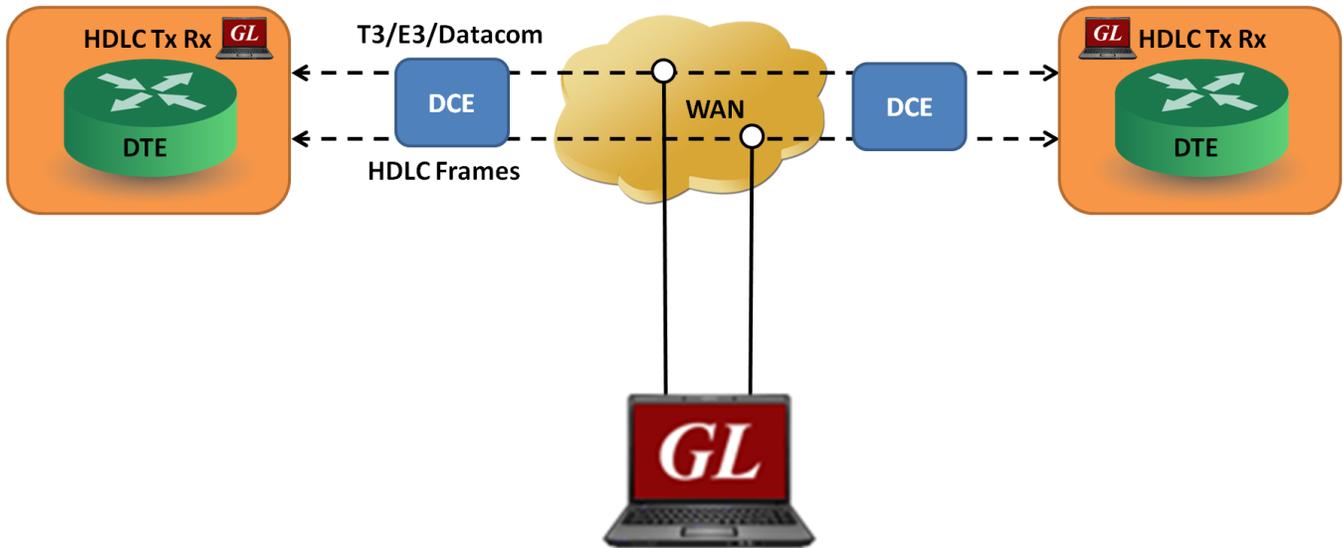# HDLC Analysis / Playback / Simulation

GL's HDLC Analysis and Emulation

Overview

The HDLC protocol is a data link layer used for transmitting data between called nodes. The HDLC protocol embeds information in a data frame that allows devices to control data flow and correct errors. A frame of data is encapsulated by flags. The beginning and end of an HDLC frame are marked by flag characters - 01111110 binary.

At the end of the frame, a Frame Check Sequence (FCS) is used to verify the data integrity. The FCS is a CRC calculated using polynomial $x^{16} + x^{12} + x^5 + 1$ (FCS 16 bits) or $x^0 + x^1 + x^2 + x^4 + x^5 + x^7 + x^8 + x^{10} + x^{11} + x^{12} + x^{16} + x^{22} + x^{23} + x^{26} + x^{32}$ (FCS 32 bits).

GL's **T3/E3/Datacom** HDLC protocol analyzer provides the capability to capture, and analyze HDLC data on a T3/E3/Serial Datacom links. There may be a single data channel per T3/E3/Datacom line. After setting the T3/E3/Datacom ports and FCS type and starting the decoding process, the main screen displays the captured HDLC frames. Flags are stripped, and all other data is presented, including FCS bytes.

For more details, refer to T3/E3 Datacom HDLC Protocol Analysis webpage.

Main Features

Display

- Displays Summary, Detail, Hex-dump, and Statistics Views
- Detail View
  - Displays decodes of a user-selected frame from the summary view
  - Provides options to display or hide the required protocol layers
  - Contents of this view can also be copied to clipboard
  - Provides option to toggle detail view vertically or horizontally as feasible for the user
- Summary View displays timeslot, sub channel, frame#, device#, LAPD, LAPF specific information and IP information like source/destination IP address, TCP source port, TCP destination port, and so on in a tabular format
- Any protocol field can be added to the summary view, filtering, and search features providing users more flexibility to monitor required protocol fields
- Option to combine data from multiple columns under one column

Supported Protocols

- LAPF, LAPD, LAPD+IP, LAPX+IP, X.25, Cisco HDLC Protocols

Filtering and Search

- Advanced filtering and search based on any user selected protocol fields
- Real-time capture filter can be set for filtering frames based on frame length

Capturing Streams

- Streams can be captured on the selected time slots (contiguous or non-contiguous), sub-channels or full bandwidth

Export Options

- Exports Summary View information to a comma delimited file for subsequent import into a database or spreadsheet
- Capability to export detailed decode information to an ASCII file

Record/Playback

- Captured frames can later be used for traffic simulation using HDLC Transmit/Receive/Playback application
- Recorded trace files can be played back using HDLC playback option

Remote Monitoring

- Remote monitoring capability using GL's Network Surveillance System

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Summary, Detail, Hex dump, and Statistics Views

The HDLC Analyzer application is invoked from the main menu of GL's **T3/E3/Datacom** Analyzer for real-time analyzer. The analyzer displays summary, detail and hex dump view in different panes. The summary pane displays Frame Number, Time, Length, Error, C/R, SAPI, TEI, CTL, P/F, N(S), N(R), FUNC etc. User can select a frame in summary view to analyze and decode each frame in the detail view. The selected frame is analyzed and decoded according to HDLC frame specifications. The Hex dump view displays the frame information in HEX and ASCII.
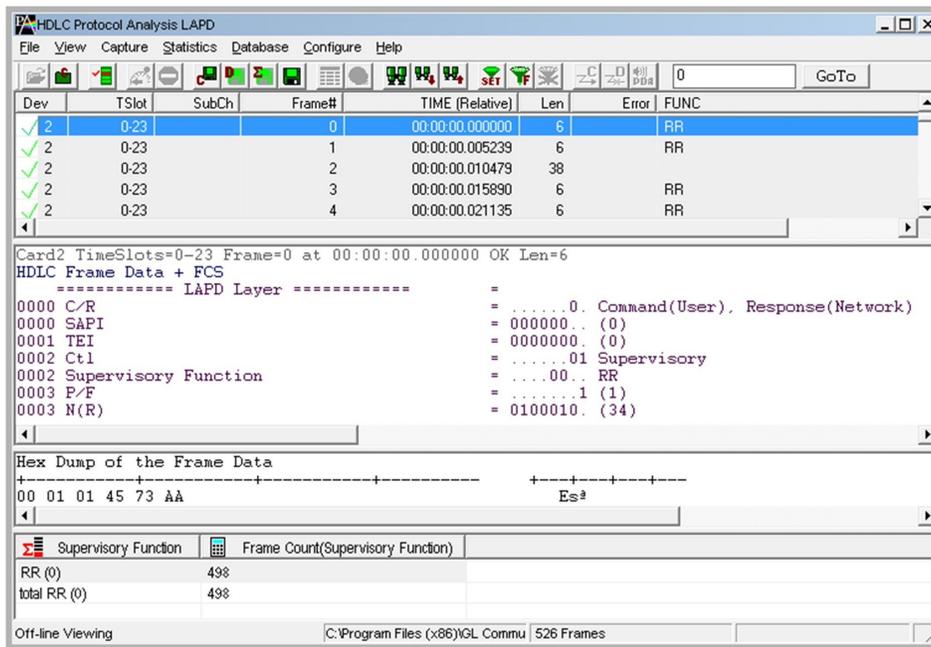
Figure: Summary, Detail, Hex dump, and Statistics Views

Real-time, Remote, and Offline Analysis

User can capture and analyze multiple HDLC links in real-time and record all or filtered traffic into a trace file. The recorded trace file can then be analyzed offline and exported to ASCII file, or printed. Real-time capturing requires user to specify Tx/Rx ports FCS (16 & 32 bits).
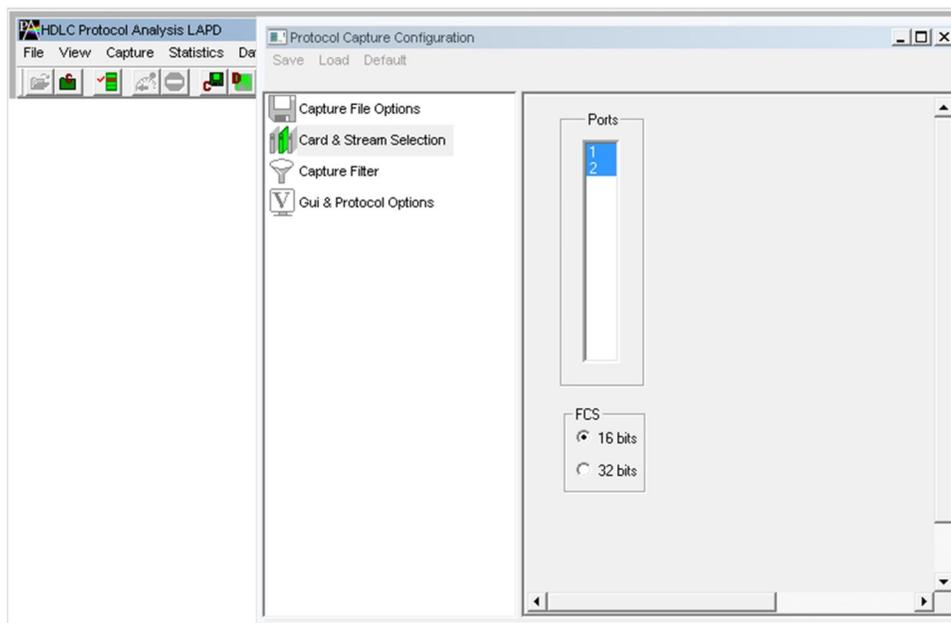
Figure: Stream / Interface Selection

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Enhanced Trace Saving Options

Users can save the captured trace files using different conventions such as trace files with user-defined prefixes, with date-time prefixes, the total number of files, file size, frame count, or time limit. This feature also allows saving only the filtered frames from the capture based on the filtering criteria set using display filter feature.

Filtering and Search

Users can record all or filtered traffic into a trace file. Filtering and search capability adds as another powerful feature to the HDLC Analyzer. This feature can isolate required frames from all frames in real-time as well as off-line

Users can specify custom values for frame length to filter frames during real-time capture. The frames can also be filtered after completion of capture according to CTL, C/R, Modifier Function, N(R), N(S), P, P/ F, SAPI, Supervisory function and TEI. Similarly, search capability helps user to search for a particular frame based on specific search criteria.
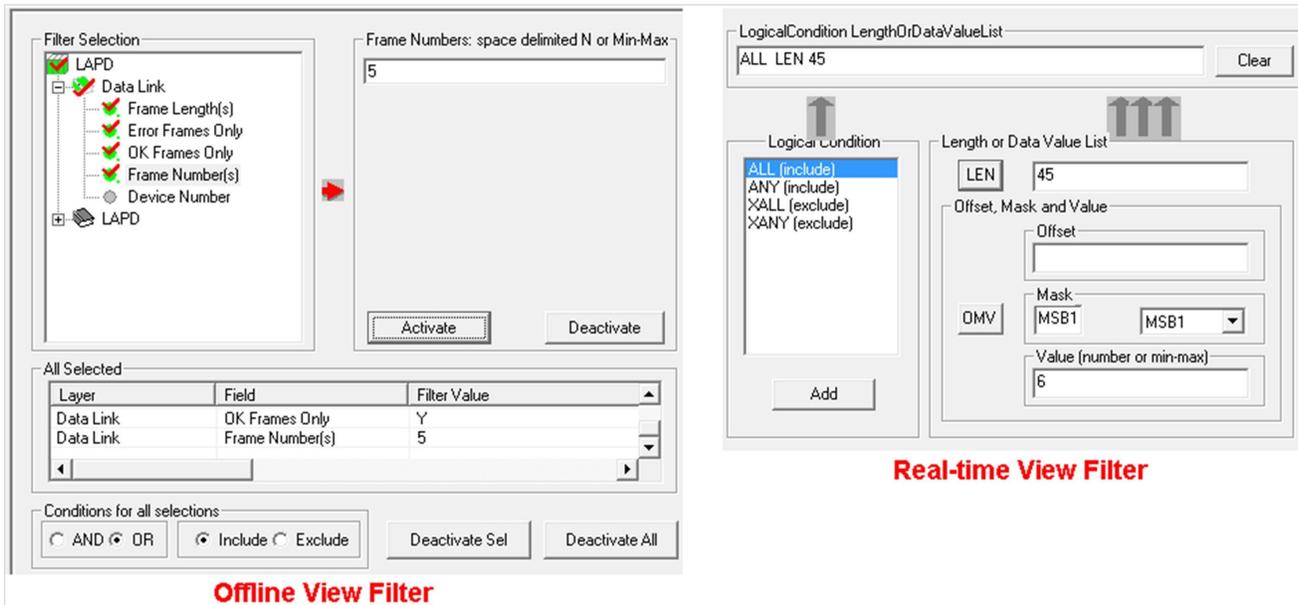

Figure: Real-time and Offline Filter

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Save/Load All Configuration Settings

Protocol Configuration window provides a consolidated interface for all the important settings required in the analyzer. This includes various options such as protocol selection, startup options, stream/interface selection, filter/search criteria and so on.

Any protocol field can be added to the summary view, filtering, and search features from this GUI providing the users more flexibility to monitor required protocol fields.

All the configuration settings can be saved to a file and then loaded for future operations, or user may just revert to the default values using the default option.
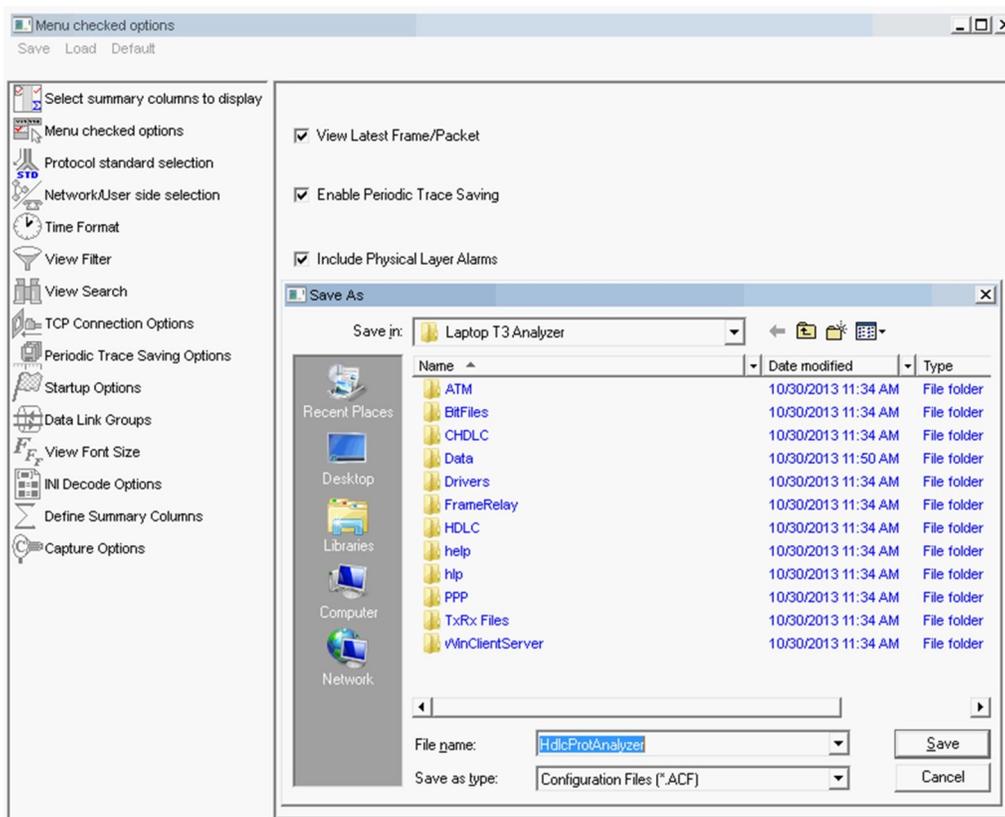

Figure: Save / Load Configuration Settings

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HDLC Playback (Transmit) For Datacom Analyzer

It is used to transmit HDLC frames in the pre-recorded files over Datacom channels. The frames can be transmitted on selected datacom ports (port #1, #2 …). Further, the application also provides the option to reverse or inverse bits in the selected data during transmission.
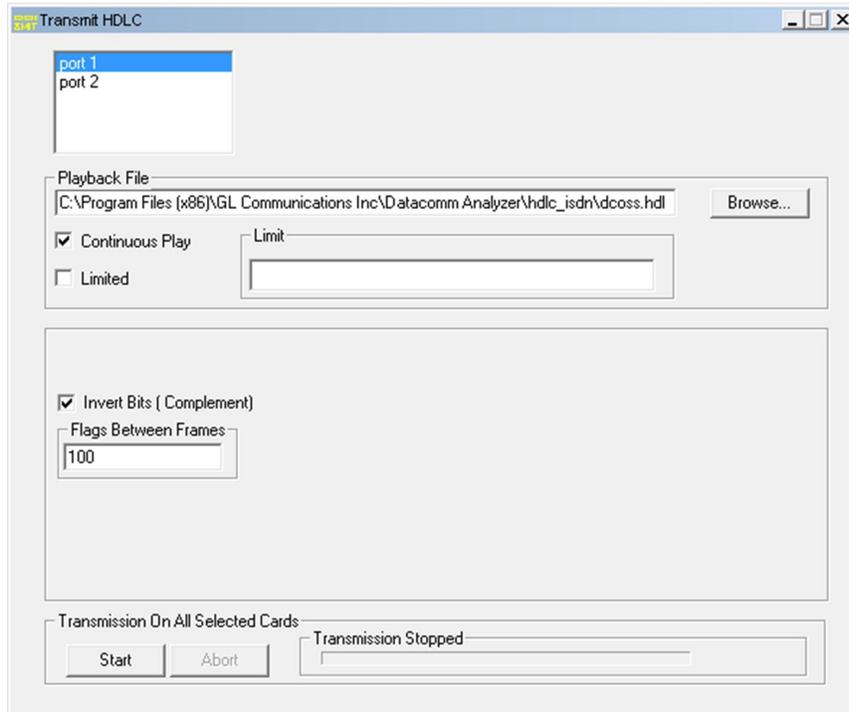

Figure: HDLC Tx and Rx

HDLC Tx/Rx Test for Datacom Analyzer

The HDLC Automated Test System consists of two applications: Transmitter application and Receiver application. Each application has real-time and off-line features. The Transmitter application generates HDLC test frames using special algorithms, transmits them over Datacom ports or records them to an HDL file for subsequent use with other applications. The Receiver application can receive frames in real-time over Datacom or can verify an off-line HDL file for correct frame order and data integrity.
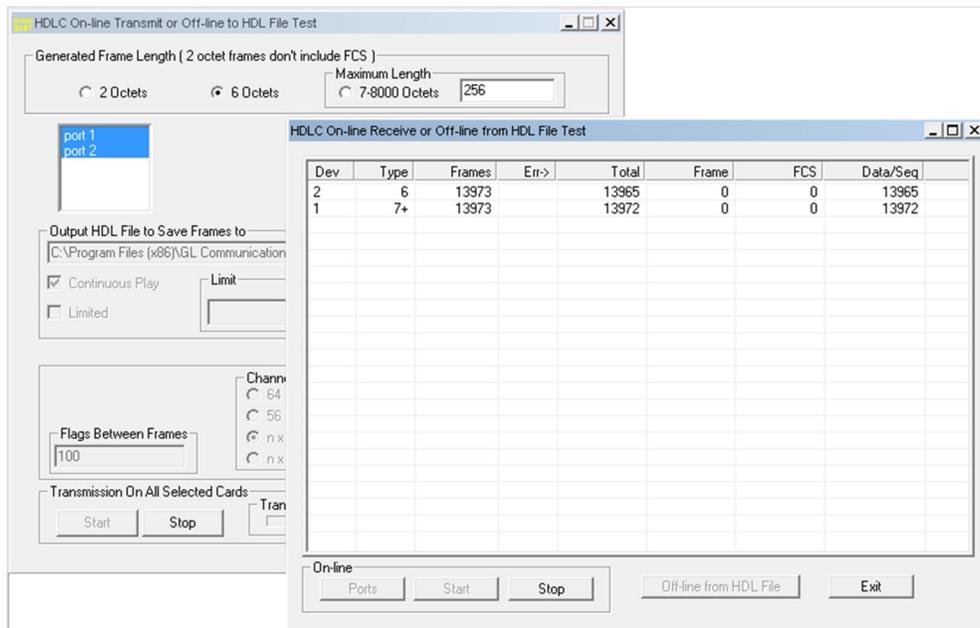

Figure: HDLC Transmit and Receive

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HDLC Playback (Transmit) For T3E3 Analyzer

USB T3/E3 **HDLC Transmit** is an optional application designed used to transmit HDLC frames in the pre-recorded files over T3/E3 stream. It can transmit HDL files by creating streams on each card (port #1, #2 and so on).

It can transmit HDLC files continuously (repeated transmission of a single file) or only once (without loss) through the T3 (DS3) /E3 stream. Limited file transmission based on Frame Count, i.e., by mentioning the number of frames to be transmitted (dependent on file size) is also possible.
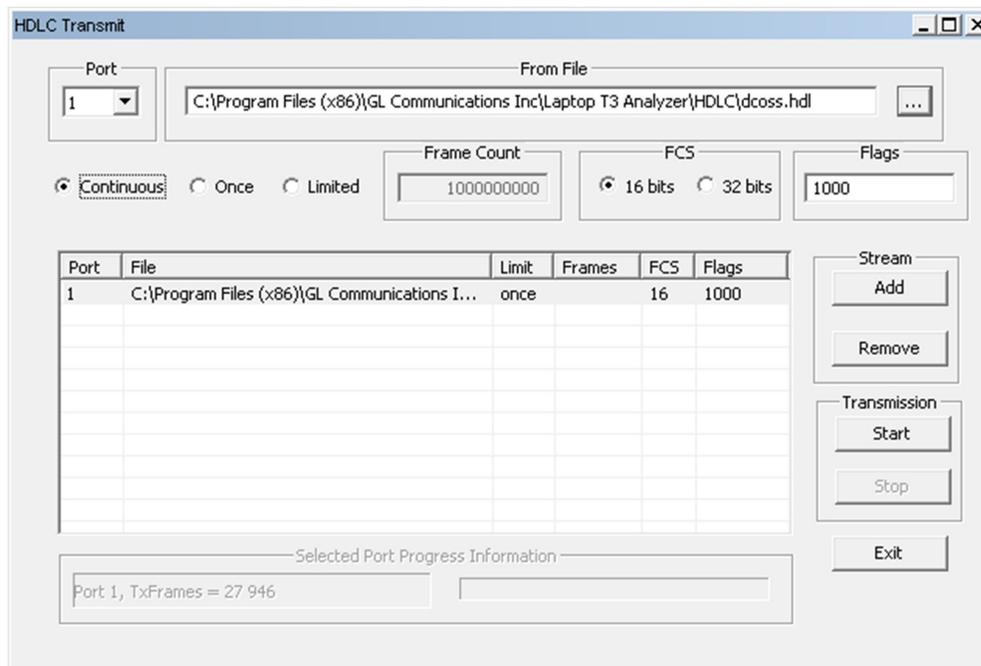
Figure: HDLC Tx and Rx for T3E3 Analyzer

HDLC Tx/Rx Test for T3E3 Analyzer

USB T3/E3 HDLC Test Optional Application is designed to transmit and receive HDLC frames over unstructured T3/E3. It generates frames in memory and fills them with 64 bit sequential integer numbers. The number is either truncated if the frame length is less than 8 bytes or the same number bytes are concatenated to make up the complete frame. At the end of each frame a Frame Check Sequence (FCS) is generated to verify the data integrity on the receive side. The FCS (also knows and cyclic redundancy check CRC) is calculated using a polynomial.
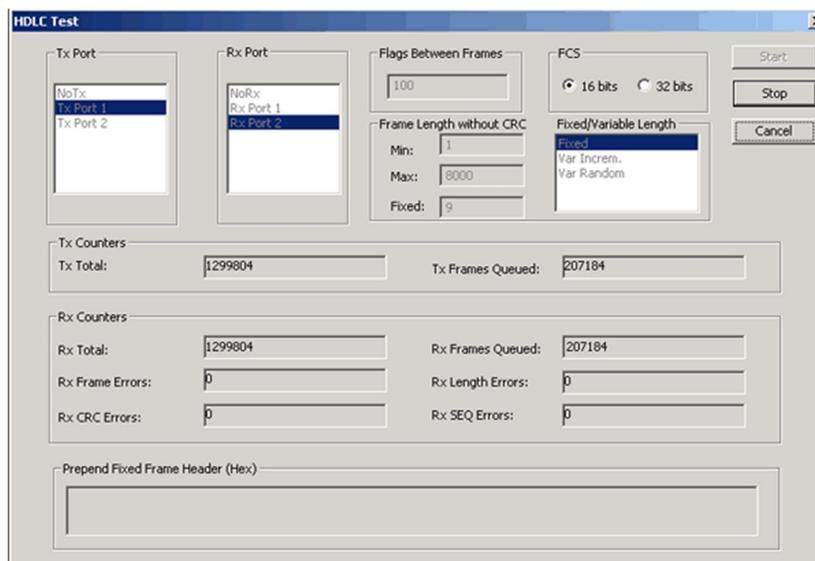
Figure: HDLC Tx and Rx Test

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Automated HDLC Testing using Client-Server

The File based HDLC Record/Playback (Hdlcfunc) module is an optional application that allows HDLC Traffic Capture/Playback. It also allows transmission/reception of *.HDL frames files located on the server and on client. For details, visit File based HDLC Record/ Playback webpage.

The HDLCTerr module performs multi-channel HDLC emulation and analysis. It permits frame error testing and transmission of memory generated sequences of fixed or variable length HDLC frames, GL *.HDL Trace file frames, and various bandwidth streams.

The HDLCHpio module performs file–based HDLC record and playback actions. It permits receive / transmit of HDLC streams of various bandwidth (hyper channel, timeslot, and multiple sub-channel streams per timeslot). For details, visit HDLC Frames Encode/Decode and Error Testing webpage.

Supported Protocol Standards

The supported protocol standards in HDLC analyzer are LAPF, LAPD, LAPD+IP, LAPX+IP, X.25, Cisco HDLC Protocols.

Supported Protocols	Specification Used
LAPD	CCITT Q.920/921
LAPF	ITU-T Q.922
IP	RFC 791
TCP	RFC 793
UDP	RFC 768
ICMP	RFC 792
STUN	RFC 3489
DNS	RFC 1035
DHCP	RFC 1533, 2131
HTTP	RFC 2616
FTP	RFC 959
SNMP	RFC 1157,1155,1902,3416,2863,2578,3418,2011,2012 etc
Cisco HDLC	http://www.protocols.com/pbook/bridge.htm#CISCOROUTER
ARP	RFC 826
LAPB	ITU-T Recommendation X.25

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Buyer's Guide

Item No	Product Description
XX090	T1/E1 Real-Time HDLC Decode/Store/Impairment/Rx-Tx Test Applications
OLV090	Offline HDLC Protocol Analyzer

Item No	Related Software
XX600	Basic Client/Server Scripted Control Software (Included with Basic Software)
XX640	File based HDLC Record/Playback
XX641	File based HDLC Remote Record/Playback
XX634	Multi-Channel HDLC Emulation and Analysis & File based High Throughput HDLC Record/Playback

Item No	Related Hardware
TE3001	Portable (USB) Dual T3 E3 / T1 E1 Hardware Unit – requires TT3001 or EE3001
PTE025	Data Communications Board for Interfaces RS-232, RS-449, EIA-530, V.35, and many others
PTE001	tProbe™ Dual T1 E1 Laptop Analyzer (Require Basic Software)

For more details, refer to T3/E3 Datacom HDLC Protocol Analysis webpage.

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