CRC	-	No Lo	opback	🔹 Terminate 💌	Int Clk	•	Card #1	•
					Terminate Bridge Monitor				

Connection Options

Clock Options

The T1 E1 analyzer has 3 clock options to choose.

- Internal Clk
- Recovered Clk
- External Clk

Eile	⊆onfig	⊻iew	Monitor	IntrusiveTest	Special Applications	<u>W</u> indow	Help		
CA9	5 & CRC	-	No Lo	opback	🔹 Terminate 💌	Int Clk	-	Card #1	-
						Rec Cli	k		
						Ext Clk			

Clock Options



Intrusive Test Applications

The analyzers use a variety of intrusive testing applications to verify the working of T1 E1 lines. The Basic and Enhanced **BER Testers** generate / detect framed, unframed, fractional, and sub-channel BER patterns with 16 different static patterns. Enhanced BERT also offers online / offline views of events through a powerful graphic viewer. **ATM Bit Error Rate Test** (BERT) application permits BER testing over the ATM layer. **Precision Delay Measurement** measures the round trip delay of a system with accuracy at the microsecond level. **Tone / Multiframe / Noise** generation and detection, **Signaling Bits** manipulation and recording, including error insertion features, provide complete signaling ability for the T1 E1 Analyzers. The **Error Insertion** application permits single, fixed, automatic, and random error insertion into the incoming bit stream, including Bulk Delay feature .

Note: Bulk delay for error insertion is not available on Octal/Quad T1 /E1 Analyzers.



Transmit Multiframe, Transmit Signaling Bits

Tx Tone - tProbeE1 Card	#1 ×	
Tx Tone Timeslots Freq	uency Sweep Device Selection	
Tone Frequencies (Hz) 1st Tone 2r 1004 2	(0-3995) Tone Power (dBm) d Tone Level (-40-> 3 dBm) -10 +	
Freq Sweep Sie	Precision Delay Measurement - tPr	obeE1 Card #2
A-Law Encoding	Error/Delay Results Error Count Delay Time (ms)	Time-Slot Selection Start End 1 - 31 -
	Stop Measure RTD	Calculate Internal Delay

Transmit Tone and Precision Delay Measurement

Jitter Generation (XX012 Included with Basic Analyzer)

Jitter Generation generates jitter based on user defined frequency module and amplitude values.



Error Insertion

The Error Insertion application permits inserting single, fixed, automatic, random, and burst error into the incoming bit stream. The application allows to manually insert CRC, Framing, International bits, National bits, A Bits, CAS Multi-frame, Logic Error, and Bipolar Violations.

	Error I	nsertion - Univ	/E1 Card #3	_ 🗆 🗙
Manual Error Insertio	ons			
	Logic Error	Extra Bits	National Bits	Crossport Normal CCS+CRC
CRC Errors	Bipolar Violations	s Y Bit	A Bits	T TOOD T
Frame Errors	MF Error	CAS Multiframe	Intl. Bits	J♥ TSUPass Thru
Bulk Delay Enable Bulk Delay Enable Bulk Delay Units Microsecondsi Millisecondsim Timeslot Selection 00 01 02 03 04 16 17 18 19 20 Multiframe Mask File: Auto Error Insertions Interval © Fixed © Random © Continuous Mf Error Rate: U BPV Logic Error	MF Error Bulk (µ-sec) s) B5 06 07 08 09 11 1 22 23 24 25 26 S	LAS Multitrame Colay Co	Select All Deselect All Load MF Mask e mor Enter Enter Enter	
Frame Error		1.00E-005	Enter	0
CRC Error			Enter	0
CAS MF Error		1.00E-005	Enter	0

Error Insertion

Precision Loopback, Broadcast

The Precision Loopback and Broadcast interface is used to broadcast data from a selected Rx port to multiple Tx ports. It allows users to define timing margins, block sizes, and safe margins to ensure precise loopback and data transmission. Also, helps in monitoring parameters such as transmission delays, data availability, and overrun conditions.

Dat	a from I	Rx port is	; broadcas	ited to ports e	.g. 1 3-4. Mar	g define delay	. LB Block in	ms defines bytes to rx/tx is one cycle.	<
LE	8 Rx ->	Tx port	Rx Avail	Curr Tx Marg	Min Tx Marg	Max Tx Marg	LB Block ms	Rx OverRuns	
Ŀ									
Ŀ.									
			1		1	1			
Rx	Port	1	-> Tx F	Port List 2		Tx Safe Mar	g ms 96	Tx Max Safe Marg 192 LB Block ms 48	
Dat	a from R	x port is l	broadcaste	d to ports e.g.	1 3-4. Marg de	fine delay. LB B	lock in ms defi	nes bytes to rx and tx in one cycle.	
	Start		Stop	Load	d Sa	ave De	fault	Add LB Del Select Exit	

Precision Loopback, Broadcast

Software Delay Measurement

The Software Delay Measurement utility operates in both hardware-based and software-based T1 E1 analyzers. It accurately measures delay using the computer's precise timing by tracking a byte mark in the global buffer of a specified Tx port and monitoring when it appears in the Rx global buffer of a specified Rx port.

- The maximum measurable delay is limited to twice the global buffer size (2 seconds max).
- The tool ensures precise approximation of the transmission time by adjusting the measurement dynamically.

Software Delay	y Measurement		\times
Tx Port:	1	> Rx Port: 2	
	Delay Millisecor	nds	
	Current:	15	
	MIN:	13	
	MAX:	16	
	AVG:	14.589743	
Start	Stop	Exit	

23-Tone Test - Director (Tx)

23-Tone Test - Director (Tx)

The **Test Director** is responsible for generating and injecting 23 distinct test tones into the communication channel. These tones serve as a reference signal for evaluating parameters such as frequency response, distortion, and noise levels. By transmitting a well-defined set of tones, the Test Director ensures that the receiver has a known signal for comparison, enabling accurate performance analysis.

23-Tone Test Director		-		×
#Port:Timeslot Tx Signal Port #1 1 Format A-Law]	Power	-23	•
Start			Exit	

23-Tone Test - Director (Tx)

23-Tone Test - Responder (Rx)

The **Test Responder** is the receiving component that captures and analyzes the test tones after they pass through the communication channel. It compares the received tones with the originally transmitted signals to measure deviations caused by factors such as distortion, phase shifts, noise, and attenuation. The Test Responder helps identify transmission issues, ensuring that the communication system meets quality standards.

#Port:	Timeslot #1 💌	1 .	Rx Sign Format	al A-Law	▼ Us	e D Filter
Tone	Freq	Rx Pwr	Rx Ph	FDD	EDD Freg	EDD (uS)
1	203		1 MAILE	1	281	200 (00)
2	203			2	439	
2	516			2	504	
4	672			4	750	
5	878			5	906	
5	020			6	1063	
7	1141			7	1210	
2	1207			8	1215	
0	1452			0	1575	
10	1600			10	1688	
11	1766			11	1944	
12	1922			12	2000	
12	2078			13	2156	
14	2070			14	2313	
15	2201			15	2469	
16	2547			16	2625	
17	2703			17	2781	
18	2859			18	2938	
19	3016			19	3094	
20	3172			20	3250	
21	3328			21	3406	
22	3484			22	3563	
23	3641				0000	
	3011					
		1				

23-Tone Test - Director (Tx)

Bulk Delay

Bulk delay is an added feature in Error insertion application that allows users to apply Bulk delay on the entire T1 E1 trunk (full multiframe) of 1.544Mbps (T1) pipe or 2.048 Mbps (E1) pipe. This helps to simulate network delay along the T1 E1 links. After selecting or adjusting the delay, the Delay will fill a buffer and begin transmitting the signal; this will cause the T1 or E1 multi-frame signal to briefly lose sync when applying the delay.



- Bulk delay can be applied in either microseconds or milliseconds units
- Delay can be varied from 0 to 169.77mSec or 69 to 169845 µSec in T1 and 0 to 127.99mSec or 46 to 128042µSec in E1 with an accuracy of +/- 10uSec
- By cascading E1s one can achieve larger delays >127 ms
- The delay resolution is based on the byte increments of T1 or E1 (8 bits at a time)

Transmit DTMF/MF (MFR2-F, MFR2-B) Digits (XX022 Included with Basic Analyzer)

The transmit applications provide the ability to transmit DTMF, MF, MFC-R2-forward and MFC-R2-backward digits on one or more time slots. The application displays call script window to view the various digits, and transmit/ receive events. The call-script 'save' feature allows the script display to be saved as a text file, and the 'load' feature allows the scripts to be loaded from a file.

Transmit Dialing Digits - Ve	r. 2.0		
MF Parameters M Dial	IFR2-f Parame Set Up	eters	MFR2-b Parameters DTMF Parameters
Tx DTMF-1: on=50, off: ▲ Tx DTMF-2: on=50, off: Tx DTMF-3: on=50, off:	Dial Digits O DTMF	C MF	C MFR2-f C MFR2-b
Tx DTMF-4: on=50, off: Tx DTMF-5: on=50, off: Tx DTMF-6: on=50, off:	4 5	3 A 6 B	0n 50 🕂
Tx DTMF-7: on=50, off: Tx DTMF-8: on=50, off: Tx DTMF-9: on=50, off:	7 8	9 C	Digit Power (dBm)
Tx DTMF-*: on=50, off= Tx DTMF-0: on=50, off=	× 0	# D	
Tx DTMF-#: on=50, off Tx DTMF-A: on=50, off ▼	Tx Events-		Rx Events
	OFFHook	ONHook	Wait for ONHook
Save Load Clear	Sig Bits ->	0000	Wait for OFFhook
Status	Wink	50 🗦	ms Wait for-> 0000
Running	Pause	50 🚊	ms Wait for Wink
	VF Input	5000	ms Timeout (ms)
Stop Close	File	1000	ms 1000

Transmit Dialed Digit

Windows Client-Server (XX600 Included with Basic Analyzer)

Client / Server applications allow the user (with an appropriate client) to operate analyzers remotely, write scripts for automation, or provide multi client connectivity to a single T1 E1 VF Data analyzer. Almost every GUI application has a WCS counterpart. Now, Windows Client / Server available as a part of Basic Applications in T1 E1 Analyzer.

GL provides sample-working clients in C++, VB, and TCL along with the server.

With additional licenses, various modules can be obtained to suit the testing requirements. Refer to WCS Modules.



GL Client-Server

Dual VF Tx Rx - (XX605 Included with Basic Analyzer)

The **Dual VF Tx Rx** (earlier called as Simplified Audio Client) is now a part of Basic Applications in T1 E1 Analyzer. This application is designed exclusively to perform non-intrusive and intrusive VF audio monitoring, VF audio recording, and testing easily. SAC provides an alternate and simple GUI as against the T1 E1 Analyzer applications in basic software to perform analog Tx/Rx functions.

Analog/Digital Simplified Audio) Client	_[8] ×
CL 2007 Configure VF1/VF2 VF	B81 B81 Bail B	
Board1 VF2 In (Rx) Rx Fie	Re Tore Re Digits Re File	Board1 VF1 In (Rx) Rx Fie
0 -50 -100 0 1,000 2,000 3,000 4,000	Ør Auto Deale Name Step Voice File Name 97 Auto Deale Name Step Voice File Name 97 Stel_04112011_140428 pom Voice File Name 97 Stel_04112011_140428 pom	0 -50 -100 0 1,000 2,000 3,000 4,000
Freq: 1004 Idle	Continuous with one hour file	Freq: 1004 Idle Power: -10.13 Idle
Recorder: Stop	Towell VII Dut (In) Tx Towel xDgbs Tx Fie Tx Towel xDgbs Tx Fie	Recorder: Stop
 Tx File Tx Tone Tx Tone Tx Digits 	Torest Torest <thtorest< th=""> <thtorest< th=""> <thtorest< th="" th<=""><th>Tx File Tx File Tx Tone Tx Tone Tx Digits</th></thtorest<></thtorest<></thtorest<>	Tx File Tx File Tx Tone Tx Tone Tx Digits
Board1 VF2 Out (Tx)	201Hz 402Hz 803Hz 1004Hz 2509Hz 201Hz 402Hz 803Hz 1004Hz 2509Hz - Tores Duation P Continuou Tx Tone	Board1 VF1 Out (Tx)
	Unitine (dec) 1 Unitine (dec) 0 Unitine (dec) 1 Unitine (dec) 1Unitine (dec) 1 Unitine (dec) 1Un	
Freq: 1004 Idle Power: -9.99 Idle	Tmestorp Tmestor Tank Events 4/11/2011 204 40 PM 0 11:0 Stard Recod File 4/11/2011 204 45 PM 0 11:0 Stard Recod File 4/11/2011 204 45 PM 0 11:0 Stard Command end task 12; 4/11/2011 204 45 PM 0 11:0 Recod File Done 4/11/2011 204 45 PM 0 11:1 Stard Command tasks 1004; 1008±1021 continueut:	Freq: 1004 Ide Power: -9.39 Ide
Impedance: 600 Ohm	471/2011 268:34 PM 1 11:1 Start Send Tone(s) 471/2011 268:34 PM 0 11:0 Send Command: is server file "C-Vhogan File-VGL Communications Inc:Simplified Audo Client/VF1_Site1_ 471/2011 268:34 PM 0 11:0 Start Record Tile	Impedance: 600 Ohm
Out In	Deve Events Capture Events	Board1 VF1
Board driver started	Analog Configured 4	/11/2011 2:14 PM

Simplified Audio Client Analog Configuration

Buyer's Guide

Item No	Related Software
<u>XX010</u>	Application Development Tool Kit (Programmer's Guide)
<u>XX018</u>	Multi-Channel BERT Software
<u>XX019</u>	Transmit/Receive File Utility Software
<u>XX020</u>	Record/Playback File Software
<u>XX021</u>	FDL Software for ESF (T1 only)
<u>XX022</u>	DTMF/MF Detector & Generator Software
XX023	T1 A-law or E1 μ-law Software
<u>XX051</u>	Synchronous Trunk Record Playback
<u>XX031</u>	Enhanced T1 / E1 Call Capture/Analysis Software
<u>XX031</u>	T1 or E1 Call Capture and Analysis Software w/ Traffic Activated Trigger Option
CDR032	Call Data Records
<u>VBA032</u>	Voice Band Analyzer
<u>VBA033</u>	Two-Wire Echo Analysis for VBA
<u>VBA036</u>	Traffic Analysis for VBA
VBA038	Fax Demodulator / Decoder
XX600	Basic Client/Server Scripted Control Software (Included with Basic Software)
XX605	Dual VF Tx Rx (Only for tProbe) (Included with Basic Software)
XX606	Pulse Shape & Jitter Measurement (Included with Basic Software)
<u>XX610</u>	w/ File based Record/Playback
<u>XX616</u>	T1 E1 WCS Client Python Module
<u>XX620</u>	Transmit/Detect digits (included with basic software)
<u>XX625</u>	w/ CAS Simulator
<u>XX626</u>	w/ SS1 Signaling Analyzer and Dialer
<u>XX629</u>	w/ISDN Emulation
<u>XX630</u>	w/ DSP Capability
<u>XX631</u>	w/ Dynamic DSP Capability
<u>XX634</u>	High Throughput HDLC Tx/Rx Test
<u>XX635</u>	High Throughput PPP Tx/Rx Test
<u>XX636</u>	High Throughput MC-MLPPP Tx/Rx Test
<u>XX640</u>	File based HDLC Record/Playback

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Item No	Related Software
<u>XX641</u>	File based HDLC Remote Record/Playback
<u>XX643</u>	w/ MTP2 Emulation
<u>XX646</u>	w/High Throughput TRAU Tx/Rx Test
<u>XX647</u>	Scripted ISUP Conformance Testing (MAPS [™] SS7 Conformance)
<u>XX648</u>	Scripted ISDN Simulator (MAPS™ ISDN)
<u>XX649</u>	Scripted ISUP Emulation (MAPS [™] SS7)
<u>XX694</u>	Scripted MAP Emulation (MAPS [™] MAP)
<u>XX651</u>	w/ SA bits Encode/Decode
<u>XX696</u>	Scripted CAMEL AP Emulation (MAPS [™] CAP)
<u>XX624</u>	Scripted FXO FXS Emulation using MAPS™ (MAPS™ FXO FXS)
<u>XX652</u>	Scripted CAS Simulator (MAPS [™] CAS)
<u>XX654</u>	Scripted MLPPP Conformance Testing (MAPS™ MLPPP)
<u>XX650</u>	Inverse Multiplexing for ATM Emulation
<u>XX655</u>	MultiLink Frame Relay Emulation w/ Tx/Rx Test
<u>XX660</u>	w/ FDL
<u>XX670</u>	w/Multi-Channel Rx BERT
<u>XX680</u>	w/Traffic Classifier
<u>XX690</u>	SS7 Protocol Decode Agent
<u>XX691</u>	ISDN Protocol Decode Agent
<u>XX692</u>	Scripted GSM A Interface Emulation (MAPS [™] GSM A)
<u>XX693</u>	Scripted GSM Abis Interface Emulation (MAPS™ GSM Abis)
<u>XX003</u>	Timeslot Delay Loopback for T1 (Currently implemented in Octal T1 E1 Analyzer) Timeslot Delay Loopback for E1 (Currently implemented in Octal T1 E1 Analyzer)
<u>XX062</u>	Echo Path Delay/Loss Simulation Software
<u>XX063</u>	Echo Path Delay/Loss Measurement Software
<u>XX065</u>	G.168 Test Suite for T1 & E1 Echo Cancellers (Manual Testing Software and Procedures)
<u>XX066</u>	Digital Echo Canceller
XX067	Automated Echo Canceller Testing w/o VQT
<u>XX068</u>	Semi-Automated and Scripted Echo Canceller Testing Suite w/ C++ Client w/ LabView Client w/ Matlab Client

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Item No	Related Software
<u>PKB070</u>	Audio Processing Utility
PKB080	Automated Echo Canceller Testing TDM-VoIP
PKB081	Automated Acoustic Echo Canceller Compliance Testing (Partial Tests)
AEC001	AutoEC Test Viewer
<u>EMU037</u>	Echo Measurement Utility (EMU) Software
<u>XX089</u>	Protocol Identifier
<u>XX090</u> OLV090	T1 or E1 Real-Time HDLC Analysis/Playback/Simulate Software Offline/ Remote HDLC Analyzer
<u>XX095</u> <u>OLV095</u>	E1 Real-Time SA Bit HDLC Analysis Offline SA Bit HDLC Analyzer
<u>XX100</u> OLV100	T1 or E1 Real-Time ISDN Protocol Analyzer Offline / Remote ISDN Analyzer
<u>XX105</u>	T1 or E1 Real-Time ISDN Protocol Emulator
XX110 OLV110	E1 Real-Time V5.x Protocol Analyzer Offline / Remote V5.x Analyzer
<u>XX120</u> <u>OLV120</u>	T1 or E1 Real-Time SS7 Protocol Analyzer Offline / Remote SS7 Analyzer
<u>XX130</u> OLV130	T1 or E1 Real-Time Frame Relay Protocol Analyzer Offline/ Remote Frame Relay Analyzer
XX135 OLV135 XX136 OLV136	ML-PPP Analyzer Offline ML-PPP Analyzer PPP and MLPPP Packet Analysis Offline PPP and ML-PPP Packet Analysis
<u>XX140</u>	T1 or E1 Real-Time GR303 Protocol Analyzer
<u>XX142</u>	CDMA2000 Protocol Analyzer
XX150 OLV150 XX151 OLV151	T1 E1 Real-Time GSM Protocol Analyzer Offline GSM Analyzer w/Motorola Mobis Decode with Motorola Mobis decodes
<u>XX153</u> <u>OLV153</u>	T1 E1 Real-Time TRAU Protocol Analyzer TRAU Traffic Playback TRAU Toolbox™ Offline TRAU Analyzer

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Item No	Related Software
<u>XX155</u> OLV155	T1 or E1 Real-Time GPRS Protocol Analyzer Offline GPRS Analyzer
XX160 OLV160 XX162	T1 or E1 Real-Time ATM Analyzer Offline ATM Analyzer ATM BERT
<u>XX165</u> OLV165	UMTS Analyzer Offline UMTS Analyzer
<u>PKV170</u>	NetsurveyorWeb™ (Perpetual License, Unlimited Users/Nodes)
<u>PKV169</u>	NetsurveyorWeb™ Lite
PKV171	NetSurveyor Agent Toolkit
<u>DC007</u>	DCME Test & Analysis Software w/Desktop PC
<u>DC008</u>	DCME Test & Analysis Software w/Portable PC
<u>SA048</u>	Goldwave Software
<u>STE40</u>	Mux/Demux Software
STE50	Sample Traffic Files

Item No	Related Hardware
<u>XTE001</u> XUT001	Dual T1 E1 Express (PCIe) Boards (requires additional licenses) Dual T1 E1 Express Card Basic T1 Software (includes xx600, xx605)
XUE001	Dual T1 E1 Express Card Basic E1 Software (includes xx600, xx605)
<u>FTE001</u>	QuadXpress T1 E1 Main Board (Quad Port [™] requires additional licenses)
<u>ETE001</u>	OctalXpress T1 E1 Main Board plus Daughter Board (Octal Port™ requires additional licenses)
ETA001	Basic Software for T1 (includes xx600, xx605) (zero dollar, but required with appropriate licenses)
<u>EEA001</u>	Basic Software for E1 (includes xx600, xx605) (zero dollar, but required with appropriate licenses)
<u>XX003</u>	Timeslot Delay Loopback for T1 (Currently implemented in Octal T1 E1 Analyzer)
	Timeslot Delay Loopback for E1 (Currently implemented in Octal T1 E1 Analyzer)
<u>PTE001</u>	tProbe™ T1 E1 Base Unit
<u>PTA001</u>	tProbe™ Basic T1 Software (includes xx600, xx605)
<u>PEA001</u>	tProbe™ Basic E1 Software (includes xx600, xx605)
PTE015	w/ 2Wire FXO and FXS Optional Board
<u>PTE025</u>	Data Communications Board for Interfaces RS-232, RS-449, EIA-530, V.35, and many others

Note: PCs which include GL hardware/software require Intel or AMD processors for compliance.

For more information, please visit <u>T1 E1 Testing</u> webpage.

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