

# **OTX T1/E1 Analyzer User's Guide**

**Doc. No. 1412-1-SAA-1011-1**

**Rev. 1.3**



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# 1 Welcome to the OTX T1E1 Analyzer

The OTX T1E1 Analyzer is a software package for analysis of E1, T1, and J1 spans designed to integrate with the industry award-winning Odin Telecom framework (OTX) family of hardware products. The OTX T1E1 Analyzer provides a feature-rich and complete set of tools for low level T1, E1, and J1 analysis. Also it supports add-on modules such as Record and Playback of individual timeslots, Bit Error Rate Testing (BERT), and HDLC transmission and reception.

## 1.1 About this Manual

This manual describes how to use the OTX T1E1 Analyzer software product by Odin TeleSystems.

## 1.2 Introduction

The OTX T1E1 Analyzer software package consists of a base program and several add-on modules which are sold separately. The base program offers basic T1/E1 Analysis functions such as Line and Framing Status, Timeslot Display of received data, Oscilloscope Viewer, Spectrum Analyzer, and ABCD bit signaling access.

The following add-on modules are available:

- **Record/Playback.** Recorded data can be viewed in a hexadecimal spreadsheet form, or as a waveform in an oscilloscope display. The playback module supports playback of multiple formats, such as raw binary, or wav format.
- **BERT.** The BERT module features transmission and reception of a variety of common bit patterns, and the auto-detection feature of a test pattern makes BERT testing a simple and easy-to-use operation. The graphical interface is designed to provide a comprehensive view of the status of multiple T1 and E1 spans; possibly hosted by multiple OTX boards.
- **HDLC.** This module provides HDLC encoding (from hex values) and HDLC decoding (to hex values) on one or more timeslots.

This section introduce us how this tool can be used as a monitor (connected passively high-z or via a monitor port), or as a simulator (terminating the span with 100/120 or 75 ohm). Also it describes clocking options and their influence on the result of the analysis.



## 2 System Requirements

This section describes operating systems and OTX boards we support.

### 2.1 Supported Operating Systems

The software is supported by the following operating systems:

- Windows 2000
- Windows XP
- Windows 2003 Server
- Windows Vista
- Windows 2008

### 2.2 Supported OTX Boards

This section describes which OTX boards are supported by the software package.

- Sleipnir-1-PCI-Plus – half-size PCI card with 1 T1/E1/J1 interface
- Thor-2-PCI-Plus – half-size PCI card with 2 T1/E1/J1 interfaces
- Thor-2-PCI-Express - half-size PCI-Express card with 2 T1/E1/J1 interfaces
- Thor-4-PCI-Plus – full-size PCI card with 4 T1/E1/J1 interfaces
- Thor-8-PCI-Plus – full-size PCI card with 8 T1/E1/J1 interfaces
- Gimle-16-PCI-Plus – full-size PCI card with 16 T1/E1/J1 interfaces (receive only)
- Gimle-16-PCIe – full-size PCIe card with 16 T1/E1/J1 interfaces (receive only)
- Thor-2-ExpressCard – ExpressCard/54 card with 2 T1/E1/J1 interfaces
- Thor-2-PCMCIA (PRO/EX/CST variants) – PCMCIA card with 2 T1/E1/J1 interfaces
- Alvis-4-CSI - complete stand-alone processing system with 4 E1/T1s (both transmit and receive), Ethernet and USB
- Alvis-4M-CSI - complete stand-alone processing system with 4 E1/T1 receivers, Ethernet and USB
- Alvis-8-CSI - complete stand-alone processing system with 8 E1/T1s (both transmit and receive), Ethernet and USB
- Alvis-8M-CSI - complete stand-alone processing system with 8 E1/T1 receivers, Ethernet and USB.

At least one of these boards needs the OTX Driver installed before the OTX Analyzer will start.

Note that the OTX T1E1 Analyzer supports multiple OTX boards in the same system.





## 3 Getting Started

This section describes the basic steps to get started with the OTX T1E1 Analyzer.

### 3.1 Hardware Installation

The first step is to install the OTX hardware boards from Odin TeleSystems. The OTX T1E1 Analyzer supports multiple OTX T1/E1/J1 boards. For a list of supported boards please see chapter “2.2 Supported OTX Boards”.

Please refer to the Hardware Installation Guide for the specific board (or boards) that you will be using with this software package.

### 3.2 Software Installation

The installation procedure for OTX T1E1 Analyzer software is described in the “OTX-T1E1-Analyzer-InstallationGuide.pdf” file (OTX T1/E1 Analyzer Installation Guide Doc. No. 1512-1-SAA-1011-1) located in the Doc subdirectory of the installation media.

#### 3.2.1 License

To successfully run the OTX T1E1 Analyzer you should have a license (.LIC file) for T1E1 Analyzer, OtxRawEx, OtxHdlcEx and OtxBertEx modules in the directory of installed software. It is available in separate files or in one file (software version 2.5.6 and later). Please contact Odin's re-sellers to get the license.

### 3.3 Remote Access to the Alvis-CSI board

This section describes how to access the Alvis-CSI board via the OTX T1E1 Analyzer remotely.

This feature starts up automatically in a case of Local driver absence (the OTX Hardware is not connected to the PC). Or, if run OTX T1E1 Analyzer with “/connection” option you will see the following “Driver connection setup” window (Figure 1):

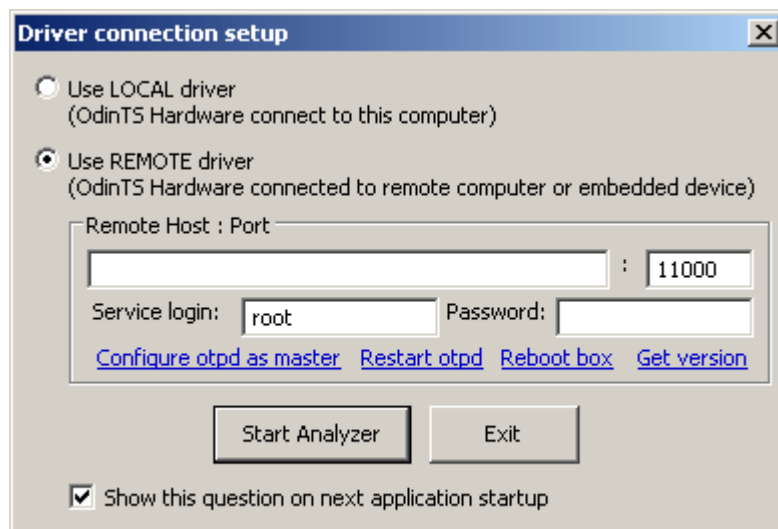


Figure 1

### 3.3.1 Needed tools

To use Remote Driver the Alvis-CSI board should have:

1. OtxDaVinci.ko driver (version 2.41.1.0 or later).
2. Otpd with support of the RemoteDrv connection (version 20091203 or later).
3. Installed Add-on “otpd-addon-1.0.2.tar.gz” for remote configuration.

The Win32 client side should have OTX API (version 2.41.1.0 or later) with support of the RemoteDriver (API and DLL\LIB).

### 3.3.2 The Alvis-CSI preparation

1. Make sure that you use firmware version 1.8.2 or later.
2. Make sure that you do not use Asterisk®, otxdahdi, etc.
3. Install the “otpd-addon-1.0.2.tar.gz” Add-on.
4. Install the latest OtxDaVinci.ko and otpd.
5. Load the latest driver and start otpd daemon via OTX T1E1 Analyzer or simply run otpd.

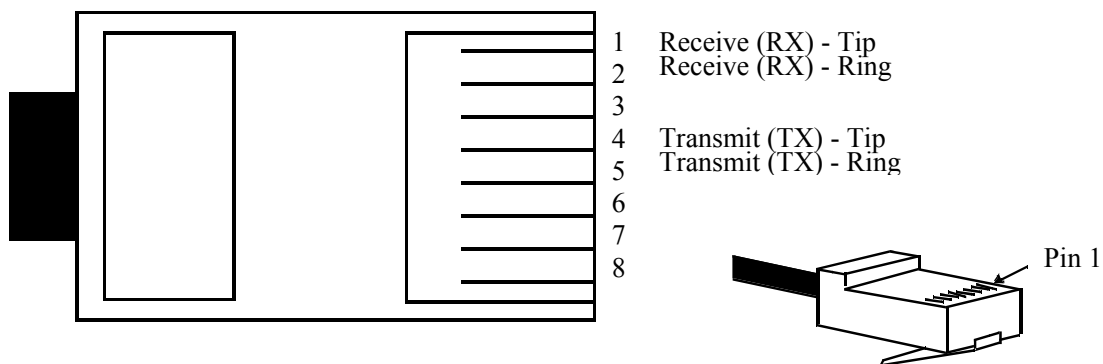
### 3.3.3 Running the remote connection

1. Make sure that Alvis-CSI and PC with OTX T1E1 Analyzer are connected to the network without firewalls.
2. Start the OTX T1E1 Analyzer with switch “/remote”.
3. Select “Use REMOTE driver” option in “Driver connection setup” window and input IP-address of the Alvis-CSI. Leave port number “11000” by default (Figure 1).
4. Make sure that otpd on the Alvis-CSI is running and waiting for connections. If any doubts you can restart otpd by clicking “Restart otpd” link.
5. Click “Start Analyzer” button to run the remote connection.

### 3.4 Connecting the E1 or T1 spans

The OTX T1/E1 hardware connects to the T1/E1 spans via RJ45 connectors. These connectors are either placed directly on the back of the board (like in the case of Thor-2-ExpressCard and Sleipnir-1-PCI-Plus boards), or the connector is placed in a harmonica (like in the case of the OTX PCI boards) or dongle (like in the case of the OTX PCMCIA boards) that connects to the OTX board via an Odin supplied cable.

The pinout for the RJ-45 connector is shown below:



The receive pair is located on pins 1 and 2.

The transmit pair is located on pins 4 and 5.

### 3.5 Configuring the Analyzer

Please configure each Li for the proper T1 or E1 Layer setting.

Also you should configure the correct clock source option in order to avoid slips.

### 3.6 Example Session – Layer 1 Configuration and Verification

This is an example of how to start an E1 recording session with the OTX T1E1 Analyzer using a Thor-4-PCI-Plus board.

#### 3.6.1 Starting the OTX T1E1 Analyzer and connecting E1 spans

Connect the appropriate E1 spans that you want to record to the appropriate Li RJ-45 connectors of the card, dongle or harmonica. In this case we are using a Thor-4-PCI-Plus card, so we connect the E1 span to Li0.

Start the OTX T1E1 Analyzer (“Start => All Programs => OTX => T1E1Analyzer”). The main application window is shown in Figure 2.

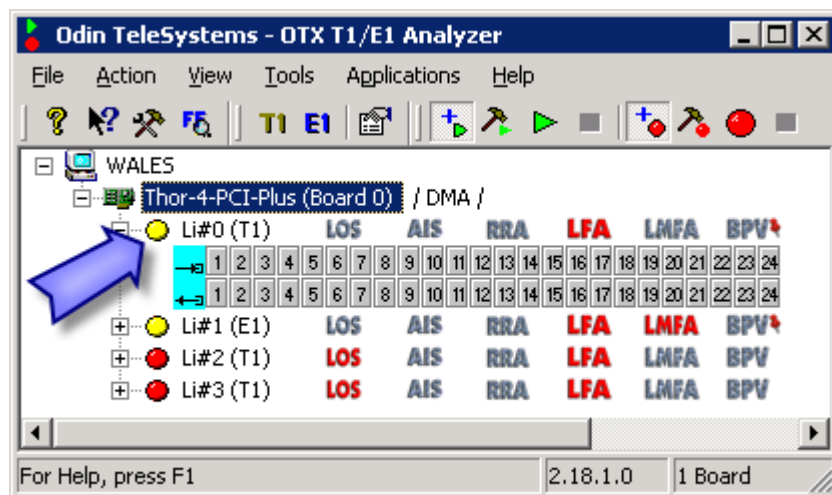


Figure 2

In this example we note that the Layer 1 status is not ok, since the status LED is yellow (see the callout arrow in Figure 2). Yellow is an indication of that the Li has some sort of electrical signal, but it can not frame to this signal. When Layer 1 is configured correctly and matching the configuration of the E1/T1 span then this LED is green.

The application stores configuration of the previous run, so it remembers previously used T1 mode for Li0.

Also we can see that Li2 and Li3 have red LEDs which are an indication of Loss Of Signal. In this example these Lis are not connected to any E1 or T1 spans, thus they both have a Loss of Signal condition.

So to fix this problem we need to switch Li to E1 mode. Here is how it can be done.

In Figure 2 the “Thor-4-PCI-Plus (Board 0)” label is filled blue. This means that the active scope is at the Board level. To switch all of the Li’s to E1 mode we just have to click the “E1” button on the toolbar. However, in this example we want to switch Li0 to E1 mode, but leave Li2 and Li3 in their current mode (T1). Therefore we need to click on the “Li#0 (T1)” label just the right of the yellow LED to change the scope to Li0. At this point we can position the mouse over the “E1” button on the toolbar (Figure 3) or select the “E1 Mode” menu item from the right-click context menu (Figure 4).

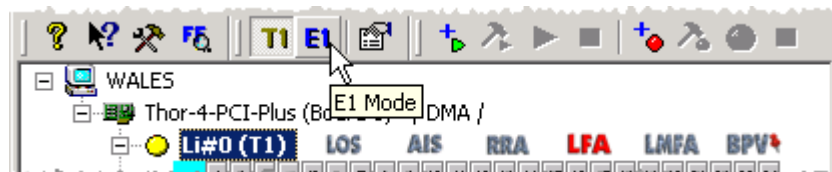


Figure 3

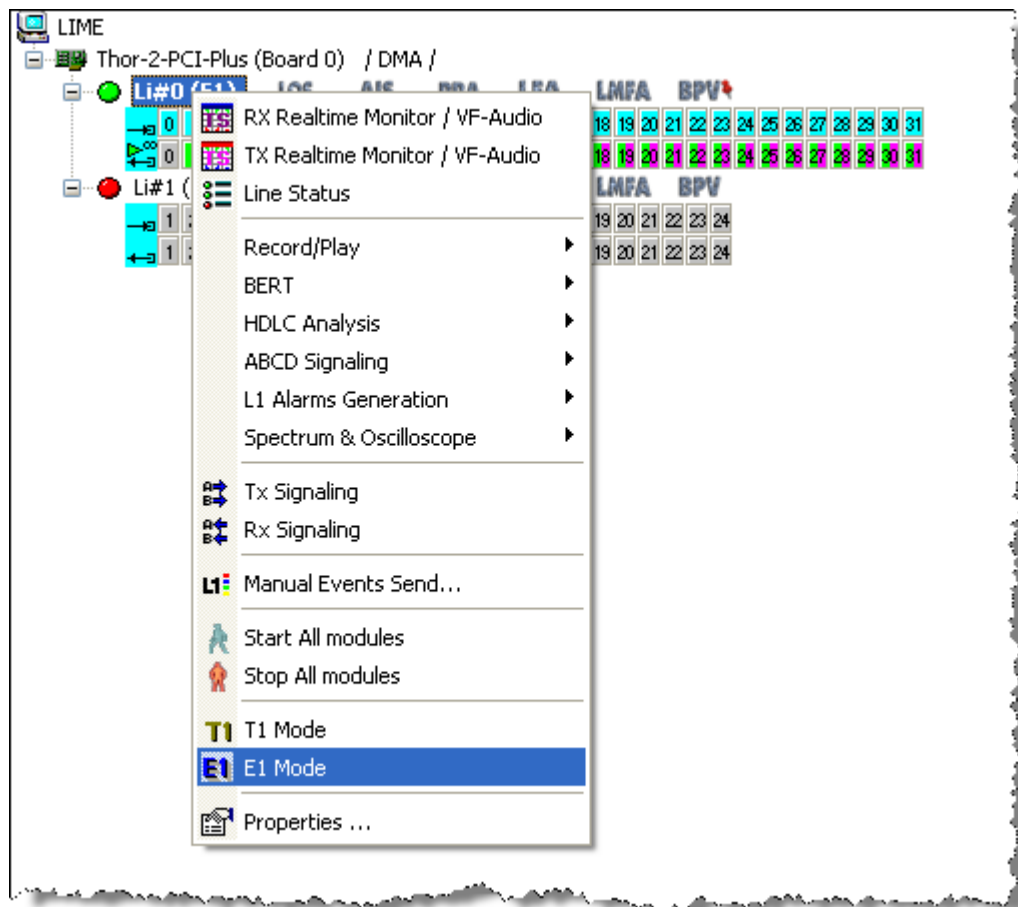


Figure 4

Please note that now we have a green LED and 32 timeslots instead of 24 (Figure 5).



Figure 5

### 3.6.2 Checking the Line Status

If we do not get the green Layer 1 status LED, we should analyze the Layer 1 status window and review the Layer 1 configuration parameters for this Li.

Choose “Application => Line Status” from the main menu (Figure 6):



Figure 6

In the Line Status window we can see if we have received any Loss of Signal events, Alarms, or Bipolar violations (Figure 7). This window also displays the Error Counters (Figure 8) and the Frequency of the span (Figure 9).

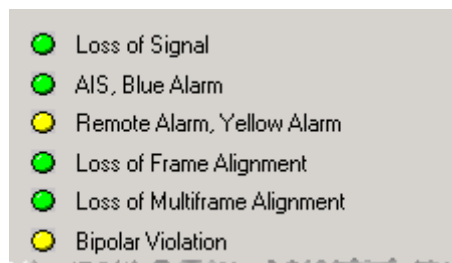


Figure 7

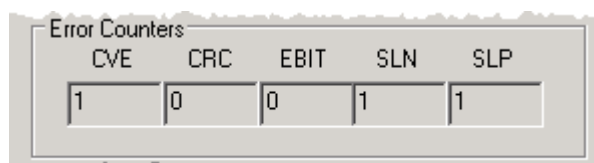


Figure 8

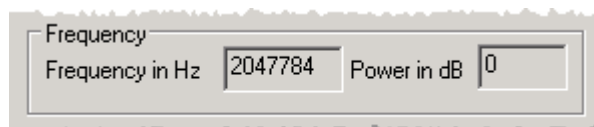


Figure 9

As we can see in Figure 7 we have also a history of Remote Alarm and Bipolar Violation. These errors could occur while we were connecting the E1 span. This is normal. As illustrated in Figure 8, we have received one Positive Slip (SLP) and one Negative Slip (SLN). These slips could occur while the device was trying to synchronize with the incoming span after we have connected the E1 span. To clear the history press the “Reset History” button (Figure 10).

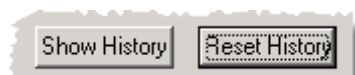


Figure 10

Verify that all LEDs in Figure 7 turned to a green color and the Error Counters in Figure 8 are remained at zero. If this condition is not achieved, the Layer 1 configuration needs to be checked and possibly modified that described below.

### 3.6.3 Configuring the Layer 1

To review the Layer 1 configuration parameters for Li0 please right-click on the “Li#0 (E1)” label and select “Properties” menu option (Figure 11). The Properties window will appear (Figure 12).



Figure 11

Note that the Properties window can also be opened from the toolbar or from the main menu.

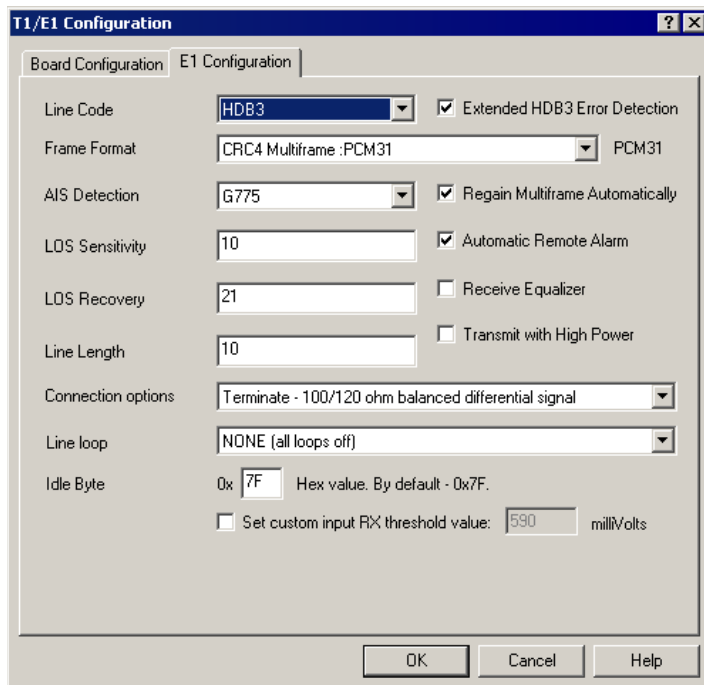


Figure 12

In the Properties window select the “E1 configuration” tab to check settings such as Line Code (Figure 13), Framing Format (Figure 14), Termination mode and Line Loop (Figure 15).

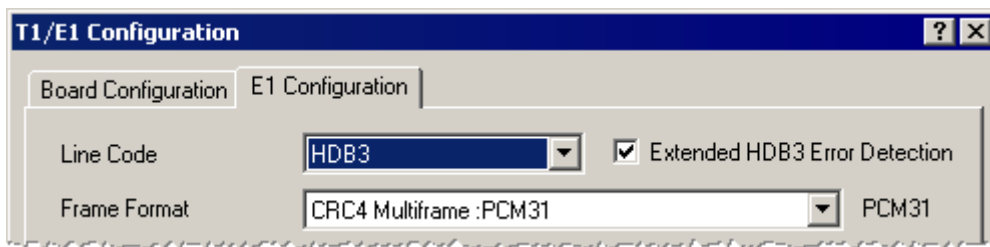


Figure 13

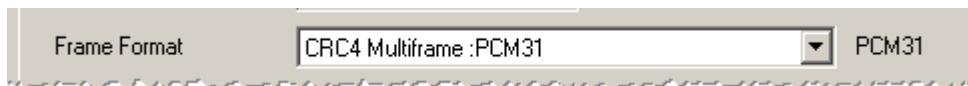


Figure 14

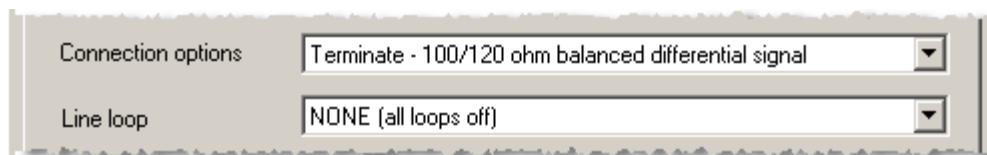


Figure 15

### 3.6.4 Checking the Clock Source Settings

Next step is to check that we have configured the board with the proper Clock Source settings. The wrong settings would result in Positive or Negative Slips events (Figure 8). One end of a T1 or E1 span should be configured as a clock master and the other as a clock slave. In our case we want to configure Li0 as a clock slave what means that Li0 will recover its clock from the incoming E1 span. To verify that we have Li0 configured as a clock slave click label “Thor-4-PCI-Plus” to move the scope of the actions to the board level (Figure 16).



Figure 16

Then select “Action => Properties” option in the main menu (Figure 17).



Figure 17

Verify that the Clock Source is set to “Slave Line 0” and the “Use Burst Device for Analysis application” check box option is checked (Figure 18).

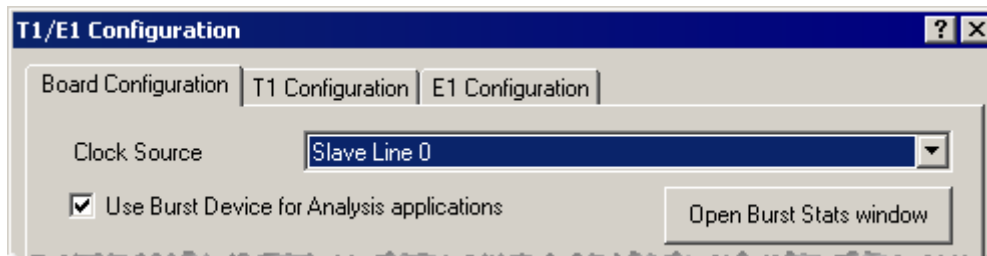


Figure 18

These actions complete the Layer 1 configuration and verification.



### 3.7 Example Session – Recording

#### 3.7.1 Preparing for recording

Before going any further, please make sure that Layer 1 is set up correctly.

The Alarms (Figure 7) and the Error Counters (Figure 8) should not be changed during the recording; otherwise there is a problem with the Layer 1 configuration. Then you should review and modify the Layer 1 configuration and try to record again.

You should reset the history (Figure 10) to clear old Alarms and Error Counters for each span (Li) that you want to record.

Select “Enable Recording” for each span that you want to record (Figure 19).

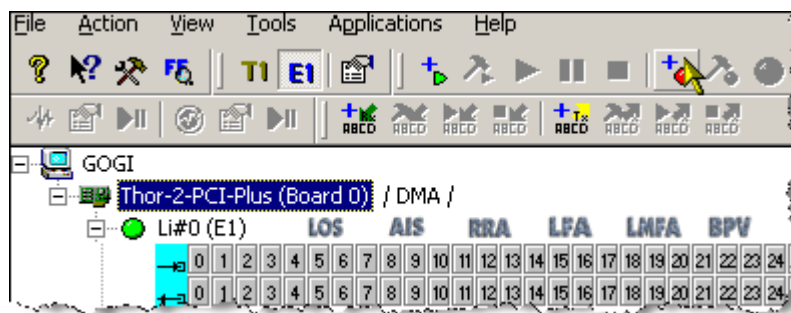


Figure 19

Select the board level as the scope of operations. Open the “Setup Recording” by right-clicking on the board (or use the icon on the toolbar) to setup and to activate all Lis together (Figure 20).

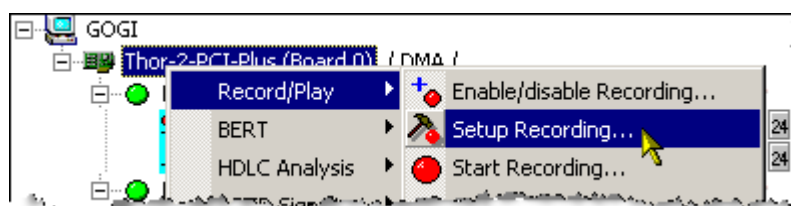


Figure 20

Select all timeslots in the check box list by clicking “Select All” button (Figure 21 **Error! Reference source not found.**). Select the File Type “Binary file” in the drop down list and type the name of the recording file in the “Capture File” field. Then click “OK” button (Figure 22).

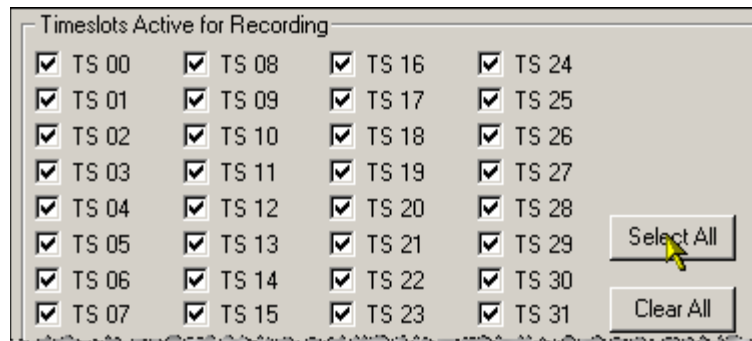


Figure 21

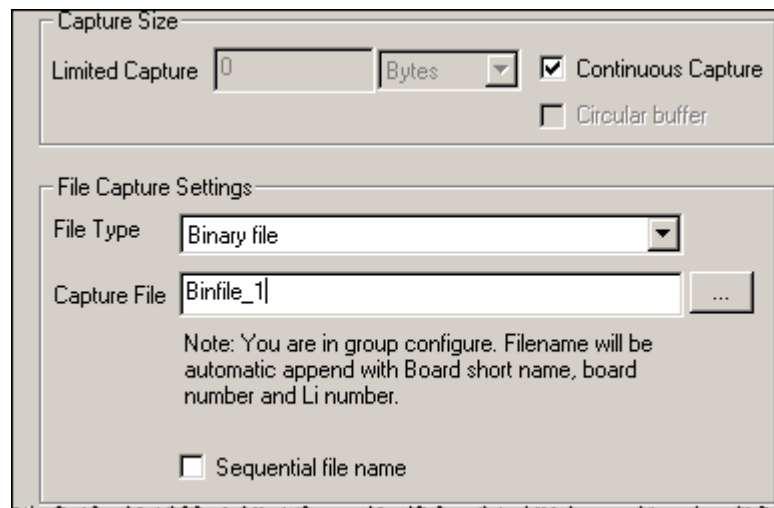


Figure 22

Please note that the color of active scope for recording timeslots turned red (Figure 23).

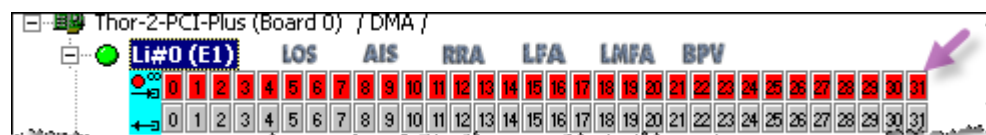


Figure 23

### 3.7.2 Recording

To start the recording session, select “Start Recording” by right-clicking on the board level label or clicking on the appropriate icon on the toolbar (Figure 24).

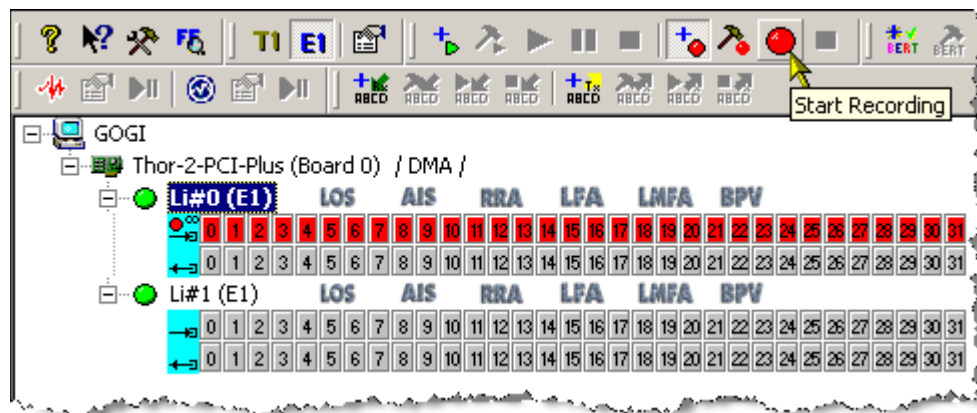


Figure 24

### 3.7.3 Stopping the recording

Before stopping the recording, please verify that the recording time has appeared for each span (Li) you asked to record (in Figure 25 – marked with an arrow).

To stop the recording session, select “Stop Recording” by right-clicking on the board level label or clicking on the appropriate icon on the toolbar (Figure 25).

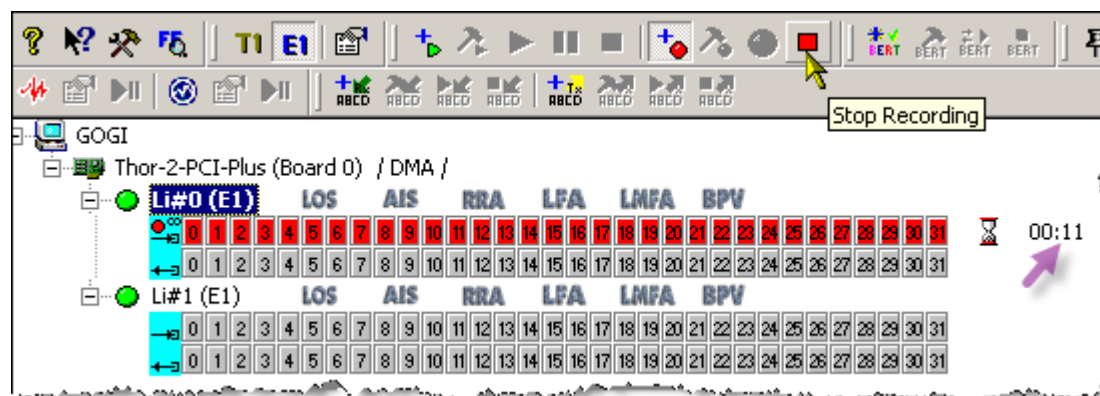


Figure 25

### 3.7.4 Viewing the recorded data

Now it is time to view the recorded data. Choose “Tools => Recorded Data Viewer” option in the main menu as shown in Figure 26.

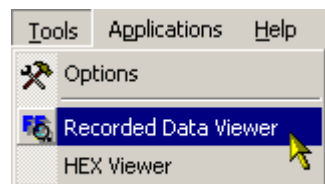


Figure 26

In the Recorded Data Viewer window go to the “File => Load” option (Figure 27) and then choose the file you have just recorded.

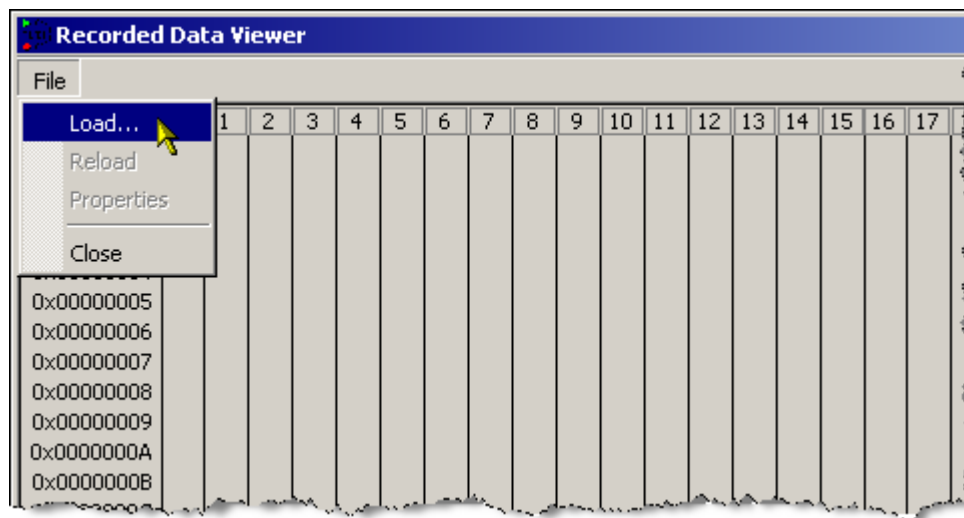


Figure 27

Now you can see the recorded data in accordance with timeslots (Figure 28).

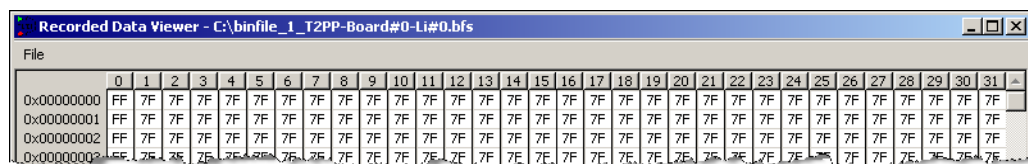


Figure 28

## 3.8 Example Session – Playback

### 3.8.1 Preparing for playback

Select “Enable Playback” for each span you want to playback (Figure 29).

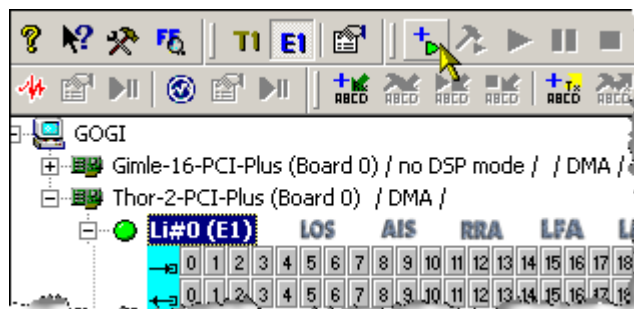


Figure 29

Select the board level as the scope of operations. Open the “Setup Playback” by right-

clicking on the board (or use the icon on the toolbar) to setup and activate all Li's together (Figure 30).

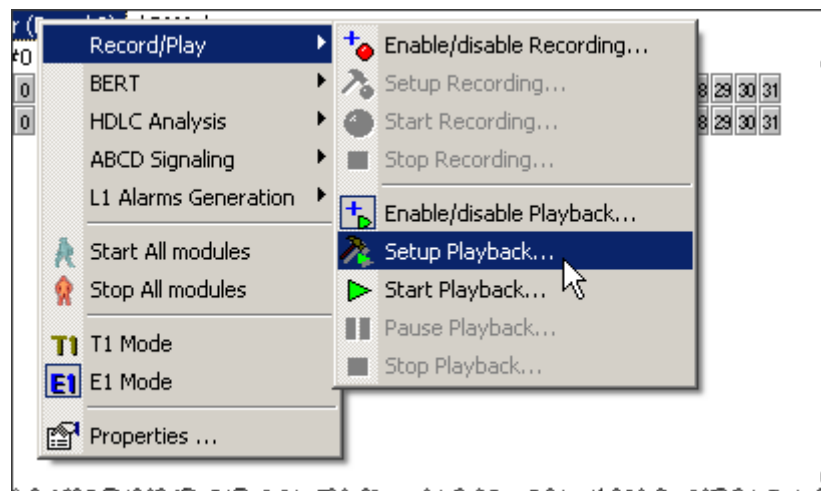


Figure 30

Select files for playback by clicking the “Add” button. Select any raw file (for example, text file) by choosing “All files” in the “Files of type” combo-box in the “File Load” dialog box (Figure 31). Note that .xspf and .pcap formats are read-only.

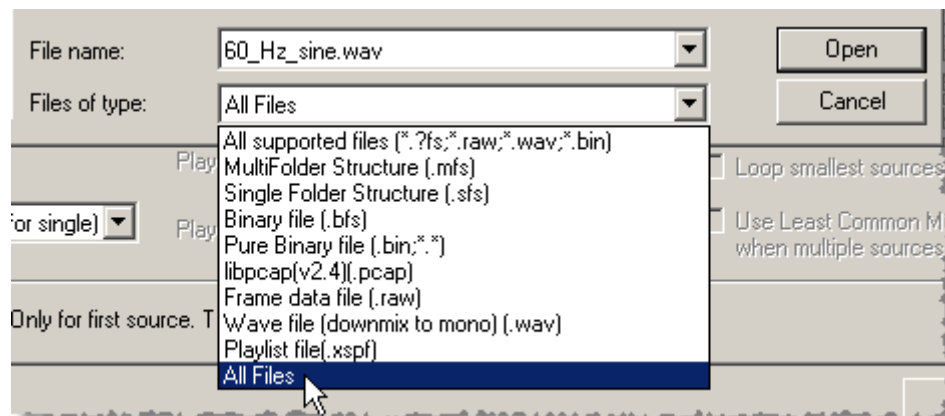


Figure 31

You can select sound files (\*.wav) if the sound card is installed on your PC.

To add data for playback in timeslot, click on the “Raw data” or “Wave data” for the data you want to add and then check the check-box corresponding to the timeslot (Figure 32).

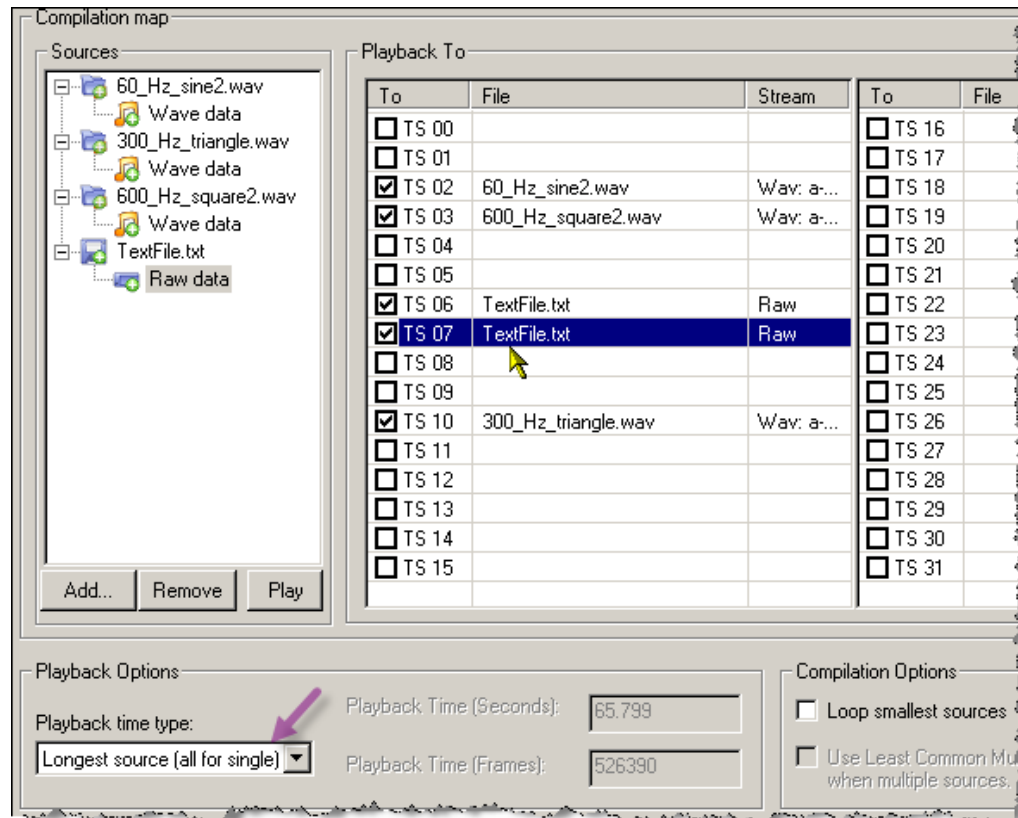


Figure 32

You can select “Playback time type” (Figure 32 – marked with an arrow): longest source, loop mode or you can adjust time manually (Figure 33).

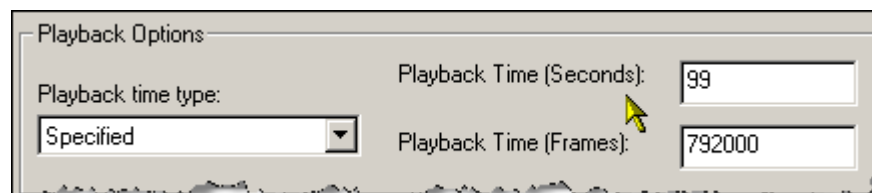


Figure 33

Please note that the color of active for playback timeslots turned green (Figure 34 – marked with an arrow).



Figure 34

### 3.8.2 Playback

To start the playback, select “Start Playback” on the toolbar (Figure 35).

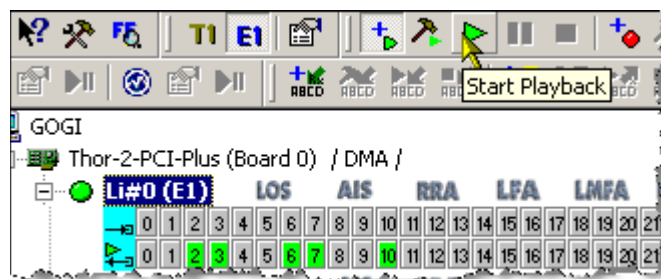


Figure 35

Now you can see the compilation window for some time depending on the length of your compilation (Figure 36). When it disappears, the playback starts. You can see the progress bar and a figure expressed as a percentage showing the played part of the compilation (Figure 37– marked with an arrow).

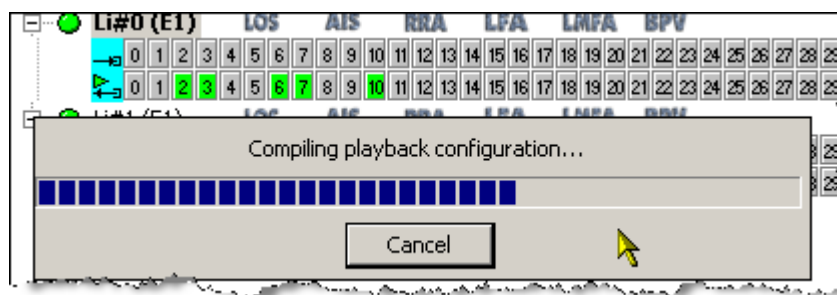


Figure 36



Figure 37

### 3.8.3 Stopping the playback

There are two options to stop the playback.

The playback stops when the compilation is finished (provided that the loop mode is not selected in the “Playback Time Type”) (Figure 32 – marked with an arrow).

Playback may be stopped manually by clicking on the appropriate icon on the toolbar (Figure 38).

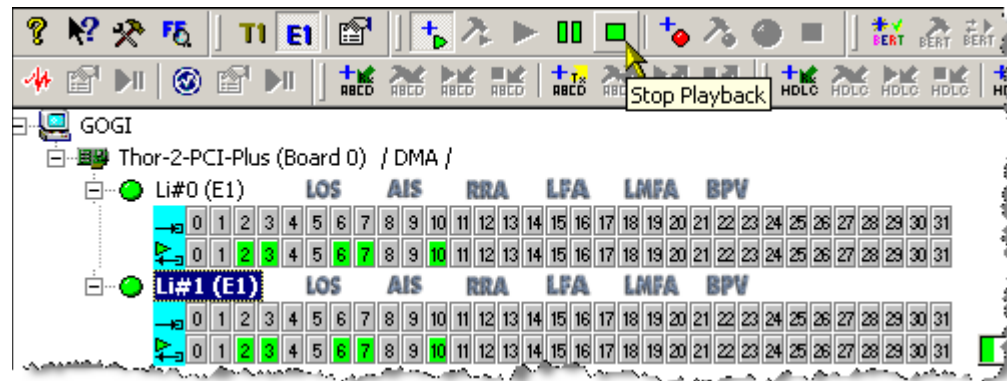


Figure 38

To pause the playback, right-click on the board/span level or click on the appropriate icon on the toolbar (Figure 39).

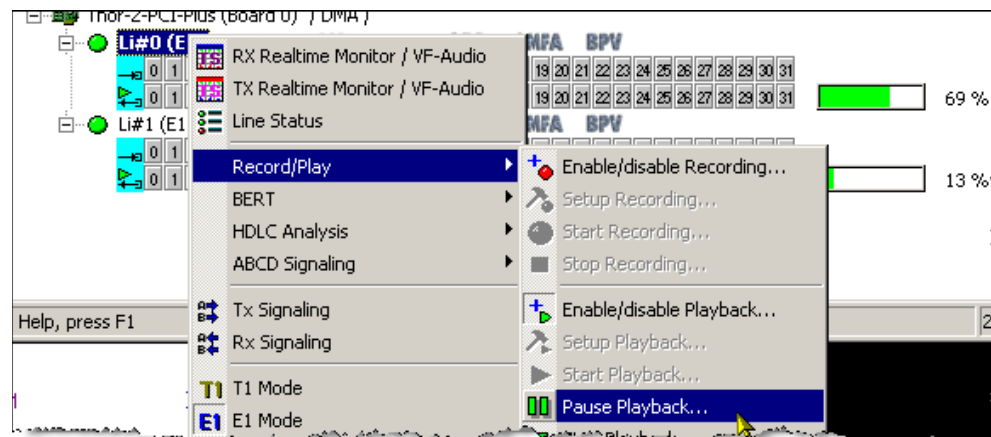


Figure 39

## 3.9 Example Session – BERT

### 3.9.1 BERT Setup

Plug loop cable between two spans you plan to use.  
Select “Enable BERT” for each connected span (Figure 40).



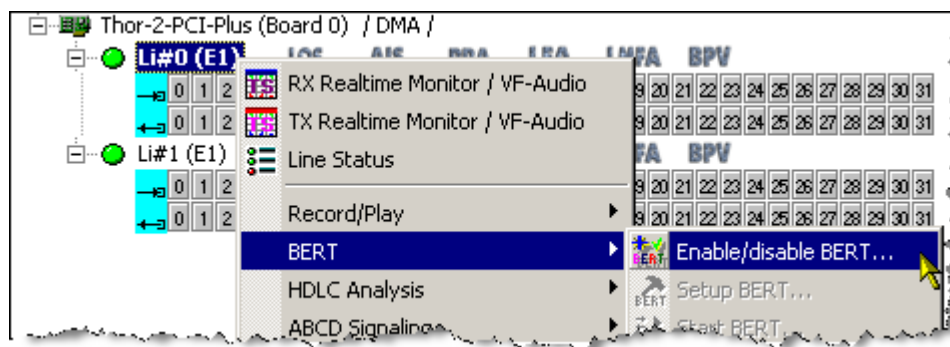


Figure 40

Select the board level as the scope of operations. Click on the “BERT Setup” icon on the toolbar to setup all spans together (Figure 41).

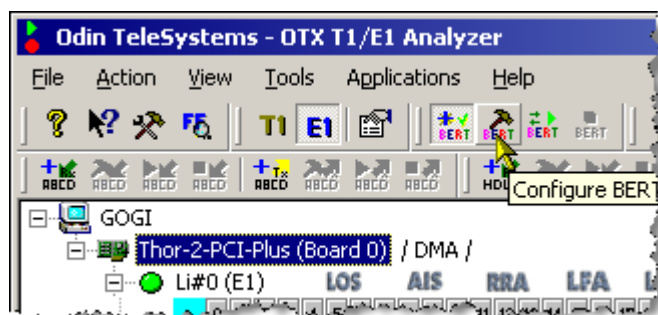


Figure 41

Select the bit pattern (Figure 42) and active timeslots by clicking on the “TS Selection” button (Figure 43).

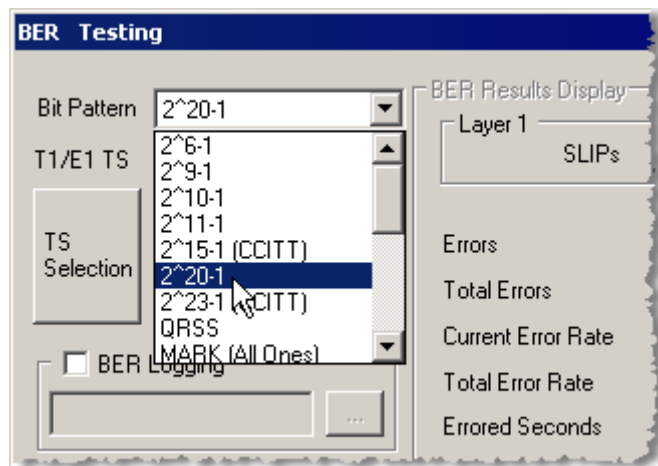


Figure 42

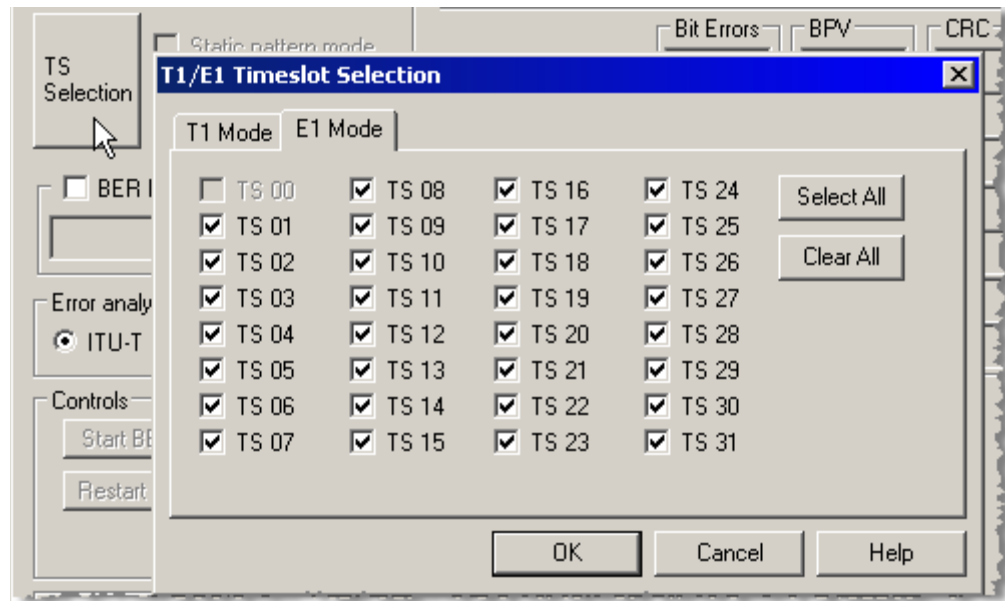


Figure 43

After finishing the set up click the “Save setup” button.

Please note that the color of active for BERT timeslots turned ice green (Figure 44).

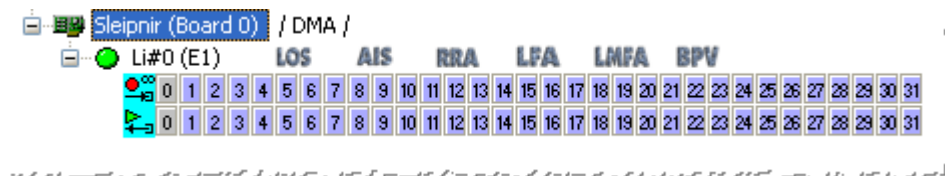


Figure 44

### 3.9.2 BER Testing

Select the board level as the scope of operations. Start up the BER Testing on all spans simultaneously by clicking the corresponding icon on the toolbar (Figure 45).

The BERT should run on both spans connected by the loop cable.

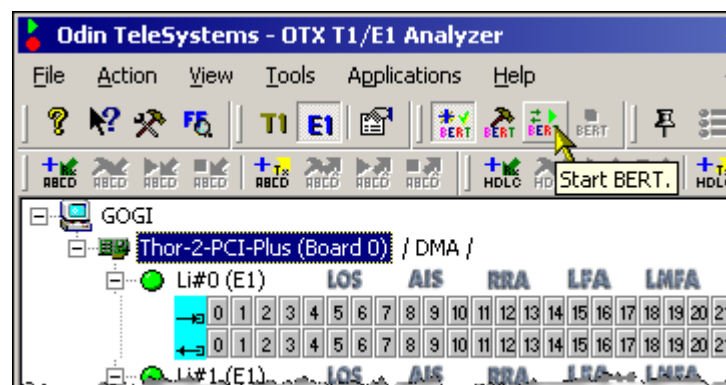


Figure 45



BERT conditions are:

Wait (Figure 46) – bit pattern is not detected;

**Err** (Figure 47) – several errors occurred in the short run;

**Ok** (Figure 48) – the test is in the progress, status is Ok; error rate is shown.



Figure 46



Figure 47

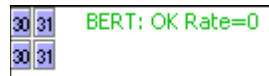


Figure 48

Select the span level as the scope of operations.

Without stopping BERT, click on the “BERT Setup” button (Figure 41).

In the appeared window (Figure 49) pay attention to the Error Counters and the BERT progress indicator (marked with an arrow).

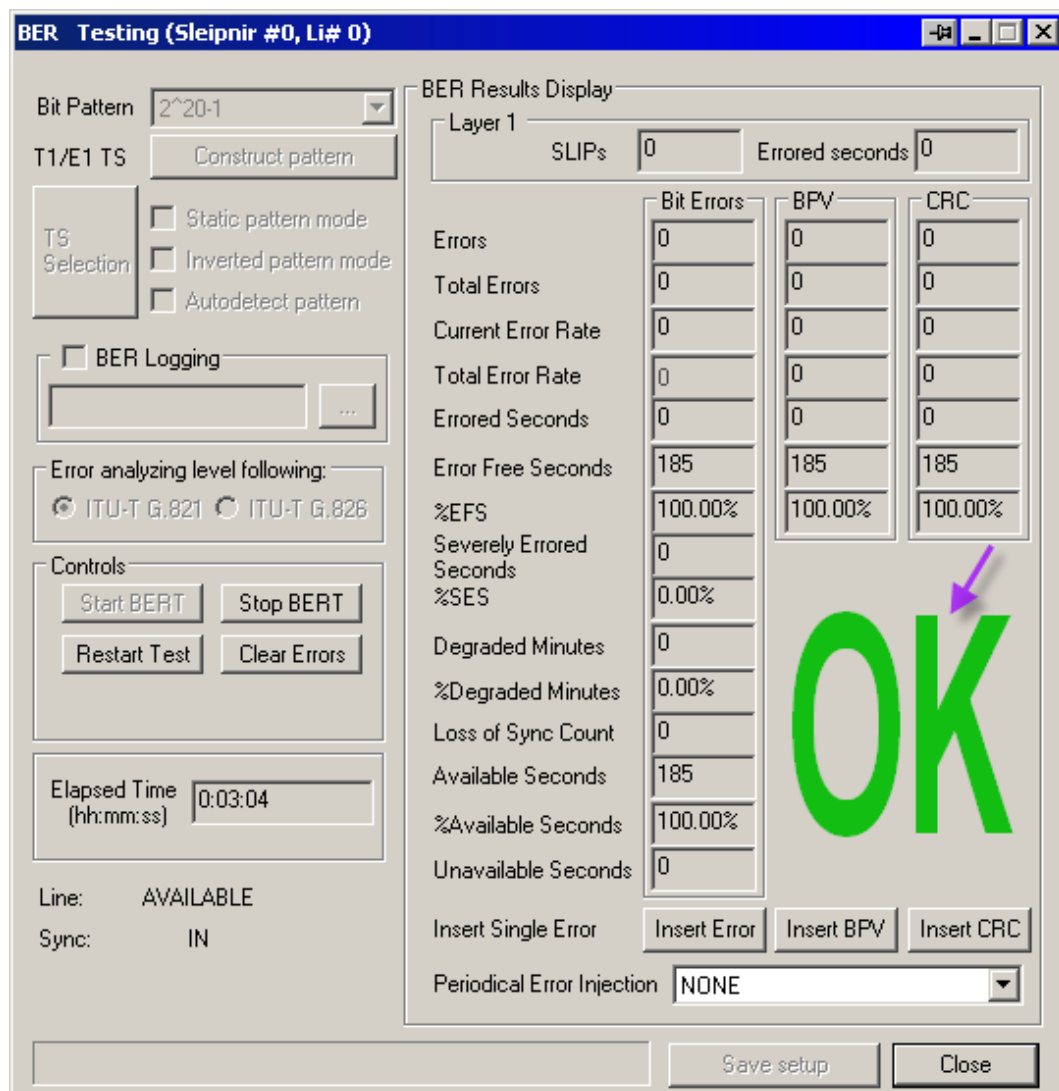


Figure 49

### 3.9.3 Stopping BERT

You can stop BERT by clicking the corresponding icon on the toolbar (Figure 50), or by clicking the “Stop BERT” button in the BER Testing window (Figure 49).

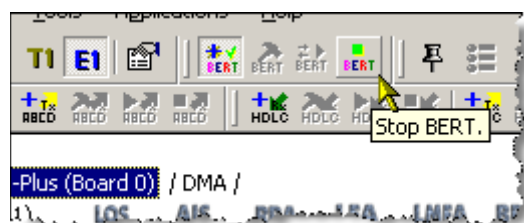


Figure 50

## 3.10 Example Session – HDLC

### 3.10.1 HDLC Tx Setup

Plug loop cable between two spans you plan to use.

Select “Enable HDLC Tx” for one of the connected spans (Figure 51 **Error! Reference source not found.**).

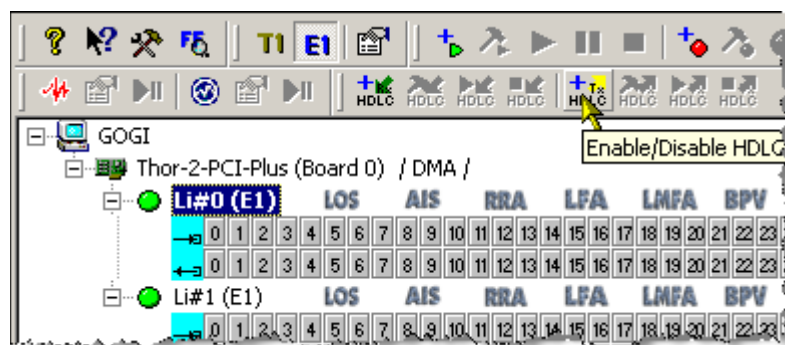


Figure 51

Click the “Setup HDLC Tx” button:



Input hex string to transmit (Figure 52).

You can also check the loop mode check-box (marked with an arrow).

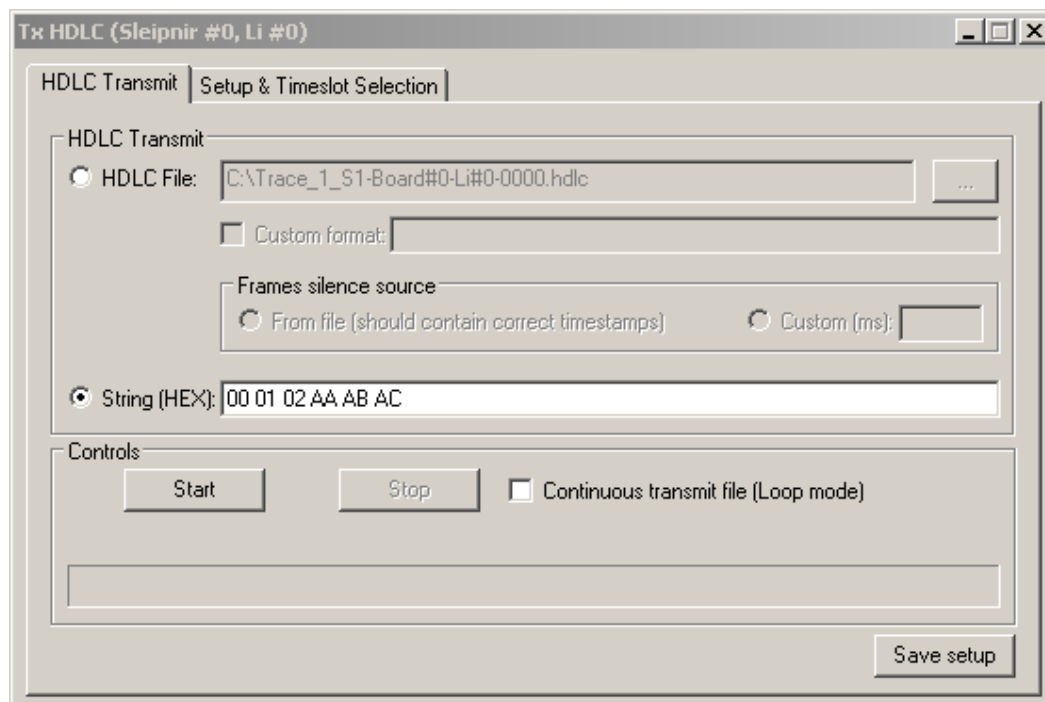


Figure 52

Go to “Setup & Timeslot Selection” tab (Figure 53).

Select the timeslot (marked with an arrow) and Data rate.

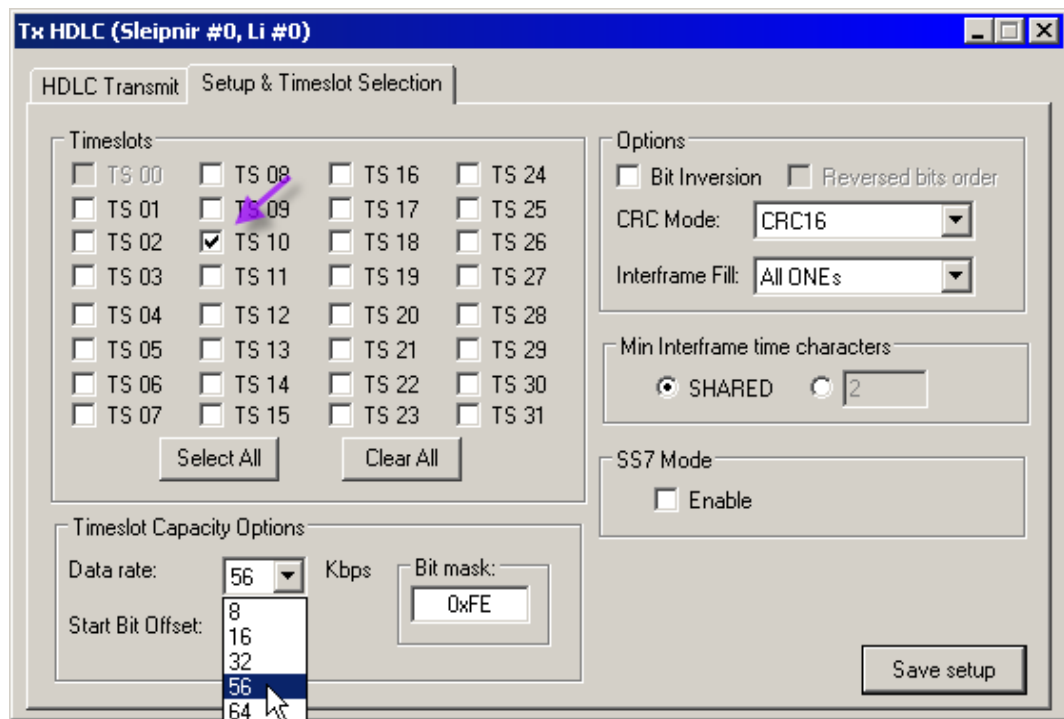


Figure 53

To finish the HDLC Tx set up click “Save setup” button.

Please note that the color of active for HDLC TX timeslots turned purple (Figure 54).



Figure 54

### 3.10.2 HDLC Rx Setup

Select “Enable HDLC Tx” for the second connected span (Figure 55).

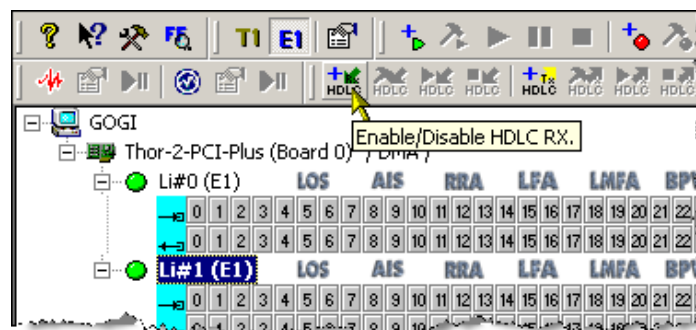


Figure 55

Click on the “Setup HDLC Rx” button:

Select the same timeslot and Data rate (Figure 56) as for HDLC Tx (Figure 53).

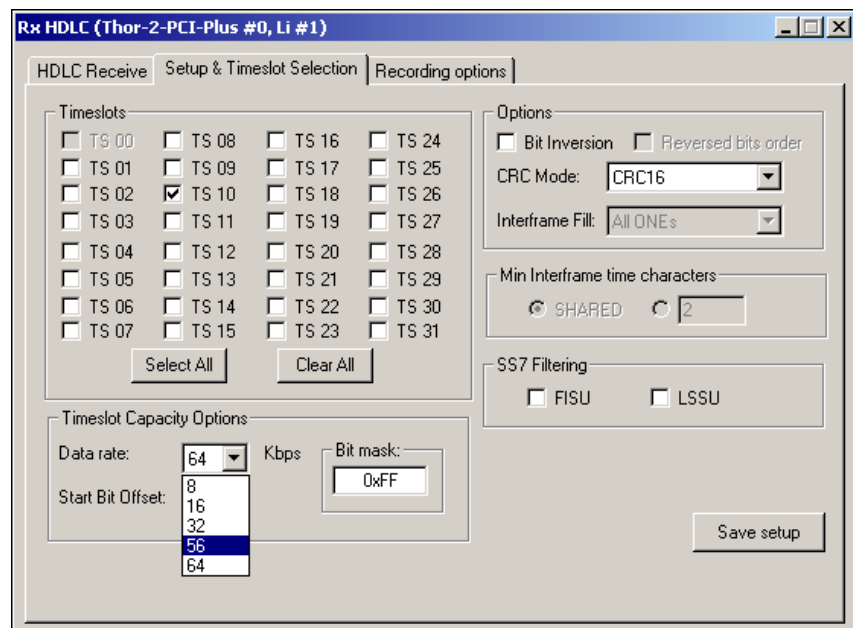


Figure 56

Please note that the color of active for HDLC Tx timeslots turned aqua (Figure 57).

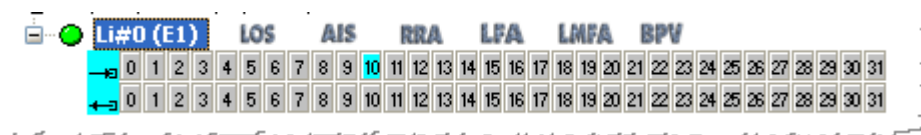


Figure 57

### 3.10.3 HDLC transceiving

Go to the “HDLC Receive” tab. Click the “Start Receiving” button (Figure 58).

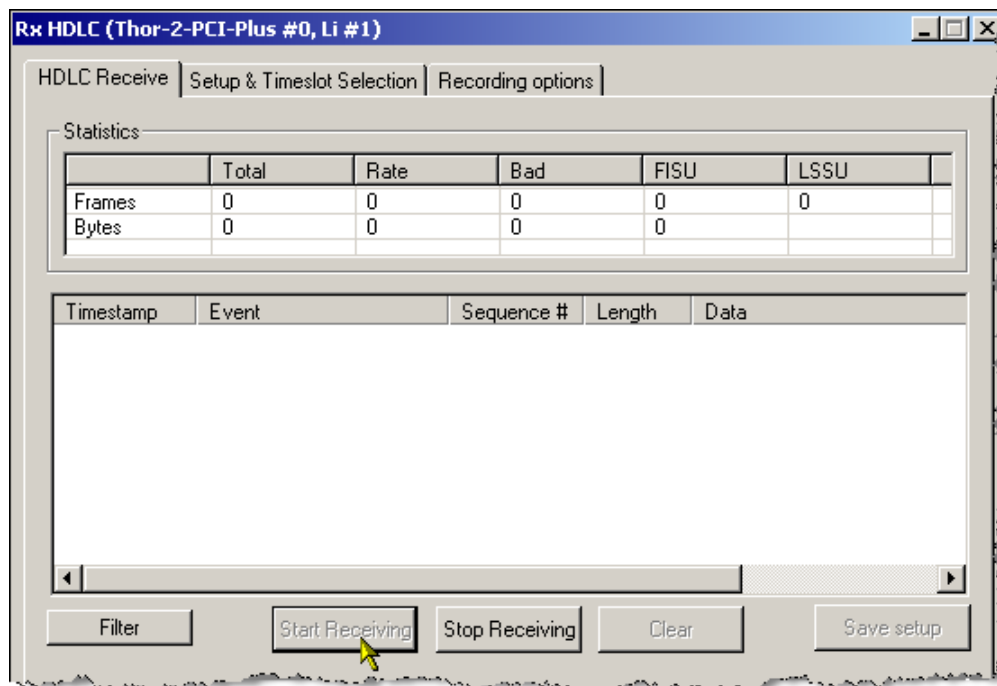


Figure 58

Then close the HDLC Rx window. You can see the HDLC statistics on the main screen (Figure 59 - pointed with an arrow).

Start HDLC Tx by clicking on the appropriate icon on the toolbar (Figure 59).

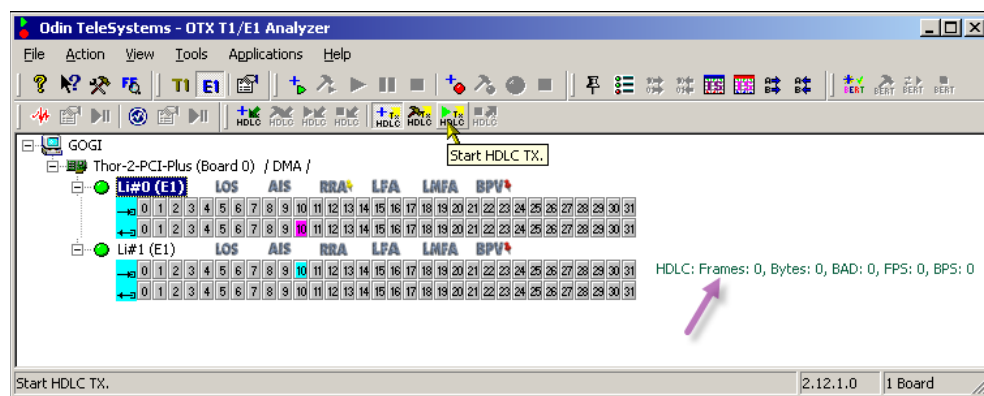
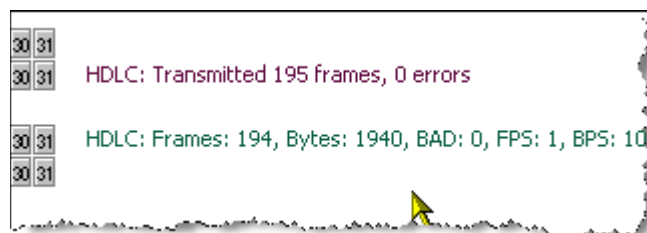


Figure 59

You can see the transferred data on the main screen (Figure 60).





7 28 29 30 31 HDLC: Frames: 42, Bytes: 252, BAD: 0, FPS: 2, BPS: 12  
 7 28 29 30 31 HDLC: Transmitted 42 frames, 0 errors

Figure 60

Open the Setup HDLC Rx window (Figure 62**Error! Reference source not found.**).  
 You can see the report on receiving data.  
 To stop HDLC Rx, click on the “Stop Receiving” button.

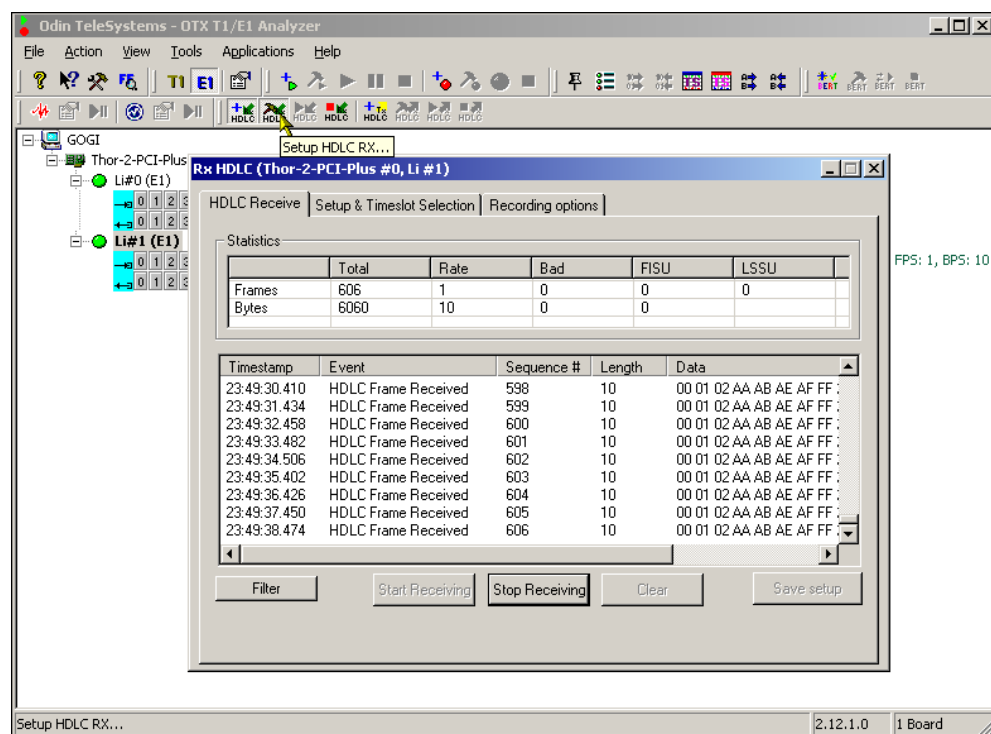


Figure 61

To stop the HDLC Tx, click on the corresponding icon on the toolbar:



### 3.10.4 HDLC logging

Go to the “Recording options” tab of the Setup HDLC Rx window (**Error! Reference source not found.**).

Add new trace by clicking on the button “Add”. Then enable the trace by choosing the corresponding check-box. Set file for logging by clicking the Browse button. Click the Save setup button. (Figure 63**Error! Reference source not found.** - pointed with an arrows)

Now when you will start HDLC Rx, HDLC logging will run automatically.

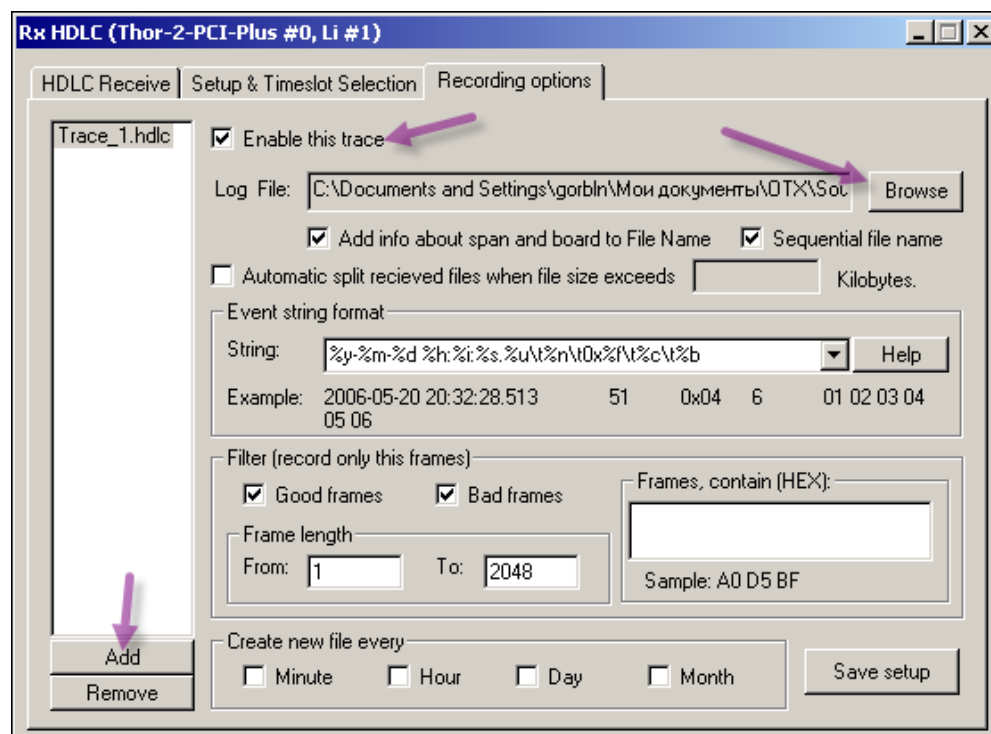


Figure 62

## 4 Base Package

This section describes the basic features of the Analyzer (when no add-on modules are installed). Description of add-on modules is given later in this Guide (refer to chapter “5 Add-On Modules”).

### 4.1 Drop-down menus

#### 4.1.1 File

This menu (Figure 63) is simple, and is used to exit the application.

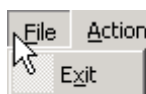


Figure 63

#### 4.1.2 Action

The “Action” menu (Figure 64) allows to carry out basic actions on boards and spans.

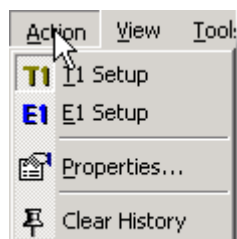


Figure 64

In this menu you can select T1 or E1 (Layer1) operating modes of the current span or board:

**T1 Setup/ E1 Setup** – to set up T1 or E1 operating mode;

**Properties** – to set up the operating mode of the board or spans;

**Clear History** – to clear the operating dynamic statistics of the span or several spans.

This menu is context-dependent and supports group operations.

You can operate on one span, on the whole board or on all the boards of the system depending on the position in the hardware tree. For example, to change the operating mode of all the spans of the Thor-4-PCI-Plus board from T1 to E1 you should select the board in the hardware tree and select “E1 Setup” in the menu. At the same time if the boards have different operating options or some options are incompatible with one of the boards in the system, the Analyzer will set only compatible options.

### 4.1.3 View

The “View” menu option (Figure 65) enables to control the Toolbars display, the Status Bar and allows to refresh the window if the shown condition does not represent the fact. You can separately control the display of each toolbar listed in the “Toolbars” submenu. The “Toolbars” menu is also available via right-clicking on any toolbar-free space intended for the toolbar's indication.

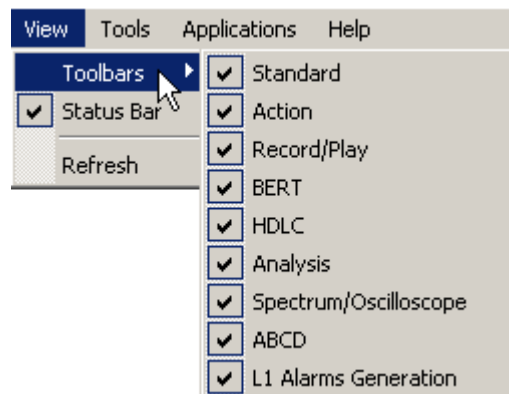
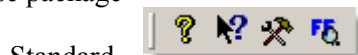


Figure 65

The following toolbars are presented in the current Analyzer's version:

Base package



Standard –

This toolbar allows to change program options (See 4.1.4.1), to get help or to launch Recorded Data viewer (See 4.1.4.2).



Action –

This toolbar allows to change span or board properties as described in 4.1.2

Add-ons:

Record/Play, BERT, HDLC, Analysis, Spectrum/Oscilloscope, ABCD and L1 Alarms Generation. Add-on toolbars will be described later in this Guide (See 5).

### 4.1.4 Tools

The “Tools” menu option (Figure 66) allows to access the application's and the modules' global settings and also to open some Plug-In modules, integrated into the Analyzer, such as “Recorded Data Viewer” and “HEX Viewer”.

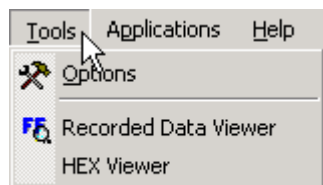


Figure 66

“Recorded Data Viewer” allows to view the file formats, recorded with the Record module. The data is available as a group of timeslots represented frame by frame. This module also supports converting into other formats.

HEX Viewer allows to look through the data of a separate timeslot as in HEX so in a text format. This module can be launched directly from the “Tools” menu option (Figure 66), or from the “Recorded Data Viewer”.

#### 4.1.4.1 Options

The Application settings window consists of two parts: the settings tree is indicated in the left part and settings themselves are placed in the right part (Figure 67).

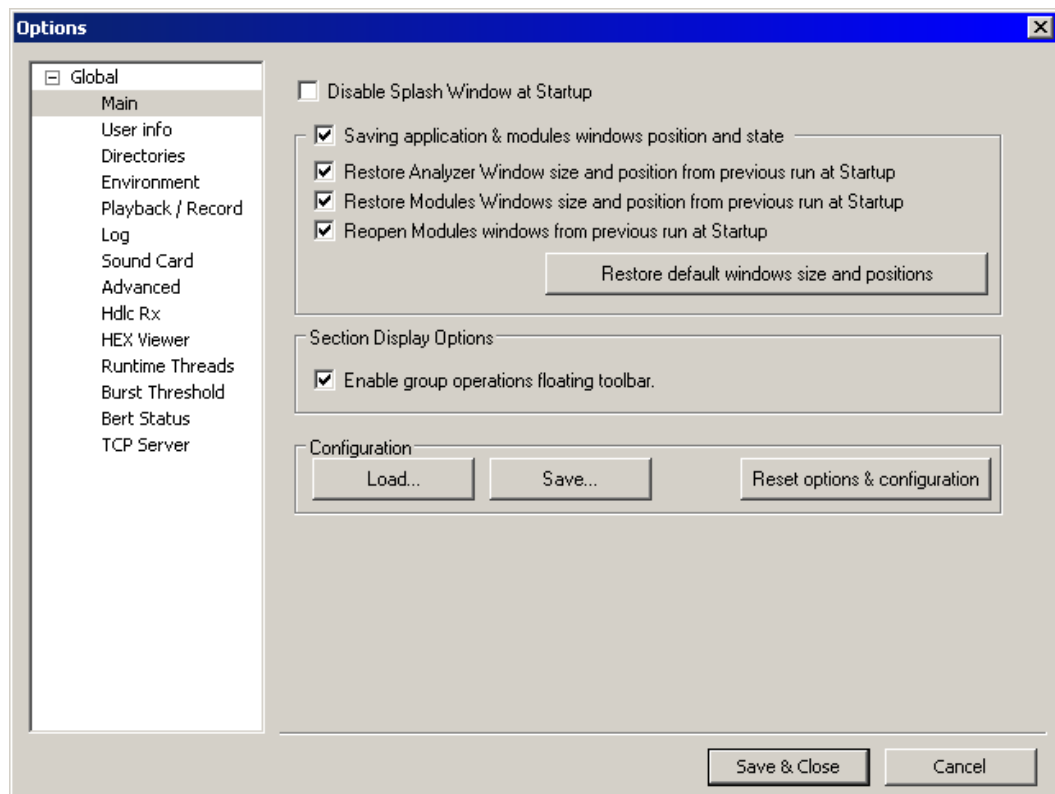


Figure 67

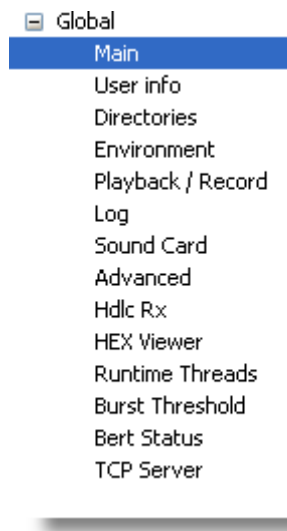


Figure 68

Global Options (Figure 68) have the following settings subgroups:

- Main - basic application settings as well as load, save and reset configuration;
- User info – user's data used for registration and technical support;
- Directories – default directories settings for modules and the temporary folder;
- Environment – options settings for hardware tree display on the main screen;
- Playback / Record – default options settings for “Record” and “Playback” modules;
- Log – Log module settings;
- Sound Card – setting of operating parameters of the Microsoft Windows® sound subsystem; Playback and Record Output Devices, their operating modes and VF-Audio module default parameters' settings are specified;
- Advanced – power user settings;
- Hdlc Rx - HDLC RX module settings;
- HEX Viewer - HEX Viewer module settings.

#### 4.1.4.1.1 Main

“Global/Main” setting groups' functions (Figure 69):

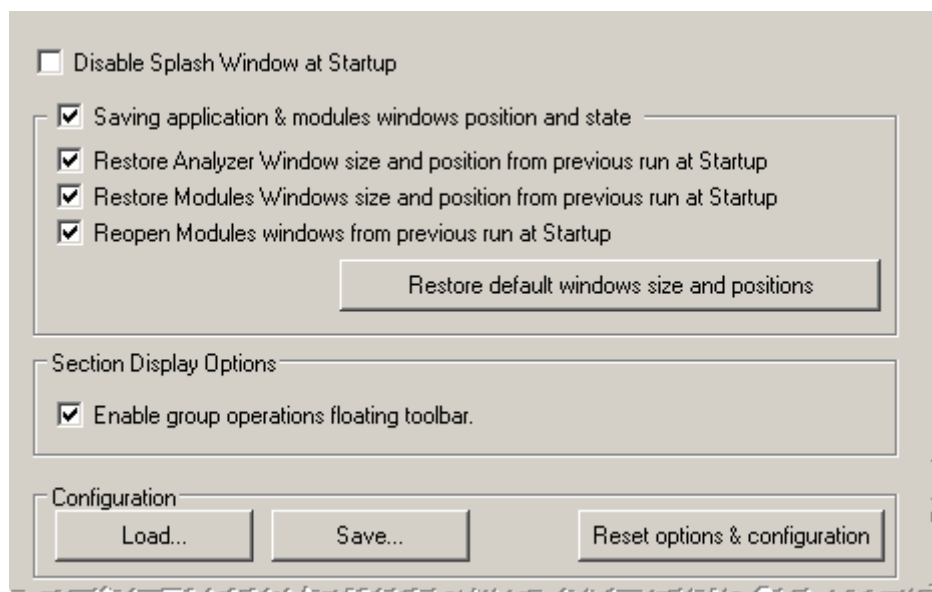


Figure 69

**Disable Splash Windows at Startup** – at the startup of the application the splash window is displayed by default. If it irritates you, disable the splash window by putting a tick not to display it.

**Saving application & modules windows position and state** - you can save and restore all modules and main window's size, position and state (minimized, maximized or normal) between program executions by selecting this check-box and other check-boxes in this frame.

☒ Restore Analyzer Window size and position from previous run at Startup

Figure 70

Save the last position and the size of the Main window from the previous start up (Figure 70).

☒ Restore Modules Windows size and position from previous run at Startup

Figure 71

Save the Modules windows size and position from the last module start up position and size (Figure 71).

☒ Reopen Modules windows from previous run at Startup

Figure 72

Open the utility with the Module windows shown from the previous start up positions (Figure 72).



### Section Display Options

**Enable group operations floating toolbar** – if this option is active the group operations floating toolbar display is enabled. The toolbar is displayed if the mouse cursor is pointed at the device in hardware tree. The toolbar is context-dependent and allows to minimize the number of clicks for carrying out some actions on modules. With this toolbar the active modules startup is possible as well as the group startup of all active modules. The startup and the stop is possible as on the span level so on the board level and system level.

### Configuration

**Load...** - the load of the previously saved configuration (hardware and modules settings);

**Save...** - current configuration's saving;

**Reset options & configurations** – all current settings and options reset to their default values.

Note: This option is recommended to implement after the Analyzer's version has been changed.

#### 4.1.4.1.2 User Info

User Info (Figure 73): here you can specify your personal data. This data can be saved as product registration info, as additional information to the recorded files or can be used for Odin TeleSystems Inc. support issues.

The form is titled 'User Info' and contains three input fields. The first field is labeled 'Name:' and contains the text 'Bill Smith'. The second field is labeled 'Initials:' and contains the text 'BS'. The third field is labeled 'Mailing Address:' and contains the text '800 E. Campbell Rd, Suite 334' and 'Richardson, TX 75801-8173'. To the right of the input fields, there is a note: 'Please fill in some information about you. This information will be used for support issues only.'

Figure 73

#### 4.1.4.1.3 Directories

In the "Global/Directories" section (Figure 74) you can specify the default folder for "Record" module capture files and Temporary files' Folder. If you would not specify the folders by yourself, the Analyzer will use the system's Temporary folder for temporary files and the current folder for Capture Directories.



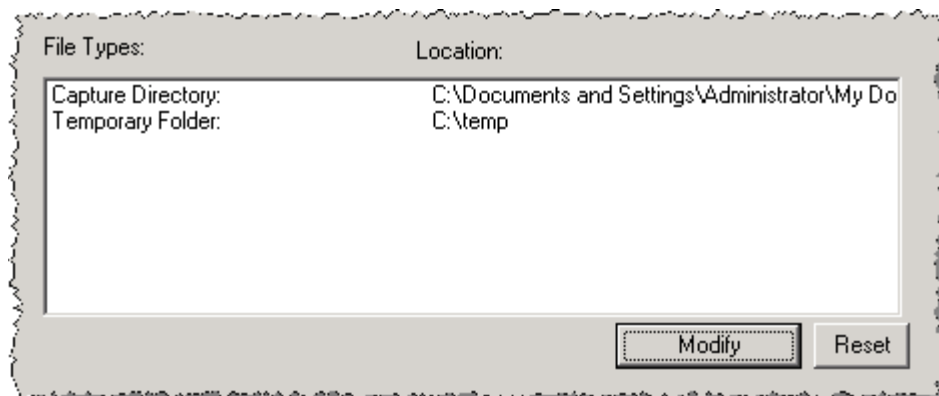


Figure 74

#### 4.1.4.1.4 *Environment*

“Global/Environment” options group (Figure 75) allows to specify display settings. At present only one item is available:

**Display Burst DMA operation mode in Main Screen** – enables Burst DMA operating mode display.

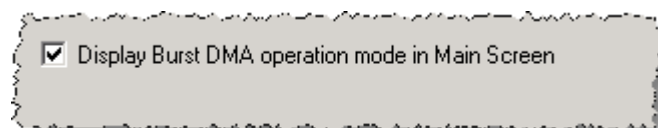


Figure 75

#### 4.1.4.1.5 *Playback/Record*

“Global/Playback-Record” options group (Figure 76) allows to specify the module settings. At present the following settings are available:

**Ignore file extensions while load** – put a tick to auto-detect the file type irrespective of its extension. If you clear the check-box, the auto-detection will be disabled and the files will be loading according to their extension.

**Limit number of concurrent timeslot in playback/record in DSP mode** – “Record” and “Playback” modules’ capacity in DSP mode is strongly dependent on hardware configuration, DSP type, system load and other factors that is why it is highly recommended not to record/playback more than 20 timeslots simultaneously. However, you can override this limitation at your own risk by disabling this option.

**Limit temporary playback file to** – set the temporary playback file’s maximum size.

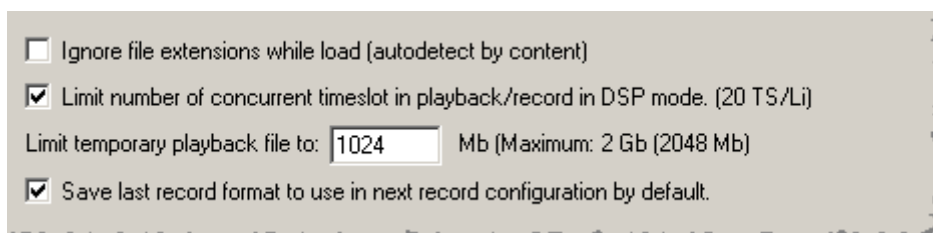


Figure 76

#### 4.1.4.1.6 Log

“Global/Log” options group (Figure 77) allows to specify Analyzer’s logging settings.

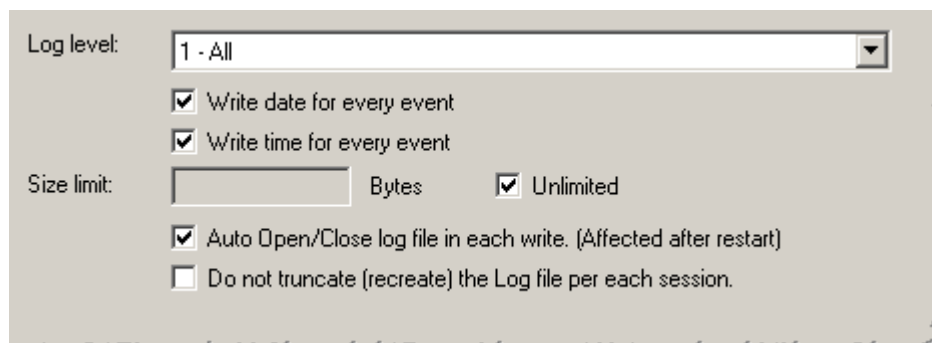


Figure 77

At present the following settings are available:

**Log level** – allows to set log file details level. 1 – all messages, warnings and errors, 5 – only warnings and errors, 8 – only errors. Values from 2 to 4 and from 6 to 7 are intermediate, e.g. values from 2 to 4 - all errors and warnings and only some messages will be written; values from 6 to 7 – all errors and some warnings will be written. So the lower details level - the more information the log file contains, and vice versa, the higher details level - the less detailed the log file is. Note: for the application’s stable operating it is recommended to keep the default value of this parameter. High detailed logs influence the Analyzer’s efficiency and reduce hard drive space.

**Write date for every event** – adds event’s date to every record in log-file.

**Write time for every event** – adds event’s time to every record in log-file.

**Size limit** – you can set the maximum log file size and if the size limit is exceeded the old record will be overwritten by new ones. To disable the size limit function tick off the «Unlimited» option.

**Auto Open/Close log file in each write** – this option changes the logging subsystem operating that at each record the file opens or closes, the file data is always actual. Note: Change this setting only if recommended by support service.

**Do not truncate(re-create) the Log file per each session** – in a usual mode the log file is re-created at each startup, by erasing the data of previous startups. By checking this

option the log file will be append.

Note: It is recommended not to use this option to save the hard drive space.

#### 4.1.4.1.7 Sound Card

##### Sound card options:

##### VF-Audio RX:

Sound output device selection and setting of its parameters (Figure 78).

**Output device** – The list of all output devices detected in the system is presented here. Default device is selected.

##### NOTE:

1. The list of output devices in Direct Sound and MCI modes can be slightly different, the output device selection should be made separately for each mode.

2. After adding or deleting the system devices their identifiers can change and the selection should be made manually.

**Sound Card Buffer size** - Sound Card Buffer size in milliseconds.

**Sound Card buffers count** - Sound Card buffers count in MCI mode.

**HW Read Buffer size** - Read Buffer size from OTX devices.

**Adaptive Interpolate sound frames** - Adaptive Interpolate sound data for sampling frequency synchronizing of sound card and OTX devices. It is recommended to use this function.

**Use Direct Sound** - use DirectX for Playback. Otherwise MCI is used. We recommend to use Direct Sound mode as you can achieve good results of Adaptive Interpolation only in this mode.

**Allow multiple timeslot connections to one channel** – allows multiple timeslots connections to one physical sound output channel. To use this option your output device should support this function (It is available in all sound cards that support DirectSound).

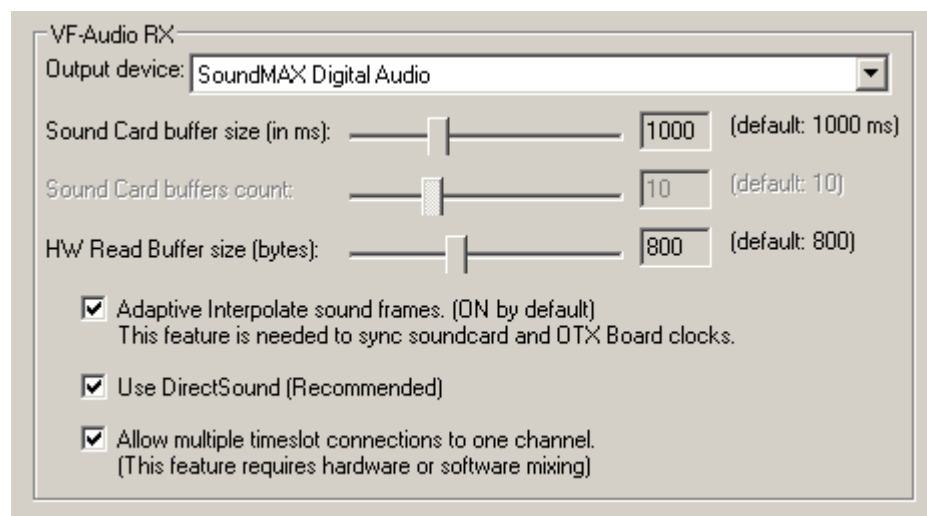


Figure 78

##### VF-Audio TX:

Sound input device (Sound recording device) selection and its parameters setting (Figure 79).

At present only MCI operating mode is supported.

**Input device** – the list of all Sound input devices detected in the system is presented here. Default device is selected.

**Sound Card Buffer size** - Sound Card Buffer size in milliseconds.

**Sound Card buffers count** - number of DirectSound buffers to be used in real-time.

**HW Read Buffer size** - Read Buffer size from OTX devices.

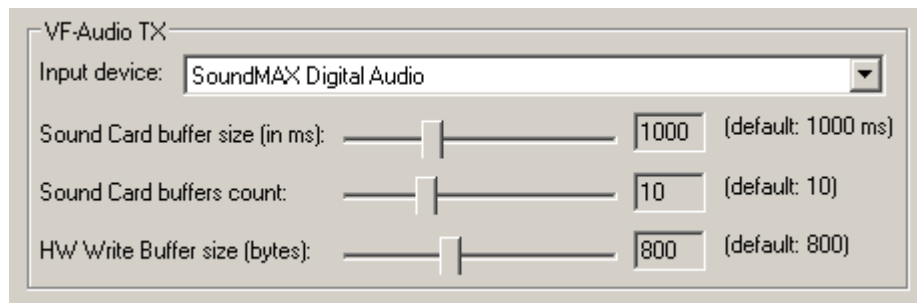


Figure 79

#### 4.1.4.1.8 Advanced

“Global/Advanced” options group (Figure 80) allows to specify the following settings:

**Display All Supported Line Loop modes** – includes the possibility to select any Line loop mode supported by the hardware.

**Default codecs** – you can specify default codecs for modules separately for T1 and E1 modes. u-Law codec for T1 mode and a-Law codec for E1 mode are default.

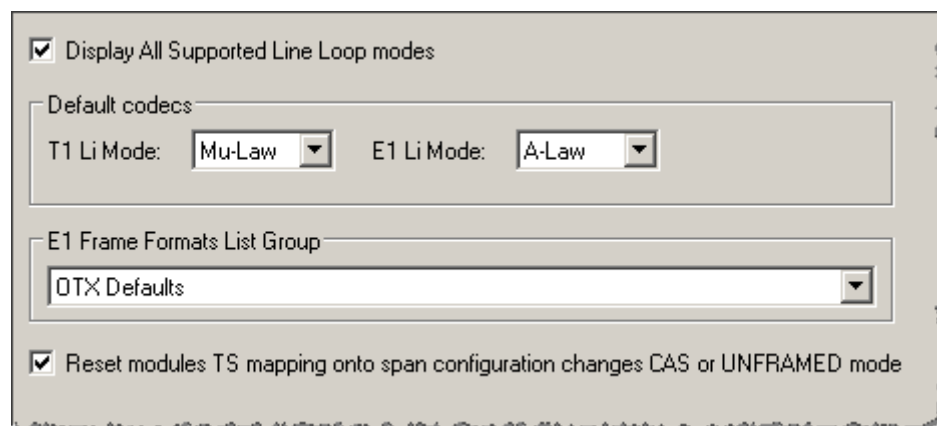


Figure 80

Different E1 frame formats are available:

- OTX (Default)
- HP compatible format
- Generic format

Choose E1 frame format from the drop-down list illustrated below (Figure 81):



OTX Defaults  
HP Compatible  
Generic

Figure 81

#### 4.1.4.1.9 Hdlc

“Global/Hdlc” options group (Figure 82) allows to set trace files’ format patterns. This feature allows to work with all known trace formats without pre-converting.

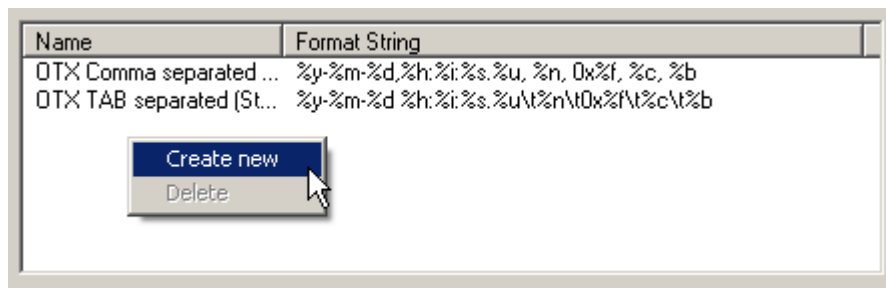


Figure 82

At supply 2 format patterns are predefined:  
OTX Comma separated and OTX TAB separated.

You can create your own format patterns by right-clicking and selecting “Create New”. Then in the format editing dialog (Figure 83) specify its name and format string.

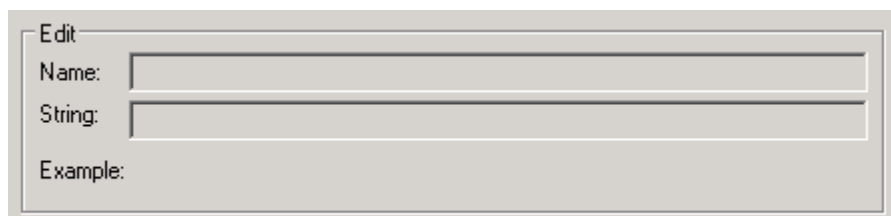


Figure 83

You can indicate the format string by using tags (Figure 84).

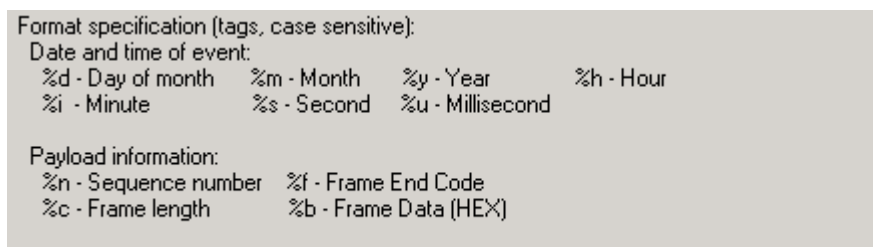


Figure 84

Note: Every tag starts with % symbol. If you just need to get % symbol but not the

corresponding tag, indicate %% specifier.

#### 4.1.4.1.10 Hex Viewer

“Global/HEX Viewer” settings group (Figure 85) allows to change the module's displaying modes:

**Bytes per row** – amount of bytes indicated in one row.

**Show HEX View** – Data display mark in HEX format.

**Show ASCII View** – Data display in ASCII format.

**Address width** – displayed offset width (in symbols).

**Colors** – allows to change background and text color in the window.

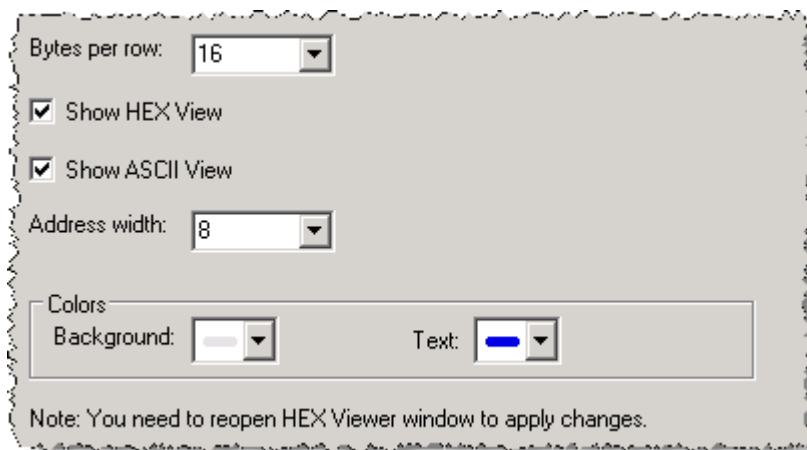


Figure 85

#### 4.1.4.1.11 Runtime Threads

Runtime Threads settings group (Figure 86): allows to change the module's runtime thread priority.

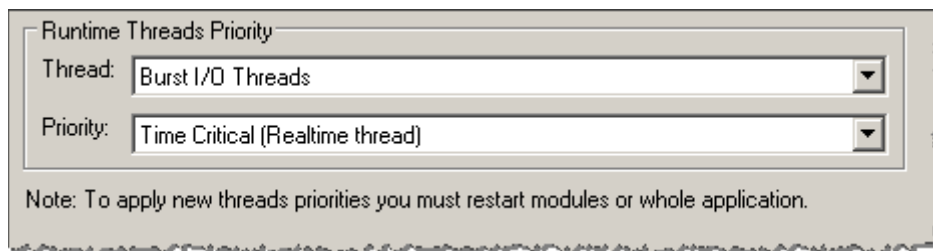


Figure 86

Select the mode of the thread (Figure 87).

Thread
Burst I/O Threads
Record Thread
Playback Thread

Figure 87

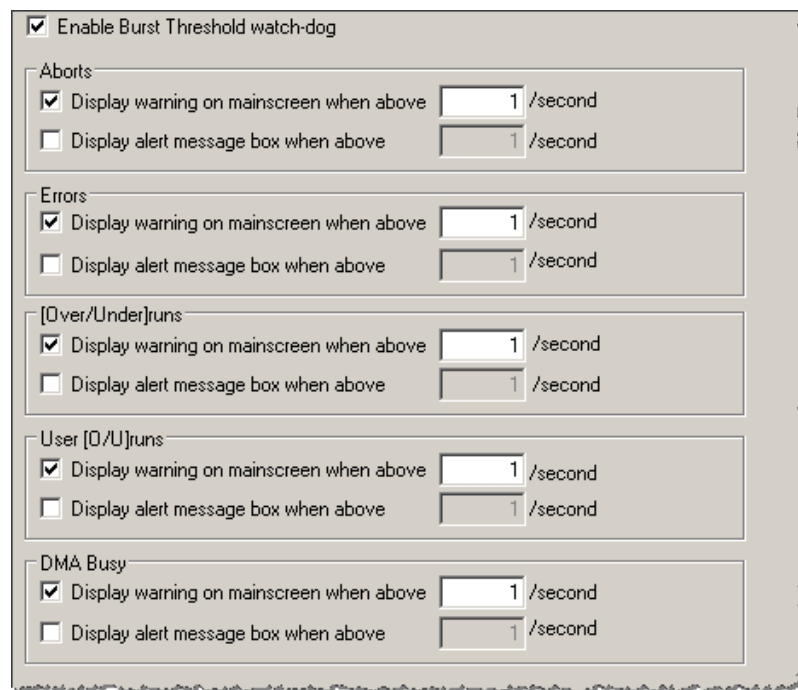
Set the priority of the thread from lowest to highest (Figure 88).

Priority
Idle
Lowest
Below Normal
Normal
Above Normal
Highest
Time Critical (Realtime thread)

**Figure 88**

#### 4.1.4.1.12 Burst Threshold

Burst Threshold settings group (Figure 89): allows to configure the burst warning error on the main screen.



The figure shows a settings window titled "Burst Threshold settings group". It contains a checkbox "Enable Burst Threshold watch-dog" which is checked. Below this are five sections, each with a title and two checkboxes: "Display warning on mainscreen when above" and "Display alert message box when above". Each checkbox is checked, and next to it is a text box containing the value "1" followed by "/second". The sections are: "Aborts", "Errors", "[Over/Under]runs", "User [O/U]runs", and "DMA Busy".

**Figure 89**

#### 4.1.4.1.13 Bert Status

Bert Status settings group (Figure 90): With attention first to the Figure 90, details are provided concerning an exemplary operational setup wherein a bit error rate tester ("BERT") module.



☒ Show HBER/LBER Error rate status and different color of TER in Bert Window

BERT status parameters displayed on the Main Screen Add to list Remove

Name	Format String
<input checked="" type="checkbox"/> Default minimim (St...	S: %s   T: %et   Err: %be
<input type="checkbox"/> Default extended (S...	S: %s   P: %pattern   T: %et   Err: %be   Rate=%cer   LOS...

Edit

Name:

String:

Example:

Format specification (tags, case sensevity):

```
%s - State (WAIT, OK, ERR) %pattern - Current pattern
%et - Elapsed Time (default format: 1 day 23:59:59)
Custom Elapsed Time:
%D - Days, %TH - Total Hours, %H - Hours,
%TM - Total Minutes, %M - Minutes, %S - Seconds
%lls - Layer 1 SLIPs %lles - L1 Errored Seconds
%be - Bit Errors %tbe - Total Bit Errors
%cer - Current Error Rate %ter - Total Error Rate
%es - Errored Seconds %efbe - Error Free Seconds
%efs - %EFS %sesbe - SES %ses - %SES
```

Figure 90

#### 4.1.4.1.14 TCP Server

Global/TCP Server settings group (Figure 91): allows to set up the Analyzer utility server options for the Analyzer Remote Control utility connections.

**Mode is Enabled** – to make the server enabled.

**Listen on the interface** – to make a selection of an interface.

**TCP Port number** – is the listening port number for the server. The default listening port number for the server is 1894.

**Maximum connections** – This parameter specifies the maximum number of connections that TCP Server may have open simultaneously.

**Modules warnings** – to set the preferred type of dialog box if warnings occur (Figure 92).





☒ Mode is Enabled

Listen on the Interface: 0.0.0.0 (All interfaces)

TCP Port number: 1894

Maximum connections: 20 (0 - no limit)

☐ Access only from:

Subnet: . . .

Mask: . . .

Modules warnings: Answer OK, Yes or Ignore to all question

NOTE: You must restart the application to take effect!

Figure 91

Answer OK, Yes or Ignore to all question

Answer OK, Yes or Ignore to all question

Answer OK, No, Abort to all question

Display message box on Analyzer server screen

Figure 92

#### 4.1.4.2 Recorded Data Viewer

With the help of this module you can view the data made by the “Record” module as well as to export any part of the file into a new file in Binary Raw Data format (Figure 93).

File	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0x000075A1		48																	
0x000075A2		13																	
0x000075A3		F6																	
0x000075A4		80																	
0x000075A5		28																	
0x000075A6		05																	

Figure 93

File menu (Figure 94) allows to open the recorded file (“Load...”), to reload already opened file (“Reload”), to view the properties and record parameters of the opened file (“Properties”) and to close the module window (“Close”).

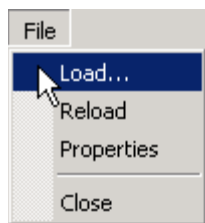


Figure 94

**File Properties** (Figure 95) window contains:

- date and time of recording;
- user name (who made the recording);
- recording source – board: its type, serial, number;
- span and its work mode, number of recorded timeslots, flag, Recording Bits (e.g. DL-Bits);
- file size (frames/seconds).



Figure 95

The Main module window (Figure 96) is a table where lines are recorded frames, and columns are timeslots. In every cell HEX values of the needed frame and the timeslot are indicated.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0x000075A1		48																	
0x000075A2		13																	
0x000075A3		F6																	
0x000075A4		80																	
0x000075A5		28																	
0x000075A6		05																	
0x000075A7		48																	
0x000075A8		13																	
0x000075A9		F6																	
0x000075AA		80																	
0x000075AB																			
0x000075AC																			
0x000075AD																			
0x000075AE		13																	

Figure 96

In status string (Figure 97) the current module state, current frame number, total number of recorded frames and recorded timeslots are indicated. Necessary hints also appear.

For Help, press F1      Frame : 0x75A1/0x13880      TS Num: 1

Figure 97

#### Parts of the Recorded Data Selection:

You can select the part of data using mouse. Press left mouse button on the upper left corner of the necessary selection area and drag the cursor to the right lower corner of the needed area. Release the button. The selection can also be done from bottom to top. To scroll the window put the cursor out of data borders but not out of module window borders. To select all data by any timeslot click on its number in the table heading.

Instead of mouse selection you can set start and end frame using right-click popup (Figure 98), using submenus “Set Start Frame” and “Set End Frame”. So you can select only the needed group of timeslots by selecting the heading and you can specify the lower and upper selection borders via popup menu.

You can set start frame to first frame, or enter offset of start frame manually.

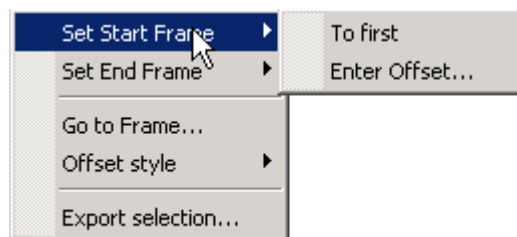


Figure 98

To export the selected area into a new file choose “Export selection...” in the menu and specify the destination file (Figure 99).

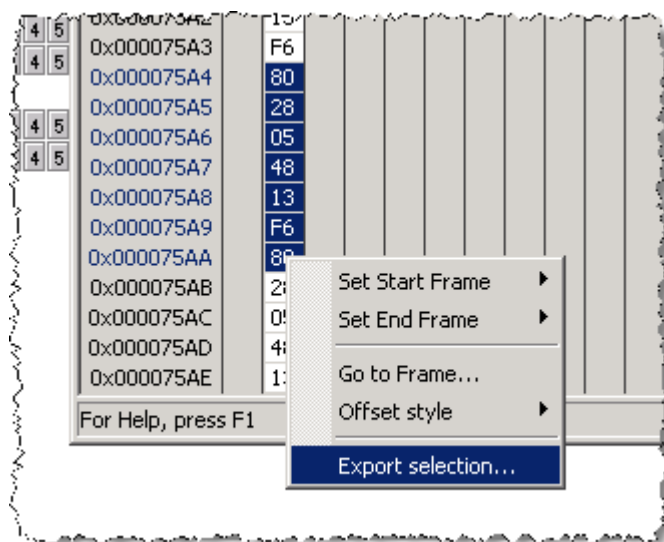


Figure 99

You can change the frame's number offset style into decimal (Dec) or to hexadecimal (HEX) via "Offset style" menu tab (Figure 100).

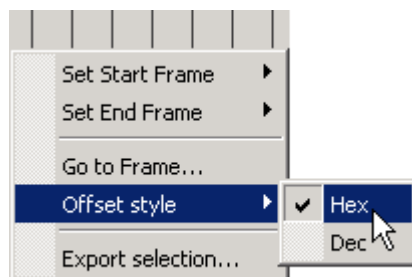


Figure 100

#### 4.1.4.3 Hex Viewer

With the help of this module (Figure 101) you can view any file in HEX and ACSII formats as in any other HEX-viewers.

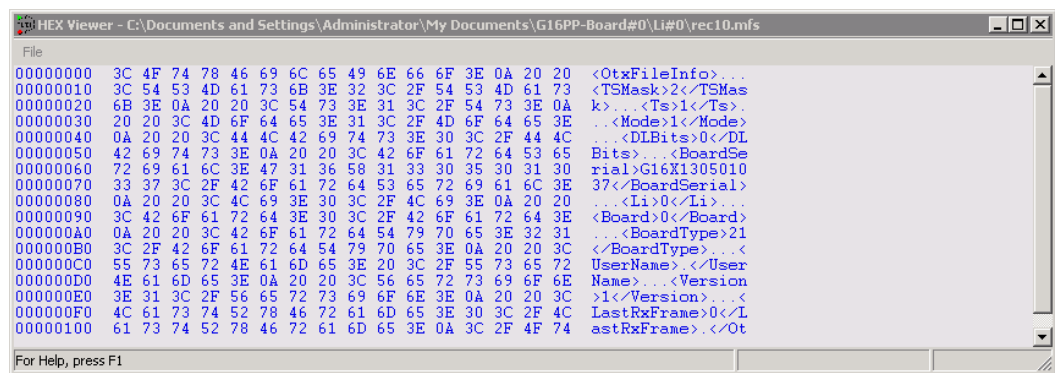


Figure 101

Depending on the module settings HEX and/or ASCII display can be hidden. You can also change the number of data shown in one string and other settings. The more detailed information you can get in chapter 4.1.4.1.10.

As the maximum the module window content contains offset, HEX-view and ASCII-view.

The offset is shown in hexadecimal format for the first byte in a row.

#### 4.1.5 Applications

“Applications” menu (Figure 102) allows to activate, set up and enable Analysis Applications:

**Line Status** – display module of the span's current state, errors and alarms protocol. It displays the Layer 1 T1/E1 parameters.

**RX Realtime Monitor / VF-Audio** – monitoring module of data received from spans in a real-time mode and stream output module from timeslots to sound card.

**TX Realtime Monitor / VF-Audio** – transmitted data monitoring module in a real-time mode. Stream transmission module from sound card to T1/E1 timeslots.

**BERT** - Bit Error Rate Tester module: receiving and transmitting.

**Record/Play** – timeslot data Record and Playback modules.

**Spectrum Analyzer** - data stream multichannel Spectrum Analyzer module.

**Oscilloscope Analyzer** – data stream multichannel Oscilloscope Analyzer module.

**ABCD Signaling** – operating module for ABCD-signaling and Rob-bits.

**HDLC Analysis** – operating module with HDLC-frames.

**L1 Alarms Generation** - connection-monitoring and T1/E1 alarm-generation features module.

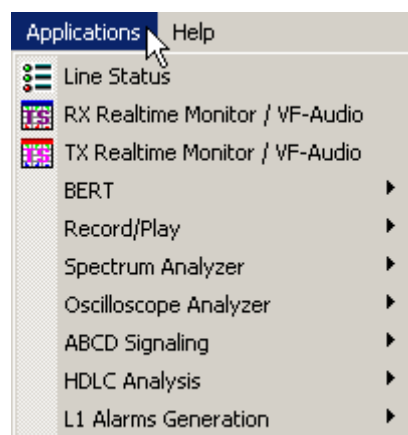


Figure 102

#### 4.1.6 Help

Application's documentation can be opened from the “Help” menu option. To call “Help” you can as well use “F1” shortcut combination.

Note: if you press “F1” but Analyzer informs you “Help” file can't be found” address to technical support service.

In “About T1/E1 Analyzer” (Figure 103) menu option you can find information about Application's version, license and technical support.

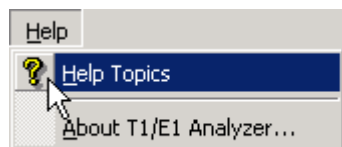


Figure 103

## 4.2 Main Window

Analyzer's Main Window (the part of it is shown at Figure 104) is a real OTX devices tree. You can get more detailed information on OTX devices in the OTX Programming Guide.

The first tree level is a computer (system). It is always one option (for the present moment), and its name is the workstation computer's current name.

On the second level there are OTX boards installed into the computer and enabled to be used in the application. The board is identified by its name and type, location (board's system number) and operating mode (without DSP, DMA)

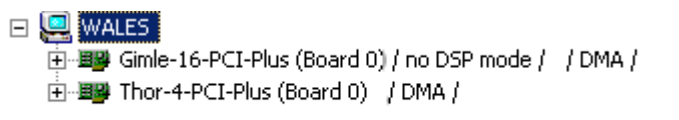


Figure 104

On the 3d level there are board's spans with the current condition and operating modes information.

On the 4<sup>th</sup> level there are span's timeslots divided into receiving (RX) and transmitting (TX). A status of active analysis modules is also indicated on the 4<sup>th</sup> level.

More detailed info on tree levels you can find in sections 4.2.1, 4.2.2, 4.2.3.

Actions on devices and operations on modules can be reached by different ways:

- Via menu bar.
- Via toolbar.
- Via right-click on the menu of a node in the Main Window.
- Via mouse hover-over feature over a node in the Main Window.

In this example (Figure 104) the Analyzer is running two boards: Gimle-16-PCI-Plus board and Thor-4-PCI-Plus board.

Consider the following example of the Main Window view (Figure 105):

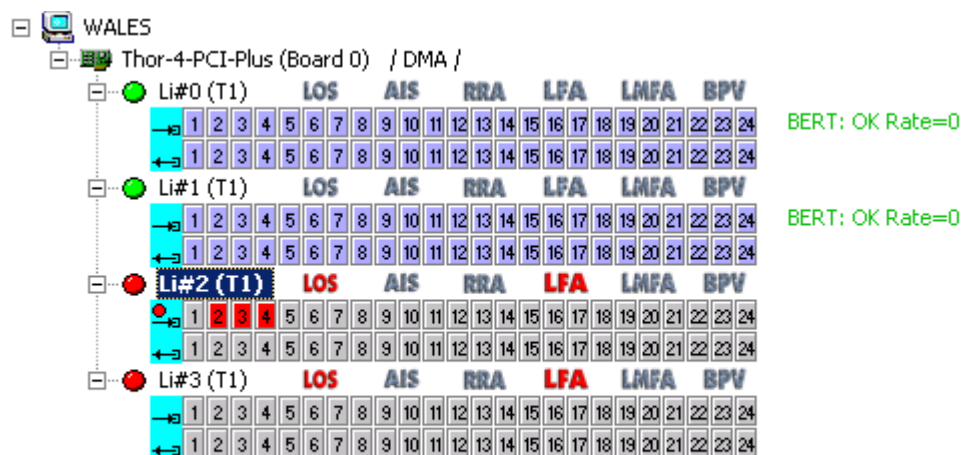


Figure 105

The name of the workstation computer here is WALES, there is 1 board in the system - Thor-4-PCI-Plus, its system number is 0 and DMA operating mode. All board's spans operate in T1 mode. Spans 0 and 1 are active, spans 2 and 3 are inactive, the BERT is running on span 1 and 0 on all timeslots, BERT condition is OK, no errors found, on the 2 span the recording is set on 2, 3 and 4 timeslots.

Here the span 2 is selected; all actions in the menu and toolbars will be applied to this span. On the spans 2 and 3 the LOS and LFA errors are detected.

#### 4.2.1 System level

System level can be reached from the properties of the first tree level of Analyzer's Main Window which we selected in Figure 104.

On the system level you can see information about all boards found in the system (Figure 106). By clicking "System Report" button (Figure 107) you can get the generated report on all OTX-boards installed in the system. To disable some boards for using in Analyzer, remove the tick from the boards you do not want to use and save the changes by clicking the OK button. The board will be concealed in the list of boards at the next startup and can be used in other applications.

Warning: If you disable all the boards, the Analyzer will not run.

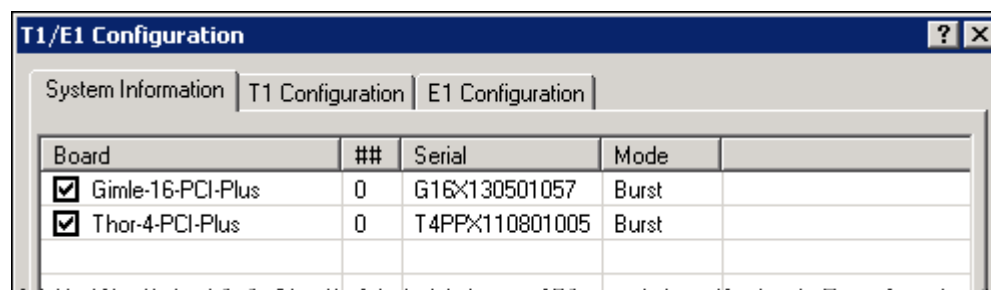


Figure 106

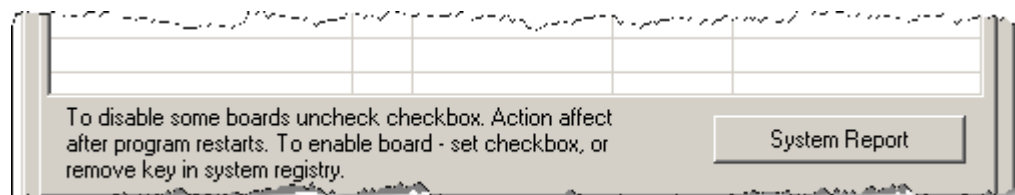


Figure 107

The T1 and E1 configuration for the entire system (all boards and all Line Interfaces) can be set in the System Properties Window. The T1 settings are in chapter 4.2.3.1 and the E1 settings are in chapter 4.2.3.2.

#### 4.2.2 Board level

On the hardware tree board level the following board's settings parameters are available (Figure 108):

**Clock source:** internal or one of the spans.

**Use Burst Device for Analysis applications:** use Burst mode instead of DSP (default mode).

**Use TS0 for playback:** allows to record TS0 slot in E1 mode (for several boards).

**Dongle Type:** Dongle Type choice for PCMCIA boards (an obsolete option, added for consistency).

**Sync record/play mode:** synchronous Record/Play startup (only for PCMCIA).

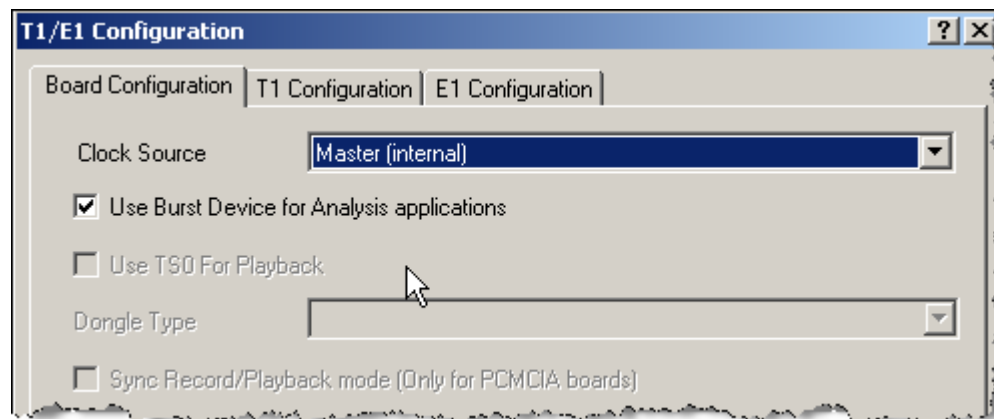


Figure 108

In the lower part of the window the board is displayed (Figure 109).

**Board information** contains serial number, board build, CPLD build, bus parameters and other service information.



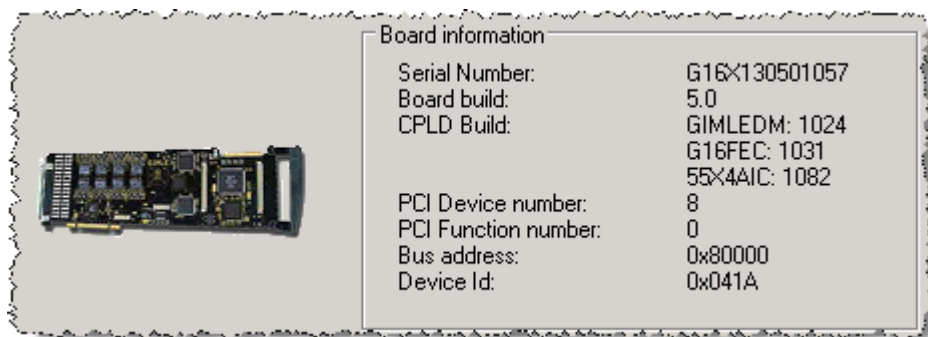


Figure 109

The T1 and E1 configuration for the entire board (all Line Interfaces on the selected board) can be set in the Board Properties Window. The T1 settings are in chapter 4.2.3.1 and the E1 settings are in chapter 4.2.3.2.

### 4.2.3 Line Interface (Li) Level

Line Interface level is the level of span and its timeslots (Figure 110). Span condition, errors history, timeslots and active modules conditions are available.

Let us examine the Li0 span condition (Figure 110) which is indicated in the hardware tree on the main screen:

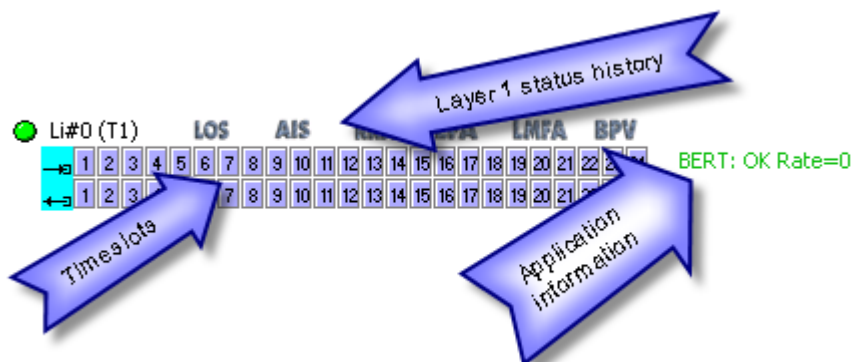


Figure 110

Green circle indicates that span is operating, synchronization is being carried out, line is hooked up and active. The remote site sends the signal with correct parameters of Layer 1 possible conditions:

Green – everything is OK.

Red – critical errors. There is no Carrier detected or spans are in different modes (T1 and E1). There can also be connection problems. Check the correct connection and connector's layout. If the problem continues refer to the Odin TeleSystems technical support service.

Yellow – there are errors but on the whole the span is runnable, there is a carrier signal. Usually there are differences in Layer 1 parameters, kind of CRC4 or MFA.

You can see Layer 1 detailed status on the top of Figure 110.

There are 3 conditions of each parameter: no errors (gray), there are errors (red, blue or

yellow), errors occurred (gray with red “button” icon)

The more detailed information on statuses you can get in chapter 4.3.1.

To the right of status indicator the red pin can be shown meaning that errors happened to be (there are records in the history). If you want to clear the records, enter “Action menu => Clear History” option (chapter 4.1.2).

In disabled modules condition the timeslots are indicated gray. The upper timeslots' row is data transmission, the lower – data reception. To the left of the timeslots pad there are correspondent data stream pointers.

Depending on the current active modules the timeslots can be marked with the following colors:

Color	Module	Direction
Red	Record	RX
Green	Playback	TX
Light blue	BERT	RX/TX
Yellow	VF-Audio	RX
Cyan	VF-Audio	TX
Pink	HDLC	TX
Cyan	HDLC	RX

To the left of the timeslots there is an icon indicating which string is a receiver and which is a transmitter, as well as Record and Playback icon at active correspondent modules.

If the Loopback span mode is active the correspondent “Line Loop” icon is displayed to the right of the error indicator (Figure 111). The more detailed information on Loopback mode you can get in chapter 4.2.3.1.



Figure 111

The Li can operate in either T1 or E1 mode. Each mode is associated with specific Layer 1 configuration settings. The Layer 1 configuration settings are accessed via the T1 and E1 property pages.

#### 4.2.3.1 T1 Properties (Layer 1 settings)

On “T1 Properties/Layer 1” settings tab (Figure 112) you can change the following T1 stream options:



**T1/E1 Configuration**

Board Configuration | **T1 Configuration** | E1 Configuration

Transmit Line Code: B8ZS ☒ Enable CRC6

Receive Line Code: B8ZS

Frame Format: ESF ☒ Automatic Resynchronization

Tx Remote Alarm Format: YELLOW\_A

Rx Remote Alarm Format: YELLOW\_A ☒ Automatic Remote Alarm

LOS Sensitivity: 10

LOS Recovery: 21 ☐ Receive Equalizer

Line Length: 10

LFA Sensitivity: WRONG\_2\_OUT\_OF\_4 ☐ Transmit with High Power

Signaling Mode: CCS ☐ J1 Mode

Connection options: Terminate - 100/120 ohm balanced differential signal

Line Loop: NONE (all loops off)

Idle Byte: 0x 54 Hex value. By default - 0x54.

☐ Set custom input RX threshold value: 590 millVolts

OK Cancel Help

Figure 112

**Transmit/Receive Line Code:****AMI** - Alternative Mark Inversion (AMI) Line Coding**B8ZS** - Bipolar 8 Zero Substitution (B8ZS) Line Coding**Frame Format:****F12** - 12-frame multiframe format (F12, D3/4, SF)**F4** - 4-frame multiframe format (F4)**ESF** - 24-frame multiframe format (F24, ESF)**F72** - 72-frame multiframe format (F72, SLC96, remote switch mode)**Tx/Rx Remote Alarm Format:**

Select the Remote Alarm Indication (Yellow Alarm) format to be expected in Receive/Transmit direction with the F12 and ESF Frames.

If Format A is selected, with F12 Frame Format the bit #2 in every channel is set to '0'. With ESF Frame Format a pattern on '1111 1111 0000 0000 ...' is sent in the data link channel.

If Format B is selected, with F12 Frame Format the Frame Synchronization (FS) bit of frame 12 is set to '0'. With ESF Frame Format the bit position 2 in every time-slot is set to '0'.



With F4 and F72 frames formats the Yellow alarm is indicated in both formats by forcing the bit position 2 to '1' in every speech channel.

**YELLOW\_A** - F12: bit2 = 0 in every channel (ESF: pattern '1111 1111 0000 0000' in data link channel)

**YELLOW\_B** - F12: FS bit of frame 12 (ESF: bit2 = 0 in every channel)

***LOS Sensitivity:***

Sets the sensitivity level for the Loss Of Signal (LOS) detection.

A LOS alarm will be generated if the incoming data stream has no transitions during programmable number (N) of consecutive pulse periods.

The number given as the LOS Sensitivity value will be multiplied by 16 to arrive to the pulse count number N. The time for detecting LOS will be  $16 \times \text{LOS Sensitivity} \times \text{Pulse Length}$  (488ns).

The maximum time is  $16 \times 256 \times 488\text{ns} = 2\text{ms}$

Possible Values: 1-256

Example Value:

LOS Sensitivity = 128 ( $16 \times 128 \times 488\text{ns} = 1\text{ms}$ )

***LOS Recovery:***

Sets the sensitivity level for the Loss Of Signal (LOS) recovery.

A LOS alarm will be cleared if in the incoming data a number of Pulses (N) occurs during the time period set with the LOS Recovery parameter. The time interval starts with the first detected pulse transition and a pulse count is incremented with every received pulse. If the pulse number is greater than the number N set with this parameter, the LOS alarm will be cleared.

Possible Values: 1-256

***Line Length:***

Specify the length of the T1 line cable in meters. This information is used by the T1 transceivers to adjust the transmit pulse masks according to the line length.

Possible Values: 0-65535

***LFA Sensitivity:***

Set the condition when the Loss of Frame Alignment (LFA) is reported.

LFA can be reported if 2 out of 4, 5, or 6 framing bits have been detected to be incorrect.

**WRONG\_2\_OUT\_OF\_4** - 2 out of 4 framing bits incorrect

**WRONG\_2\_OUT\_OF\_5** - 3 out of 4 framing bits incorrect

**WRONG\_2\_OUT\_OF\_6** - 4 out of 4 framing bits incorrect

***Signaling mode:***

**CCS** - Common Channel Signaling

**CAS\_BR** - Channel Associated Signaling (Bit Robbing)

***Connection options:***

**Terminate - 75 ohm balanced unipolar signal** - Xmit is enabled, Amplifier is disabled, Monitor mode disabled, Termination mode is 78 Ohm

**Terminate - 100/120 ohm balanced differential signal** - Xmit is enabled, Amplifier is disabled, Monitor mode disabled, Termination is 100/120 Ohm

***Line loop:***

**NONE** - All Line Loops off.



**LINE\_LOOP** - Line Loop (Payload Loopback of the external highway). Looped data will pass through the entire receiver including the wander and jitter compensation.

**REMOTE LOOP (with JITTER)** - Remote Loop with Jitter Attenuation On (Loopback of the external highway bypassing the framer).

**REMOTE LOOP (without JITTER)** - Remote Loop with Jitter Attenuation Off (Loopback of the external highway bypassing the framer).

**LOCAL LOOP** - Local Loop. The receiver on the external highway is disconnected. The internal highway is looped back to the time-space switch.

***Idle byte:***

Byte indicated in this field will be transmitted in span if the modules are not active.

***Enable CRC6:***

Set whether CRC6 checking and generation will be enabled when using the ESF frame format. When disabled, the receiver will not perform the CRC6 check and the CRC6 bits are set to '1' to the transmit direction.

***Automatic Resynchronization:***

If checked, the Framer will automatically re-synchronize after loss of synchronization. If unchecked the Framer will not synchronize automatically but a re-synchronization procedure must be specifically initiated by the software.

***Automatic Remote Alarm:***

If checked, a Remote Alarm (Yellow Alarm) will be sent automatically in the outgoing data stream when the receiver is out of synchronization. The alarm will also be automatically removed when the receiver returns to the synchronized state.

***Receive Equalizer:***

The Receive Equalizer can be used match the 18dB ITU-T I.431 requirement. When the Equalizer is turned off (unchecked), the Receiver is 6dB, when turned on, the Receiver is 18dB.

***Transmit with High Power:***

When checked the pulses on the line interface will be sent with high power. If unchecked the pulses will be sent with low power.

***J1 Mode:***

Enables J1 Frame Format mode.

#### **4.2.3.2 E1 Properties (Layer 1 settings)**

On "E1 Properties/Layer 1" settings tab (Figure 113) you can change the following E1stream options:



**T1/E1 Configuration**

Board Configuration | **E1 Configuration**

Line Code: HDB3 ☒ Extended HDB3 Error Detection

Frame Format: CRC4 Multiframe :PCM31

AIS Detection: G775 ☒ Regain Multiframe Automatically

LOS Sensitivity: 10 ☒ Automatic Remote Alarm

LOS Recovery: 21 ☐ Receive Equalizer

Line Length: 10 ☐ Transmit with High Power

Connection options: Terminate - 100/120 ohm balanced differential signal

Line loop: NONE (all loops off)

Idle Byte: 0x 7F Hex value. By default - 0x7F.

☐ Set custom input RX threshold value: 500 millivolts

OK Cancel Help

Figure 113

**Transmit/Receive Line Code:****AMI** - Alternate Mark Inversion (AMI) Line Coding**HDB3** - High Density Bipolar 3 (HDB3) Line Coding**Transmit/Receive Frame Format:****DOUBLE FRAME** - Double Frame: PCM31**CRC4 MULTIFRAME** - Cyclic redundancy check 4 Multiframe: PCM31**CRC4 MULTIFRAME G706: PCM31** - CRC4 Multiframe format with modified CRC4 Multiframe alignment**CAS Multiframe** - PCM30 - Channel associated signaling (CAS) Multiframe**CAS+CRC4 Multiframe** - PCM30 Cyclic redundancy check 4 (CRC4) and Channel associated signaling (CAS) Multiframe**UNIFRAMED** - PCM32 Unframed E1

In "PCMxx" abbreviation "xx" is the number of "active" timeslots.

The list of available frame formats is selected in the "Options\Advanced".

**AIS Detection:**

Set the algorithm that is used to detect the Alarm Indication Signal (AIS).

According to ETX300233 an AIS alarm is detected if the incoming data stream contains



less than 3 zeros within 512 bits and a Loss of Frame Alignment is indicated. The alarm will be cleared if 3 or more zeros will be detected within 512 bits or a Frame Alignment Signal (FAS) word is found. According to ITU-T G.775 an AIS alarm is detected if the incoming data stream contains less than 3 zeros within a doubleframe (512 bits) over a two doubleframe period (1024 bits).

The alarm will be cleared if 3 or more zeros are detected within a doubleframe for two consecutive doubleframes.

**ETS300233** - AIS alarm will be detected according to ETS300233

**G775** - AIS alarm will be detected according to CCITT G.775

#### ***LOS Sensitivity:***

Sets the sensitivity level for the Loss Of Signal (LOS) detection.

A LOS alarm will be generated if the incoming data stream has no transitions during programmable number (N) of consecutive pulse periods.

The number given as the LOS Sensitivity value will be multiplied by 16 to arrive to the pulse count number N. The time for detecting LOS will be  $16 \times \text{LOS Sensitivity} \times \text{Pulse Length}$  (488ns).

The maximum time is  $16 \times 256 \times 488\text{ns} = 2\text{ms}$

Possible Values: 1-256

Example Value:

LOS Sensitivity = 128    ( $16 \times 128 \times 488\text{ns} = 1\text{ms}$ )

#### ***LOS Recovery:***

Sets the sensitivity level for the Loss Of Signal (LOS) recovery.

A LOS alarm will be cleared if in the incoming data a number of Pulses (N) occurs during the time period set with the LOS Recovery parameter. The time interval starts with the first detected pulse transition and a pulse count is incremented with every received pulse. If the pulse number is greater than the number N set with this parameter, the LOS alarm will be cleared.

Possible Values: 1-256

#### ***Line Length:***

Specify the length of the T1 line cable in meters. This information is used by the T1 transceivers to adjust the transmit pulse masks according to the line length.

Possible Values: 0-65535

#### ***Connection options:***

**Bridge - HighZ** - Xmit is disabled, Amplifier is disabled, Monitor mode disabled, Termination mode is *HighZ*

**Terminate - 75 ohm balanced unipolar signal** - Xmit is enabled, Amplifier is disabled, Monitor mode disabled, Termination mode is 78 Ohm

**Terminate - 100/120 ohm balanced differential signal** - Xmit is enabled, Amplifier is disabled, Monitor mode disabled, Termination is 100/120 Ohm

**DSXMON -20dB** - Xmit is disabled, Amplifier is disabled, Monitor mode enabled, Termination is 100/120 Ohm

**DSXMON -30dB** - Xmit is disabled, Amplifier is enabled, Monitor mode enabled, Termination is 100/120 Ohm

#### ***Line loop:***

**NONE** - All Line Loops off.

**LINE\_LOOP** -Line Loop (Payload Loopback of the external highway). Looped data will



pass through the entire receiver including the wander and jitter compensation.

**REMOTE LOOP (with JITTER)** - Remote Loop with Jitter Attenuation On (Loopback of the external highway bypassing the framer).

**REMOTE LOOP (without JITTER)** - Remote Loop with Jitter Attenuation Off (Loopback of the external highway bypassing the framer).

**LOCAL LOOP** - Local Loop. The receiver on the external highway is disconnected. The internal highway is looped back to the time-space switch.

***Idle byte:***

Byte indicated in this field will be transmitted in span if the modules are not active.

***Extended HDB3 Error Detection:***

Selects the error detection mode. When turned off, only double violations are detected. When turned on, "0000" strings are detected as code violations as well.

***Regain Multiframe Automatically:***

When enabled, the receiver will search a new basic and multiframing if more than 914 CRC errors have been detected in a time interval of one second.

***Automatic Remote Alarm:***

If checked, a Remote Alarm (Yellow Alarm) will be sent automatically in the outgoing data stream when the receiver is out of synchronization.

The alarm will also be automatically removed when the receiver returns to the synchronized state.

***Receive Equalizer:***

The Receive Equalizer can be used match the 18dB ITU-T I.431 requirement. When the Equalizer is turned off, the Receiver is -10dB (short haul), when turned on, the Receiver is -36dB (long haul).

***Transmit with High Power:***

When checked, the pulses on the line interface will be sent with high power. If unchecked, the pulses will be sent with low power.

**Set custom input RX threshold value** – option is used to set the RX threshold value in millivolts.

## 4.3 Applications

In this section the list of the applications included in the base package is introduced.

### 4.3.1 Line Status

In the Line Status window you can see the line current condition, error's statistics, span events log, and also you can clear the statistics (Figure 114).



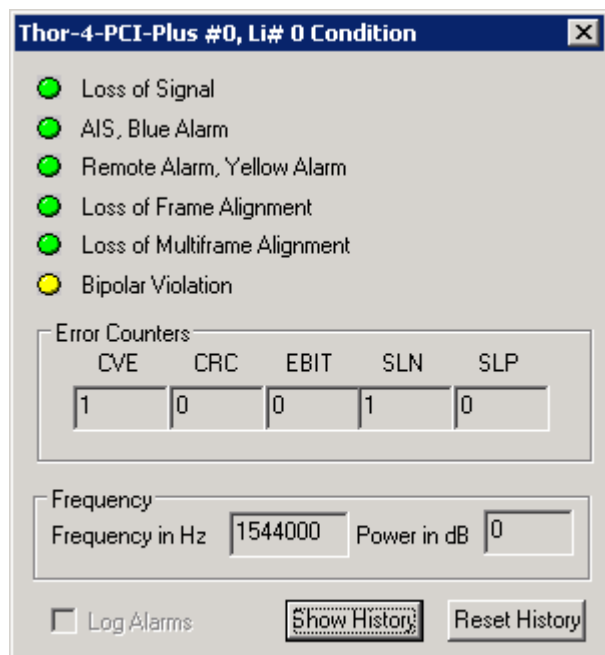


Figure 114

Let us examine each portion of the window.

Window heading (Figure 114) shows the board's type and number as well as span's number.

Line status is indicated by colored circles in a traffic light mode:

- Red - error (this parameter is in "error" condition);
- Yellow - alarm (this parameter is in OK condition, but has been in "error" condition);
- Green - OK (the parameter is in normal working state).

The following parameters conditions are shown in Figure 115:

**LOS (Loss of Signal)** - Red Alarm, means the span is disabled, there is no carrier. Probable reasons: the cable is not connected or parameters or operating mode are set falsely.

**AIS, Blue Alarm** - Alarm Indication Signal (Blue Alarm), means that errors occur in the stream. Check the span settings and AIS detector's type.

**Remote Alarm, Yellow Alarm** – means that the second site resynchronized the stream because of stream's errors.

**Loss of Frame Alignment** - Stream frames alignment error. Check Layer 1 synchronization and span settings.

**Loss of Multiframe Alignment** – Loss of alignment in multiframe alignment mode. Please check Layer 1 settings on both ends.

**Bipolar Violation** – BPV error has been detected, please check current mode.

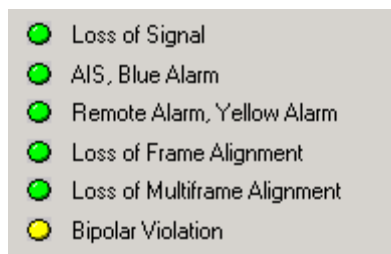


Figure 115

Error statistics (error amount) (Figure 116) is shown by the following division:

**CVE** - Code Violation Count

**CRC** - CRC Error Count. I.e. in CRC4 of Layer 1 is on. Some non-stable links (like long-DSL) has CRC mode enabled. It causes decrease of data bandwidth but assures data were not corrupted. Please check connection and test it with BERT.

**EBIT** - For E1: E-bit Error Count, For T1: Error Block Count.

**SLN/SLP** - Receive Slip Negative/Positive – Please check clock source. Usual cause: both sides are in slave mode, waiting for sync from the same Li infinite.

CVE	CRC	EBIT	SLN	SLP
1	0	0	1	0

Figure 116

For some boards the span current synchronization frequency and its Power in dB can be indicated (Figure 117).

Frequency	
Frequency in Hz	Power in dB
1544000	0

Figure 117

All span events are logged and can be viewed. Click "Show History" button and you will see the logged events in a new window (Figure 118).

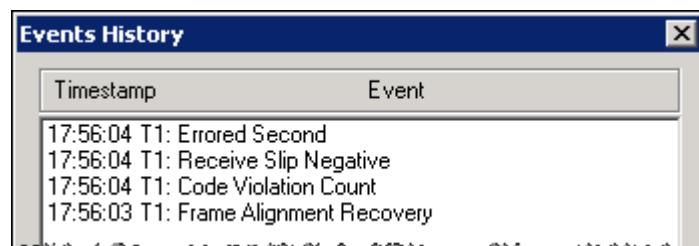


Figure 118

### 4.3.2 Oscilloscope

The Oscilloscope feature can be enabled and started from the toolbar and the main menu (under “Applications”). See Figure 119.



Figure 119

The Oscilloscope (Figure 120) can be enabled on any board that supports Burst DMA operating mode, i.e. Thor-8-PCI-Plus or Thor-2-PCI-Express.

The Oscilloscope shows oscillograms of the selected timeslots for the data period of a second/frequency refresh.

On Y axis signal value (from -0 to +0) is shown, -Inf (minus infinity) is the center, i.e. infinitely small signal. On X axis the samples are shown.

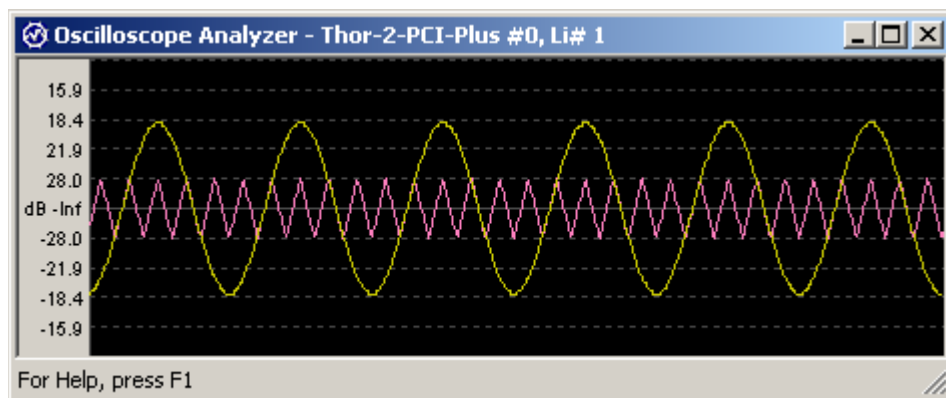


Figure 120

To setup the Oscilloscope as well as to start and stop it you can use the toolbar in the Analyzer's main window or in the popup menu (Figure 119, Figure 121). In the popup menu you can change module parameters and control start and stop.

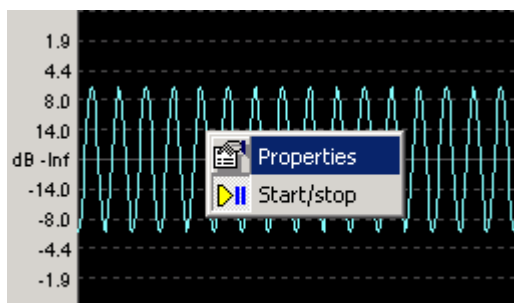


Figure 121

The main settings of Oscilloscope module are illustrated in Figure 122:

**Refresh** – refresh frequency in milliseconds. Here you can set refresh time interval, it depends on number of frame buffer data to be displayed on-screen per one turn. For

example, at 100 msec value the oscillogram will be refreshed 10 times per second and will show data collected for 100 msec period.

**Scale** – Y-axis scale factor. Default value is 1.0 X, use it for full dynamic range display. You can adjust this factor if you need more detailed view, but in this case some peaks can be beyond the edge of the window.

**Monitoring Timeslots** – you can select the timeslots for which the oscillogram needs to be displayed. To activate the timeslot tap off the check-box to the left of the timeslot's name and select the codec and line's color.

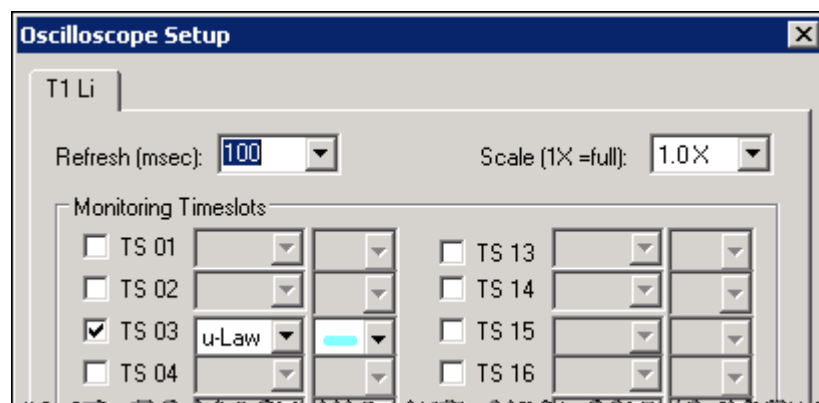


Figure 122

In this case we had picked to monitor one timeslot, TS3. There is u-law data stream in it. We are seeing a 500 Hz sine-wave in this timeslot. The oscillogram is displayed acceleration on the time axis (Scale 1.0X); refresh frequency is 10 times per second.

Timeslots' additional settings and "Select All/Clear All" functions are located in the lower part of the window (Figure 123):

**Thick lines** – if you tick off the check-box, the line will double increase in thickness.

**Select All** – to activate all timeslots.

**Clear All** – to disable all timeslots.

**Other Colors:**

**Background** – oscilloscope background color.

**Grid** – oscilloscope grid line color.

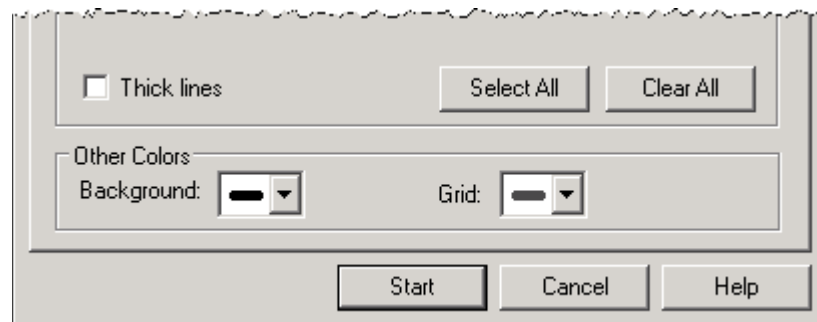


Figure 123

### 4.3.3 Spectrum Analyzer

The Spectrum Analyzer application can be enabled and started from the toolbar and the main menu (under “Applications”) as well as using right-click popup in device tree on the main screen. See Figure 124.



Figure 124

Spectrum Analyzer module can be enabled on any board which supports Burst DMA operating mode, e.g. Thor-8-PCI-Plus or Thor-2-PCI-Express.

With Spectrum Analyzer (Figure 125) you can view the real-time spectrum analysis of selected timeslots.

Note: this module can work in a multichannel mode.

On Y-axis there is spectrum energy on selected frequencies (X-axis).

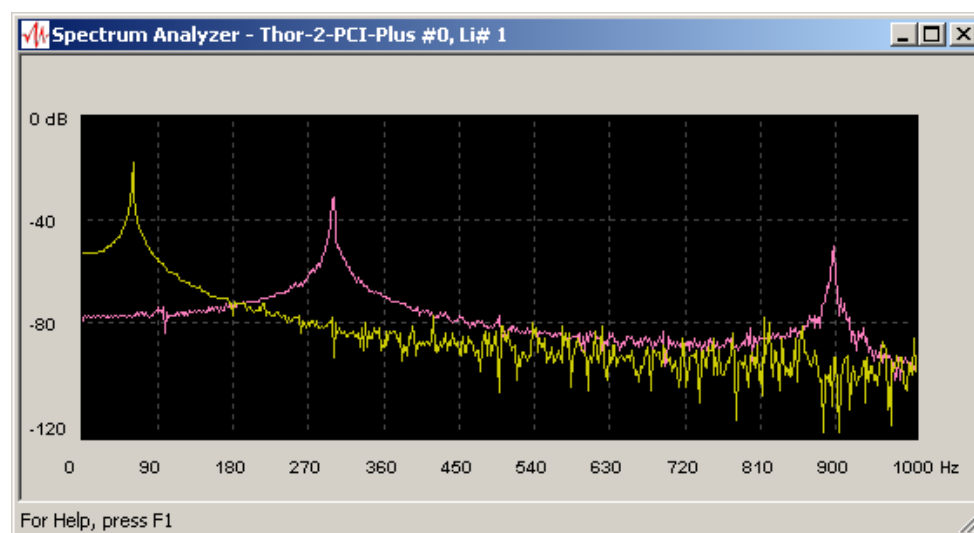


Figure 125

In this example we are listening to a 60 Hz sine-wave and 300 Hz triangular waveform.

To set up, start and stop the Spectrum Analyzer use the toolbar in the main window or popup menu (Figure 124, Figure 126)

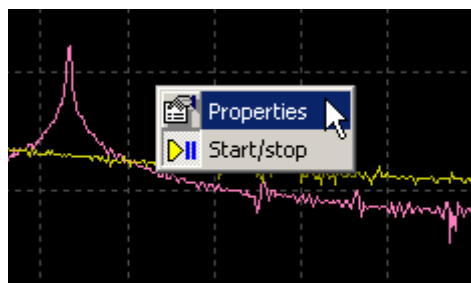


Figure 126

Spectrum Analyzer's main parameters are illustrated in Figure 127:

**FFT Size** – defines the frequency range amount of FFT algorithm for which the spectrum power is valued. The higher the parameter's value, the more detailed analyses will be and more processor time will be needed.

**Smoothing window** – chose the algorithm for FFT algorithm smoothing. It is known that on the boundaries the algorithm is in the error. To minimize it the data is additionally reprocessed before the FFT algorithm.

**Refresh** – refresh time in milliseconds, e.g. at the value of 100 msec the spectrogram will refresh 10 times per second. The best way is to set refresh interval as 500 msec. In this case the system load will be reduced, but the current processes dynamics can be analyzed.

**Db Range, Freq. range** – input data scale can be set, e.g. if it is necessary to show one of the peaks more detailed.

**Hold peaks during monitoring** – using this option peaks are storied on the screen during the set time in seconds. The option allows to see average data, prevailing frequencies in the signal.

**Save last monitored view** – if you check this option the spectrogram will not clear after module stops, otherwise the window is cleared.

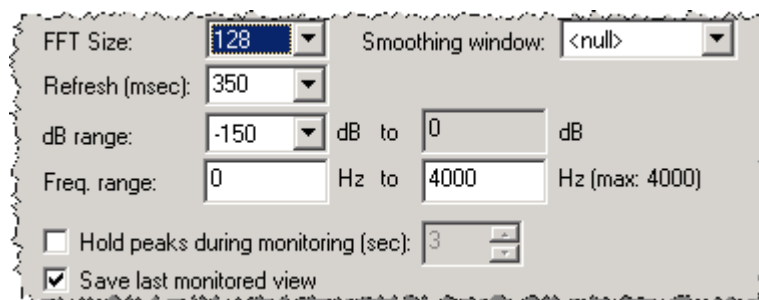


Figure 127

You can select necessary timeslots for monitoring (Figure 128). To select the timeslot tick off the checkbox to the left of the timeslot's name and indicate data format (a,w-law or PCM-8) and curve color.

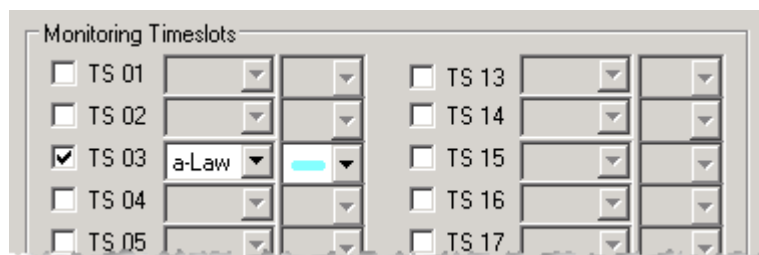


Figure 128

This module supports multi-channel operating mode, so another selected timeslot and color will also be shown on the screen. This mode is convenient to compare 2 signals visually.

Let us explain the rest of the parameters in the bottom of this dialog (Figure 129). In the window lower part the following additional settings and "Select All/Clear All" functions for all timeslots are located:

**Thick lines** – oscillogram line's double increase in thickness.

**Select All** – to activate all timeslots.

**Clear All** – to disable all timeslots.

**Other Colors:**

**Background** – Spectrum Analyzer window background color.

**Grid** – Spectrum Analyzer area grid line color.

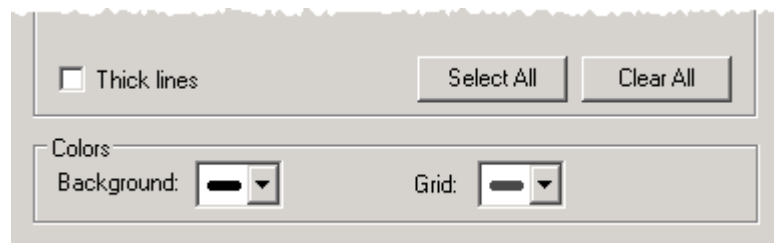


Figure 129

#### 4.3.4 RX Realtime Monitor / VF-Audio

RX Realtime Monitor/VF-Audio application can be enabled and started from the toolbar (Figure 130) and from the main menu (under “Applications”) as well as using right-click popup in device tree on the main screen.

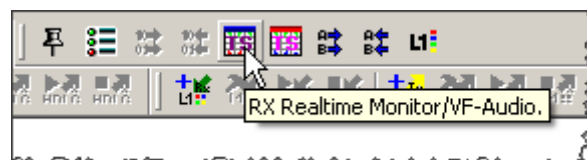


Figure 130

With the help of this module you can view the incoming data in real time, and also listen it via sound output device at your computer (Figure 131).

RX Realtime Monitor / VF-Audio (Thor-2-PCI-Plus #0, L

TS 00	FF	TS 08	BD	TS 16	B7
TS 01	D7	TS 09	EB	TS 17	ED
TS 02	ED	TS 10	B7	TS 18	D7
TS 03	EE	TS 11	BB	TS 19	DB
TS 04	BD	TS 12	DE	TS 20	7D
TS 05	8D	TS 13	8D	TS 21	77

Figure 131

Data in the window is displayed in hexadecimal format separately for each timeslot. When the data is changed the cell's background color temporarily turns red.

To listen to the data coming to the given timeslot via soundcard output right click on the necessary timeslot cell, choose codec and connect to one of the channels of your sound output device (Figure 132, Figure 133).

When you enable the timeslot to the right of the cell there the “speaker” will appear indicating that the timeslot is enabled.  
At closing the window all active timeslots switch off.

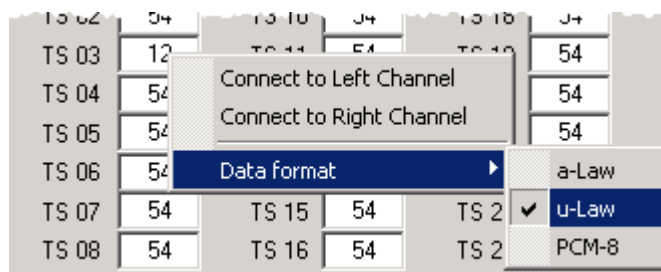


Figure 132

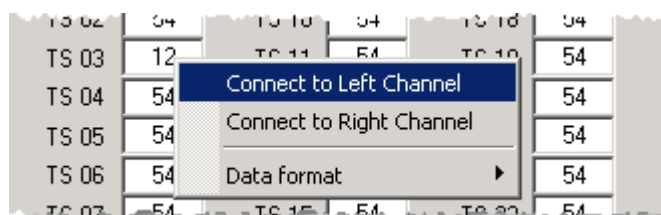


Figure 133

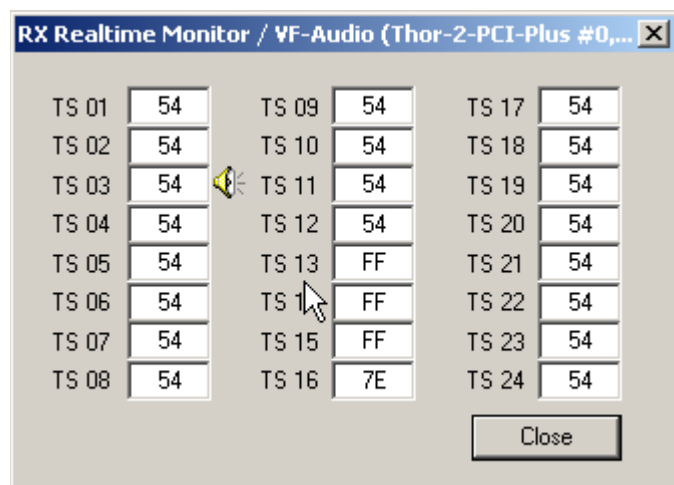


Figure 134

In this example (Figure 132, Figure 133, Figure 134) TS 03 connection to the left channel of the sound output device using mu-Law codec is shown.

#### 4.3.5 TX Realtime Monitor / VF-Audio

TX Realtime Monitor/VF-Audio application can be enabled and started from the toolbar (Figure 135) and the main menu (under “Applications”) as well as using right-click popup in device tree on the main screen.



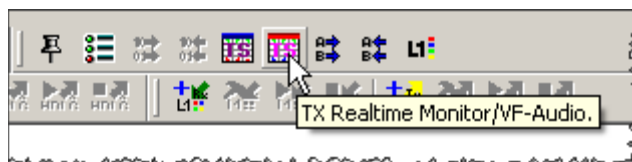


Figure 135

With the help of this module you can monitor in real time the data transmitted to the stream by Analyzer's modules separately at each timeslot (Figure 136).

Note: this is possible only in Burst DMA operating mode and only for Burst-modules.

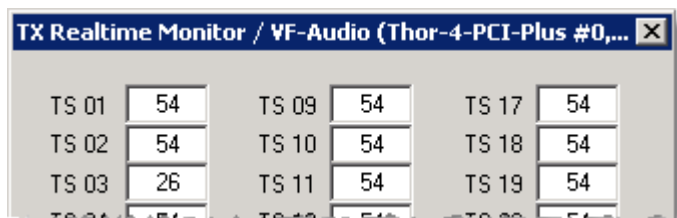


Figure 136

Using this module you can transmit audio-data from your PC sound device to some timeslot. Right-click on the needed timeslot's cell, choose the codec and connect to one of the channels of your sound input device (Figure 137, Figure 138).

In case of sound channel will be connected and stay active you will see notification: a mic icon on the right from timeslot cell for the right sound channel and on the left – for the left sound channel. In case of closing the window all active sound channels will be deactivated for all timeslots.

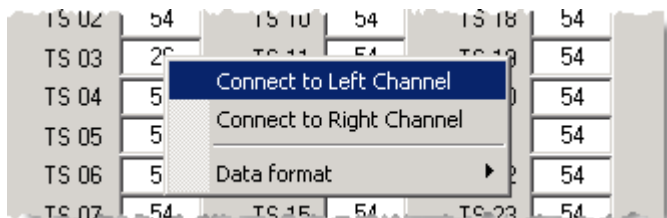


Figure 137

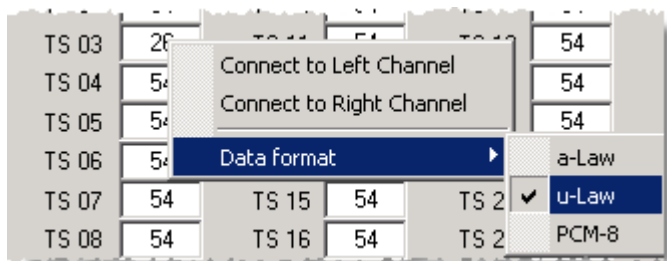


Figure 138

In this example (Figure 137, Figure 138) TS 03 connection to the left channel of the sound input device using mu-Law codec is shown.

### 4.3.6 ABCD Bit TX Signaling

This module allows to transmit previously recorded ABCD-bit sequences or manually set ABCD-values.

To transmit from some file please select it using “Browse” button, if continuous circle-wise playback is needed tick off “Continuous playback” and click “Start” button or save settings by clicking “Save setup” button and start playback from the main window (Figure 139, Figure 140).



Figure 139

To stop the playback use “Stop” button or the corresponding functions of the main window (Figure 140).

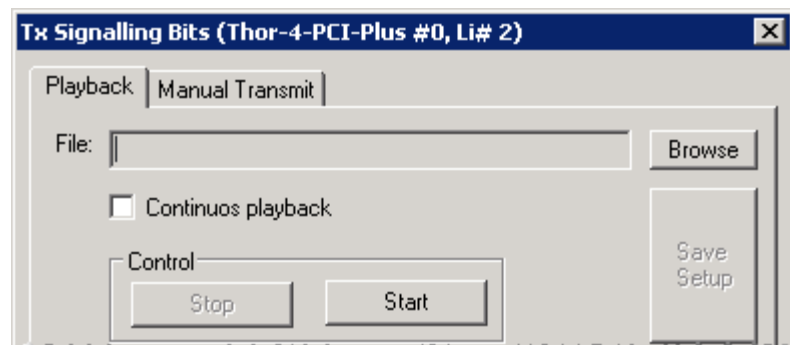


Figure 140

For manual transmit use the “Manual Transmit” tab (Figure 141). Set bits using mouse. Change the value from “1” to “0” and vice versa by clicking buttons of corresponding bits on the needed slots.

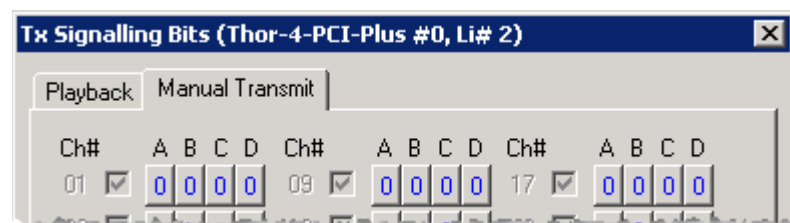


Figure 141

To transmit use the “Transmit” button. You can also save the bit sequence to file using “Save” button or load the previously saved sequence using “Load” button (Figure 142). Note: at transmitting all bits of all timeslots are transmitted at once regardless of what spans you changed.

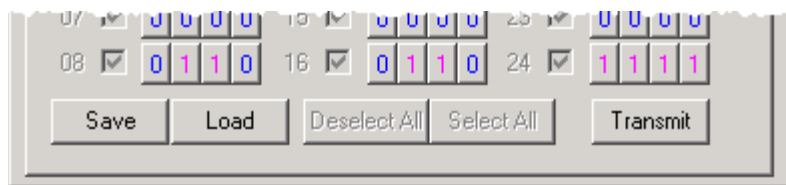


Figure 142

### 4.3.7 ABCD Bit RX Signaling

Using this module you can monitor ABCD bits changes in real time and also you can log the changes into text file for further analysis or playback. For recording please use the “Recording” tab. Using “Browse” button select receiving file and click the ”Start” button or “Save Setup” button for saving the configuration and further start/stop from the main widow. To stop recording please use “Stop” button or the corresponding functions of the main window (Figure 143, Figure 144).



Figure 143

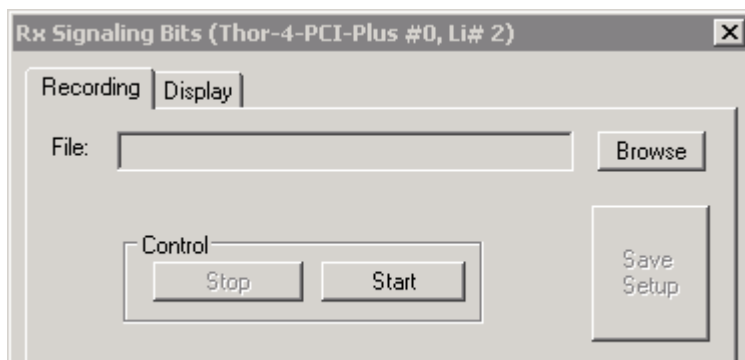


Figure 144

Use the second tab “Display” for monitoring (Figure 145). Tap off the timeslots in which you are going to monitor the bit changes.

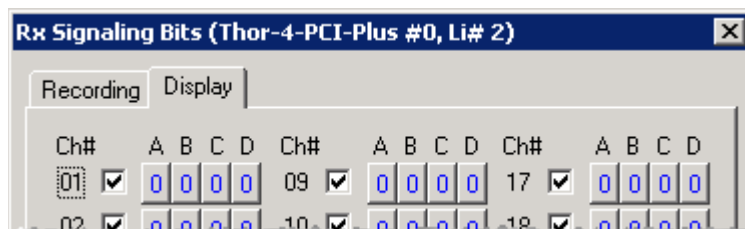


Figure 145

You can also tap off all the timeslots or use the “Select all” and “Deselect All” buttons. To save the current bit situation in a text file use the “Save” button. See Figure 146.

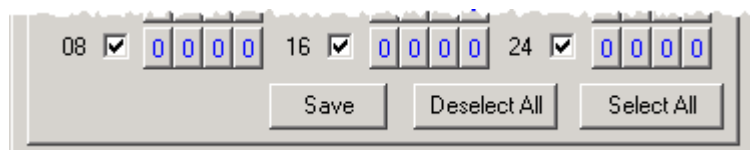


Figure 146

## 5 Add-On Modules

This section describes the optional add-on modules of the OTX T1E1 Analyzer. Each module is available via top menu, toolbar or right-click popup on the span/board/system of main screen.

### 5.1 Record/Playback Add-on Module

To start work with the Record/Playback Add-on module, you should enable Record/Playback on the spans you need or on the board level, however it is most desirable to disable Record/Playback on the spans you do not use to prevent errors during launching.

Note: there is a color code used in Analyzer in the Playback/Recording GUI: red for Record and green for Playback.

In this example we are recording on TS2-TS4, and we are playing a file on TS3 (Figure 147).



Figure 147

Note also the Record and Playback indicators to the left of the timeslots.



Figure 148

Small red circle indicates that the recording is active for this span and small green triangle indicates that the playback is active (Figure 148). However timeslots can be not active.

#### 5.1.1 Recording

Setup a recording (Figure 149):



Figure 149

In the appeared Setup Recording window select the timeslots active for recording (Figure 150). To simplify the selecting process you can press the “Select All” or “Clear All” button.

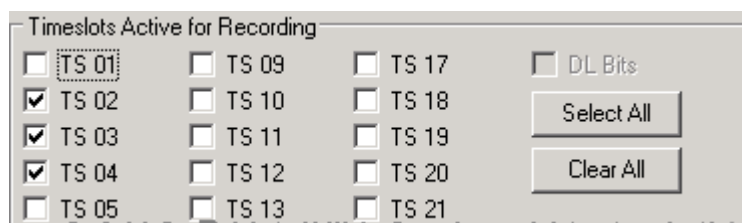


Figure 150

You can limit the recording continuance by time and by size in capture size settings by entering the corresponding value into the “Limited capture” edit box (Figure 151):

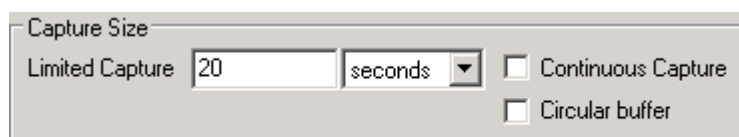


Figure 151

Select the unit (Figure 152):

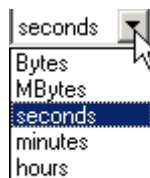


Figure 152

You cannot limit the recording size by selecting check-box “Continuous Capture” (Figure 151). If you need only the latest recent data and you want save hard disk drive (HDD) space, select “Circular buffer” option.

Setup File Capture Settings: select the needed File Type and Structure for the recording (Figure 153, Figure 154).

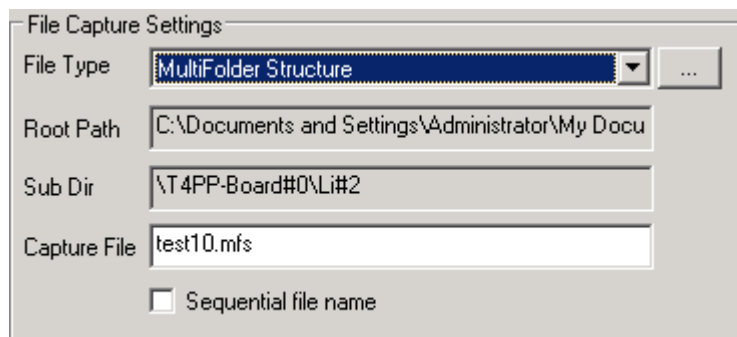


Figure 153

File Types for the recordings are:

**MultiFolder Structure** – files for each span are stored in separate folders, each timeslot with its own sub-folder.

**Single Folder Structure** – timeslot files for each span are stored in one folder.

**Binary File** – all spans' data is stored in one file.

**Pure Binary File** – all spans' data is stored in \*.bin format file.

**libpcap (v2.4) file format** – support saving captured packets to a file; files can be written using libpcap, to be able to capture network traffic and analyze it.

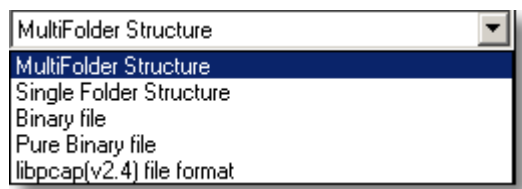


Figure 154

Note: If you need more detailed information on file structures and data formats, please contact by email our Support Service: [support@odints.com](mailto:support@odints.com).

After finishing of Setup settings you can start recording by pressing the “Start recording” button on the toolbar.

The current version of Analyzer supports group operations of recording from several spans, board or the whole system.

To start the recording on several spans simultaneously, start the recording on the Board level. To start the recording on several boards simultaneously, start the recording on the System level.

Note: Analyzer supports synchronous recording mode of several spans (on the same board). In this mode the data is recorded synchronously frame by frame for several spans. To activate this mode, please select “Sync recording mode” in Board properties.

After start of Record module you can see a mini-status on the main screen at the right from Timeslots pad. There are different modes of such indication:

- If the size of the recording is not limited, the duration of recording and the

sandglass are indicated (Figure 155).

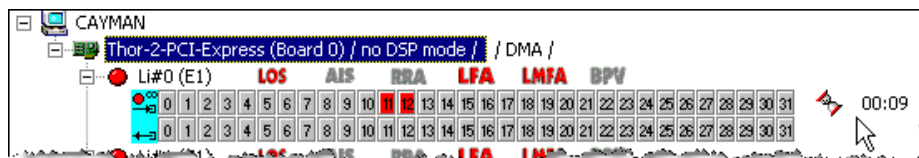


Figure 155

- If the size of recording is limited, the progress of recording operation and the ratio of recording time to total time are displayed (Figure 156).

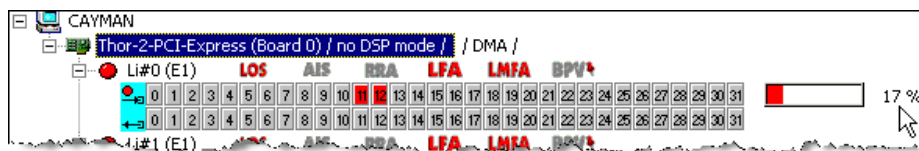


Figure 156

## 5.1.2 Playback

Set up Playback, for example, by right-clicking on the timeslot pad (Figure 157).

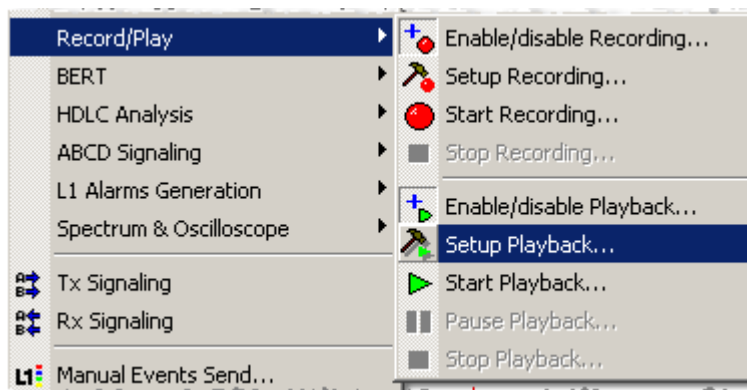


Figure 157

All the settings you have made during the setup session can be saved in a file for a quick load later in the future.



Figure 158

Having done all the necessary settings click the “Save as...” button and give the compilation file name (Figure 158). Now you can upload these settings anytime you wish by clicking the “Open...” button.

You can also reset the compilation by clicking the “New” button. See Figure 159.

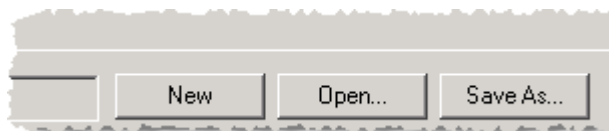


Figure 159

You can add files to compilation by clicking the “Add...” button.

According to the file type the content will be indicated in the sources tree:

Raw data, Wave data or Timeslot data (Figure 160).

To map the data into the timeslots drag-and-drop data “into” the timeslot or select data in the sources tree and then check necessary timeslots.

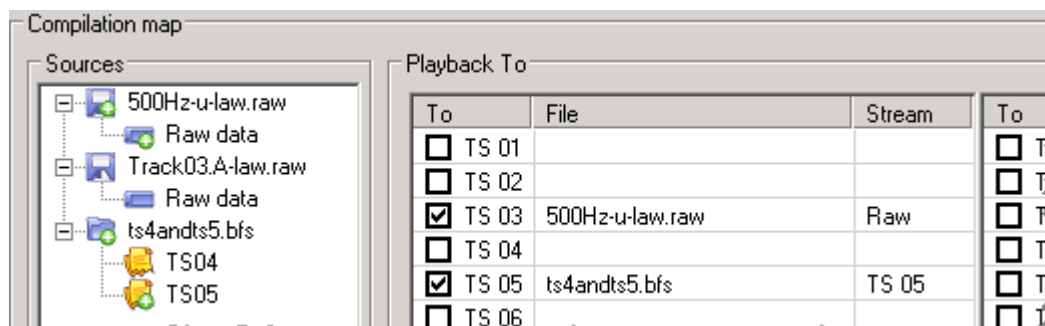


Figure 160

Right-click on the source file (Figure 161). You can add all the source data channels to the compilation (likewise double-click on source file). You can also look at the source file properties.

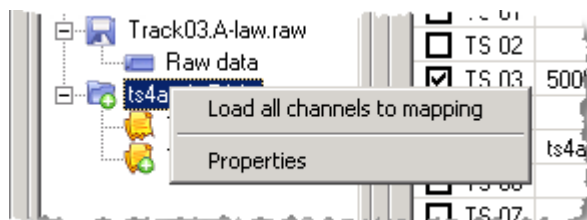


Figure 161

Using right-click menu under “Playback to” you can (Figure 162):

- set output format at all mapped timeslots to a-law, u-law or PCM-8;
- load channel as was recorded (in this case the source is added to compilation);
- set start silence – to delay source playback to defined value.

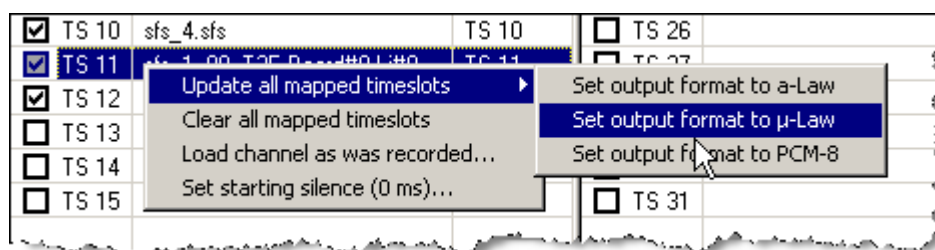


Figure 162



Select Playback time type (Figure 163):

Longest source – Playback time is equal to the longest source time.

Continuous – after playback of the longest source is finished the Playback restarts.

Specified – user sets the Playback time manually in one of the Playback time fields.

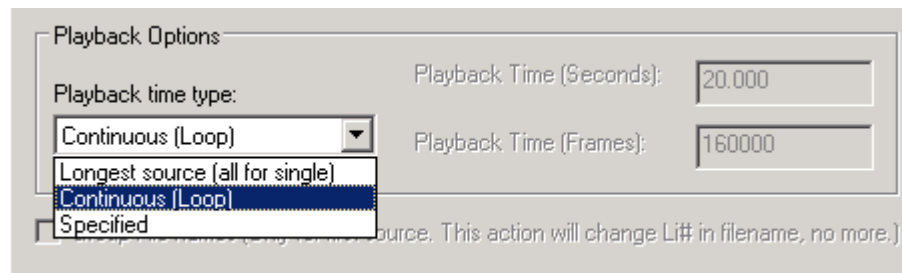


Figure 163

You can also enable “Loop smallest sources” option (Figure 164). It means that the smallest sources will be played several times while the longest source is in the progress. If this option is not activated all the sources are played once while the longest source is being played.

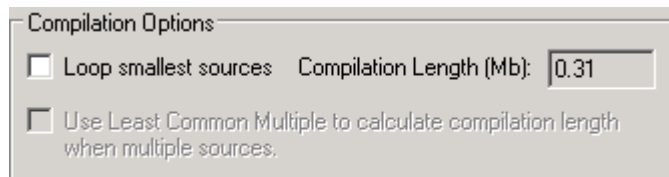


Figure 164

“Group File Names” option (Figure 165) allows the information on Li number to be added to file names. This option is applicable for the file formats that have not been designed for recording from several spans, i.e. \*.SFS.



Figure 165

## 5.2 BERT (Bit Error Rate Tester) Add-on Module

This section describes the BERT module features.

Enable and then Setup BERT by right-clicking on the timeslot pad (Figure 166) or by clicking on the corresponding icons on the toolbar.

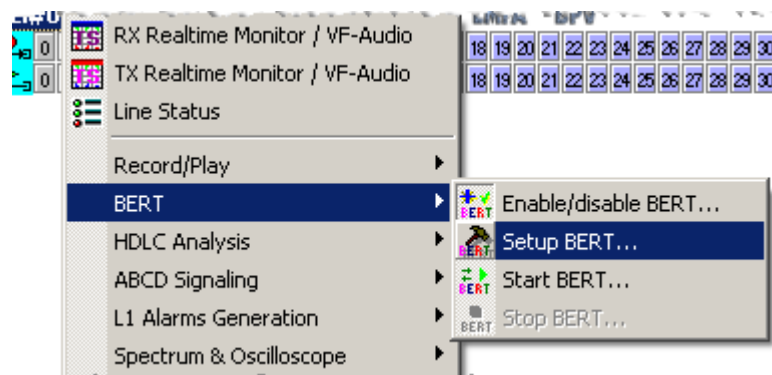


Figure 166

BERT timeslots are indicated purple. In this example we have picked TS1-TS10 and TS15-TS16 for the BERT operation (Figure 167).

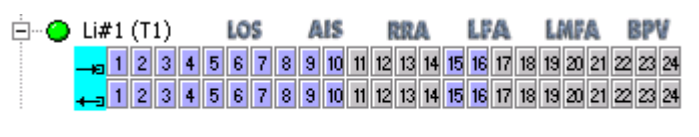


Figure 167

Let us have a look at BERT settings in detail.

### BERT patterns

Analyzer supports generation and detection of the following pattern types:

- PRBS (Pseudo Random Bit Stream) – Bit sequence sent by algorithm is pseudo random. Transmitted data Generation algorithm is based on frame bits shifting. For the successful test passing the base frame and the shifting algorithm of the receiving end should be identical to the generator. In this application the 3-byte base frame and the static shift table are used.
- Static – Static data that does not vary with time are transmitted. The receiving end should get the identical byte for the successful test passing.
- RBS (Random Bit Stream) - Bit sequence sent by algorithm but within some particular distribution law. The receiving end controls the proper bit stream filling.

There are several predefined patterns:

Pattern name	Pattern type	Description
2 <sup>6</sup> -1	PRBS	taps [5,6]
2 <sup>9</sup> -1	PRBS	taps [5,9]
2 <sup>10</sup> -1	PRBS	taps [7,10]
2 <sup>11</sup> -1	PRBS	taps [9,11]
2 <sup>15</sup> -1 (CCITT)	PRBS	taps [14,15] (verified w/ T-Berd in T1 mode)
2 <sup>20</sup> -1	PRBS	taps [17,20] (verified w/ T-Berd in T1 mode)



2 <sup>23</sup> -1 (CCITT)	PRBS	taps [18,23] (verified w/ T-Berd in T1 mode)
QRSS	PRBS	taps [17,20] (verified w/ T-Berd in T1 mode)
MARK (All Ones)	Static	All bits of transmitted data are 0. 0x00 byte is transmitted
SPACE (All Zeros)	Static	All bits of transmitted data are 1. 0xFF byte is transmitted.
1:1	RBS or static	In each bit pair one bit is 1, the other is 0. In a static mode 0xAA byte is transmitted
1:3	RBS or static	In every bit quadruple one bit is 1, others are 0. In a static mode 0x88 byte is transmitted
3:1	RBS or static	In every bit quadruple 3 bits are 1, and one is 0. In a static mode 0xEE byte is transmitted
1:7	RBS or static	In every byte one bit is 1, the others are 0. In a static mode 0x80 byte is transmitted
7:1	RBS or static	In every byte 7 bits are 1 and one is 0. In a static mode 0xFE byte is transmitted
3-IN-24	RBS or static	In every sequence of 24 bits (3 bytes) 3 bits are 1, the others are 0. In a static mode 0x440004 sequence is transmitted
2-IN-8	RBS or static	In every byte two bits are 1, the others 0. In a static mode 0x42 byte is transmitted
Gamma Test		Send bytes from 0 to 255(repeats). Gamma sequence: 00 01 02 ... FE FF
User Defined		Customizable user sequence
Timeslots Test		Sends bytes from 0 to 24 (T1) or 31 (E1), starting at TS0 and repeats every frame. Each byte value is placed exactly in timeslot with the value number. Timeslots sequence: 00 01 02 ... 1E 1F

### 5.2.1.1 User Defined Pattern

You can create your own pattern using the option “User Defined Pattern”.  
In the “Bit Pattern” menu dialogue select “User defined” option (Figure 168):

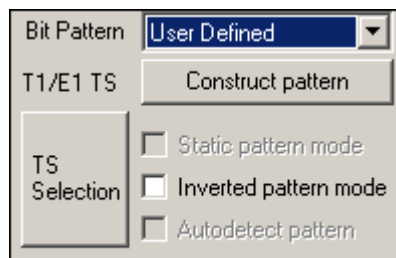


Figure 168

Press the “Construct pattern” button.  
Select the pattern type: PRBS Pattern, Random Bit Stream or Static Pattern.



### 5.2.1.1.1 PRBS Pattern

Whereas the base of PRBS algorithm (Figure 169) are the pseudo-random bit streams of 3-byte length with shifting bits, you should check the corresponding TAP in the PRBS pattern configuration dialog.

PRBS Pattern			
Random Bit Stream	Static pattern		
<input type="checkbox"/> TAP 1	<input type="checkbox"/> TAP 9	<input type="checkbox"/> TAP 17	<input type="checkbox"/> TAP 25
<input type="checkbox"/> TAP 2	<input type="checkbox"/> TAP 10	<input type="checkbox"/> TAP 18	<input type="checkbox"/> TAP 26
<input type="checkbox"/> TAP 3	<input type="checkbox"/> TAP 11	<input type="checkbox"/> TAP 19	<input type="checkbox"/> TAP 27
<input type="checkbox"/> TAP 4	<input type="checkbox"/> TAP 12	<input type="checkbox"/> TAP 20	<input type="checkbox"/> TAP 28
<input type="checkbox"/> TAP 5	<input type="checkbox"/> TAP 13	<input type="checkbox"/> TAP 21	<input type="checkbox"/> TAP 29
<input type="checkbox"/> TAP 6	<input type="checkbox"/> TAP 14	<input type="checkbox"/> TAP 22	<input type="checkbox"/> TAP 30
<input type="checkbox"/> TAP 7	<input type="checkbox"/> TAP 15	<input type="checkbox"/> TAP 23	<input type="checkbox"/> TAP 31
<input type="checkbox"/> TAP 8	<input type="checkbox"/> TAP 16	<input type="checkbox"/> TAP 24	<input type="checkbox"/> TAP 32

Figure 169

Note: The given pattern type could not be automatically detected by the Analyzer. You should set up the given pattern type and its parameters on the remote site manually for the successful test passing.

### 5.2.1.1.2 Random Bit Stream

Random Bit Stream pattern type (Figure 170) is based on the random bit sequence, transmitted within some certain distribution law.

PRBS Pattern Random Bit Stream Static pattern

Please specify parameters of Random Bit Stream pattern.  
Notice: Length of pattern must be 2, 4, 8 or 24 bits.

Number of Ones:  ☐ Hint: Select one of parameter by radio-button. Enter other parameters, selected parameter will be calculated automatically.

Number of Zeros:  ☒

Length of pattern:  ☐

Notice: The sum of Ones and Zeros will be equal to length of pattern.

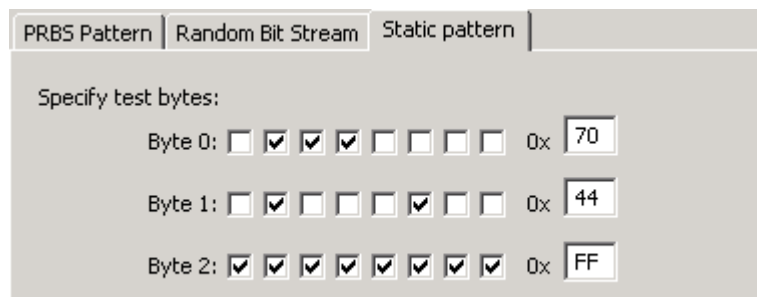
Figure 170

You can specify the length of pattern (2, 4, 8 or 24 bits) and the number of Ones and Zeros in the frame. You can select any two parameters and the third one will be calculated automatically (Figure 170).

Note: This pattern type could be detected automatically using Autodetect pattern function.

### 5.2.1.1.3 Static Pattern

In this mode the 3-byte static sequence is transmitted. The receiving end should get the identical byte for successful test passing.



The dialog box has three tabs: "PRBS Pattern", "Random Bit Stream", and "Static pattern". The "Static pattern" tab is selected. Below the tabs, it says "Specify test bytes:". There are three rows for "Byte 0:", "Byte 1:", and "Byte 2:". Each row has eight checkboxes and a hex value field. For Byte 0, the 2nd, 3rd, and 4th checkboxes are checked, and the hex value is 70. For Byte 1, the 2nd, 4th, and 7th checkboxes are checked, and the hex value is 44. For Byte 2, all eight checkboxes are checked, and the hex value is FF.

Byte	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Hex Value
Byte 0:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0x 70
Byte 1:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0x 44
Byte 2:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0x FF

Figure 171

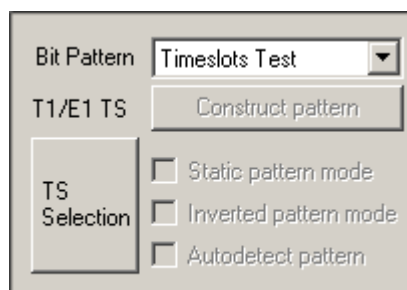
In the configuration dialog you have to mark one-bits of static frame bytes (3 bytes) using check-boxes. Alternatively you can enter HEX values in edit fields (Figure 171).

Note: This pattern type can be detected automatically using Autodetect pattern function.

### 5.2.1.2 Timeslots Test

You can observe timeslots mapping using the “Timeslots Test” option.

In the “Bit Pattern” menu dialogue select “Timeslots Test” option (Figure 172):



The "Bit Pattern" menu dialogue has a dropdown menu set to "Timeslots Test". Below it is a "T1/E1 TS" section with a "Construct pattern" button. To the left is a "TS Selection" section with three checkboxes: "Static pattern mode", "Inverted pattern mode", and "Autodetect pattern".

Figure 172

While timeslots testing you can click right mouse button on appropriate span and choose “RX Realtime Monitor” option from the options list. The following window will appear (Figure 173):

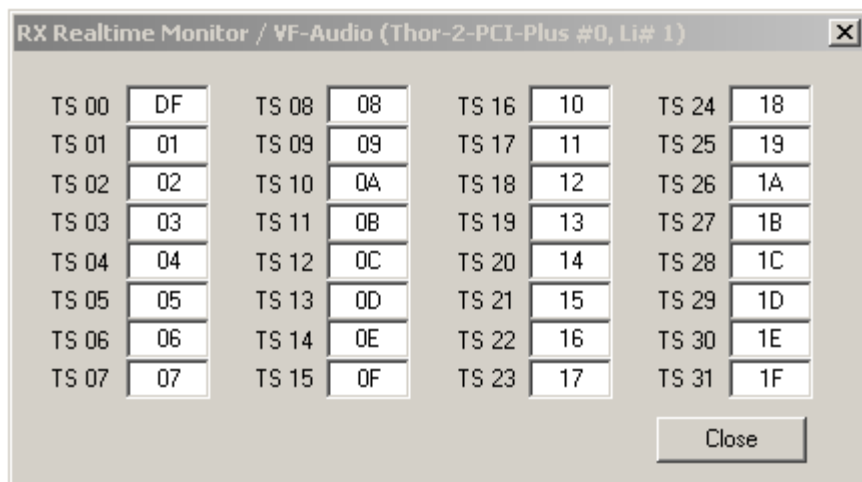


Figure 173

TX data sends and RX Realtime Monitor checks that in every timeslot placed its number.

### 5.2.2 Timeslot selection

After the pattern has been selected, select the timeslots for BERT data transmission. Click the “TS Selection” button (Figure 168).

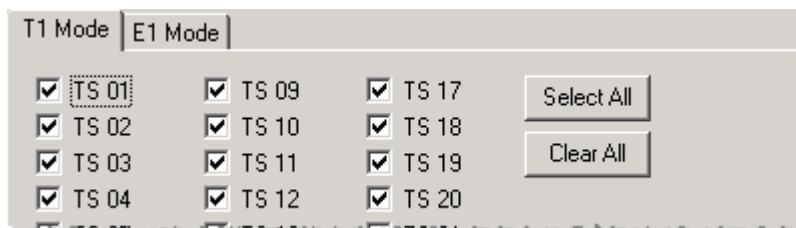


Figure 174

Timeslot is activated if check-box near its name is marked (Figure 174).

### 5.2.3 Static Pattern mode

For several predefined patterns you can set the “Static pattern” mode (Figure 168). In this case the transmitter will work in the static frame transmission mode instead of Random Bit Stream. In DSP mode only static frame transmission mode is available.

### 5.2.4 Inverted Pattern mode

For several predefined patterns you can set the “Inverted pattern” mode (Figure 168).

### 5.2.5 Autodetect pattern

The Analyzer has a very interesting feature: “Autodetect pattern” mode (Figure 168).

In this mode BERT receiver automatically defines the pattern type, transmitted by the remote site. All standard pattern types are detected.

After the pattern has been successfully detected BERT activates this pattern type and starts transmitting procedure of it.

Note: This mode should be used only on the one site. Worst case occurs when both sides will be in unsteady-state process trying to select the applicable pattern without success in infinite transition process.

### 5.2.6 Logging

To do it, please check BER Logging check-box to enable logging mode and specify log file name (Figure 175).

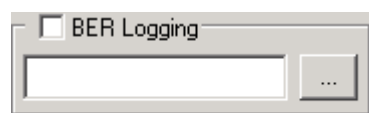


Figure 175

### 5.2.7 Controls

There are several runtime BERT controls (Figure 176):

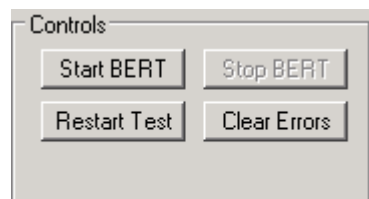


Figure 176

**Start BERT** – starts BERT on the current Li.

**Stop BERT** – stops BERT on the current Li.

**Restart Test** – restarts (stops and then starts) BERT on the current Li.

**Clear Errors** – clears error counter without stopping BERT.

Also there is single error insert feature (Figure 177):

It can be used for generation/simulation of Layer 1 errors for test of remote side.

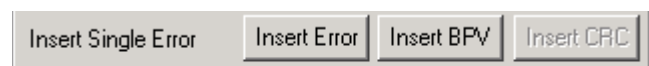


Figure 177

**Insert Error** – inserts bit error in the data stream.

**Insert BPV** – inserts Bipolar Violation error.

**Insert CRC** – inserts CRC error.

### 5.2.8 Results and Status

BERT status is indicated in bottom left corner of BERT setup/status window (Figure 178):

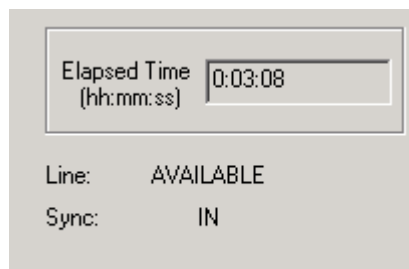


Figure 178

“Line” status characterizes the line state: AVAILABLE (is carrier detected in line) or UNAVAILABLE (no carrier in line).

“Sync” status shows if BERT is synchronized:

IN – is synchronized; OUT – is not synchronized.

On the right side of window you can see BERT results (Figure 179, continue in Figure 180):

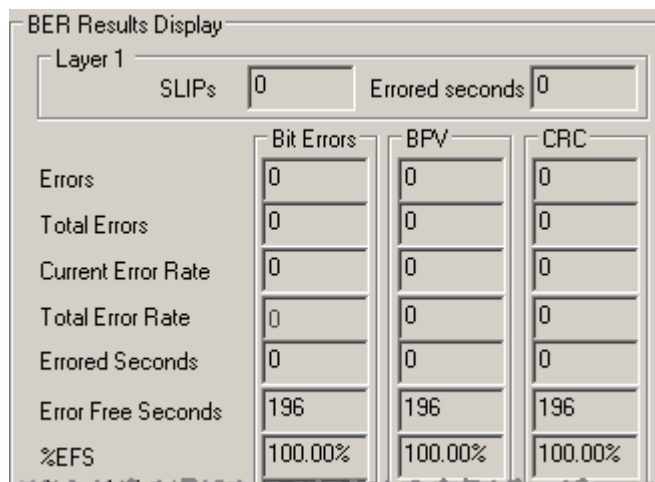


Figure 179

SLIPs & Errored seconds - Slip seconds error counters are showing the values of the slips for the current interval. If slips are presented on the line, it means that there is a clocking problem.

**Errors** – shows the amount of error for the last BERT session

**Total Errors** – shows total amount of errors.

**Current error rate** – recent error rate (for about 3 seconds).

**Errored seconds** – number of seconds when BERT receiver had no correct bit sequences but had ERR or WAIT states.

**Error Free Seconds** – operation time without failures (OK, SYNC states).



**%EFS** – the ratio of operation time without failures to the elapsed time after run.

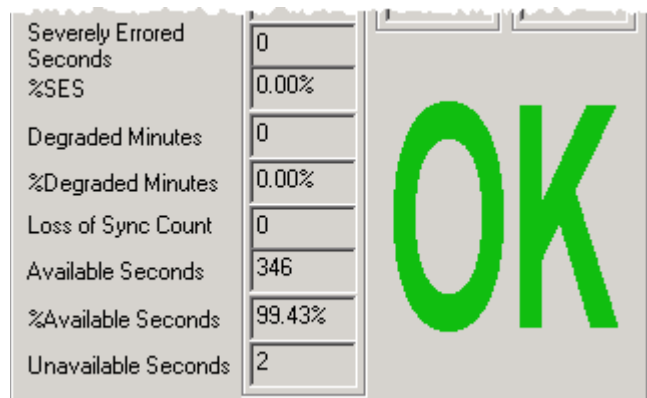


Figure 180

**SES** – operation time with failures (in seconds) (ERR state).

**%SES** – ratio of the run-with-failures time to the total elapsed time.

**Degraded minutes** – the number of degraded minutes in the stream (minutes with faulty data).

**%Degraded minutes** – the ratio of the number of degraded minutes to the test operation elapsed time.

**Loss of Sync Count** - the count of number of times the pattern sync was lost.

**Available Seconds** - the number of seconds with a BER in each second better than  $10^{-3}$ .

**%Available Sec** - the ratio of available seconds to the Test Run Sec multiplied by 100.

**Unavailable Seconds** - the number of seconds with a BER in each second worse than  $10^{-3}$ .



Figure 181

Periodical Error Injection - Error insertion control (Figure 181).

Periodic insertion errors - 1 error  $10^X$  bits:

NONE - no error insertion

1E-2 - error insertion rate is  $1.0 \times 10^{-2}$

1E-3 - error insertion rate is  $1.0 \times 10^{-3}$

1E-4 - error insertion rate is  $1.0 \times 10^{-4}$

1E-5 - error insertion rate is  $1.0 \times 10^{-5}$

1E-6 - error insertion rate is  $1.0 \times 10^{-6}$

1E-7 - error insertion rate is  $1.0 \times 10^{-7}$

1E-8 - insert single error

### 5.2.9 BERT Main Windows Status Indication

While the Bert module is running there are BERT Status and current Error rate Indications on the main screen just opposite right to active spans (Figure 182).



Figure 182

## 5.3 HDLC Encoding/Decoding Add-on Module

This section describes the HDLC module features.

Click the “Enable HDLC Rx” button (Figure 183), and then “Setup HDLC Rx” button on the toolbar.

Note: as HDLC Rx and HDLC Tx are two different modules they should be enabled separately (refer to chapter 3.10).

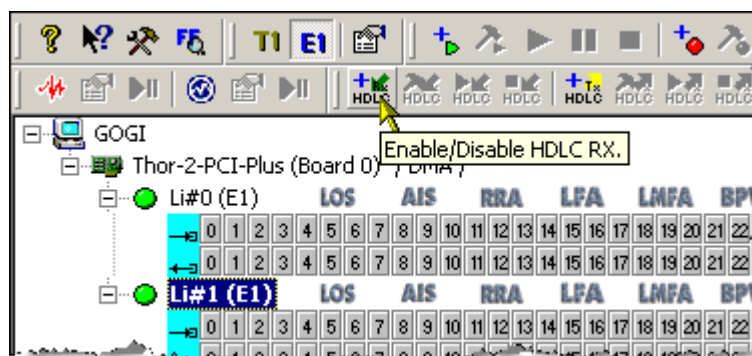


Figure 183

Color code for the HDLC Rx is cyan, and magenta is for HDLC Tx. In this example we have picked TS5 for the HDLC Rx and HDLC Tx operation (Figure 184).



Figure 184

### 5.3.1 HDLC Receiving (RX)

The HDLC receiver function decodes HDLC frames from the incoming T1/E1 bit stream. This module allows not only to monitor incoming HDLC frames, but also to record files in different formats, defined by the user.

### 5.3.1.1 Setup and Timeslot Selection

To use HDLC Rx feature you have to select active timeslots (Figure 185):

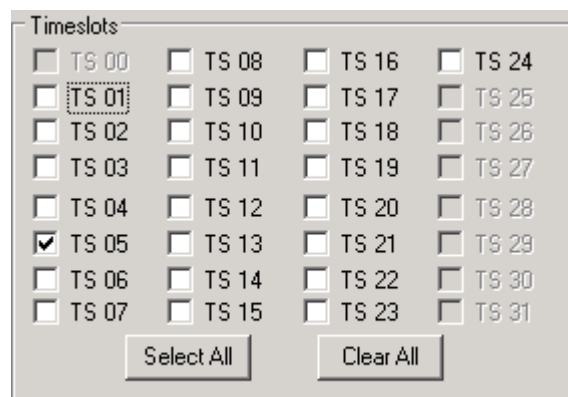


Figure 185

Next you should set the timeslot capacity (Figure 186):

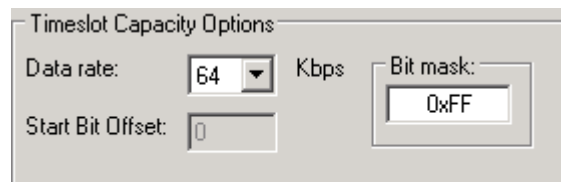


Figure 186

Set other options (Figure 187):

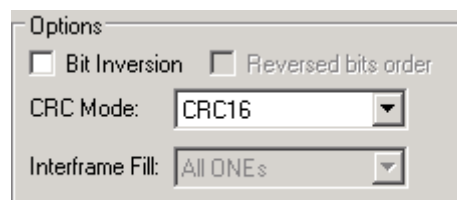


Figure 187

Set minimum Interframe time characters (Figure 188):

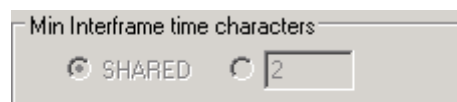


Figure 188

Set SS7 Filtering features (Figure 189):

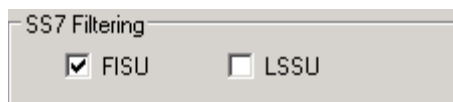


Figure 189

For additional information refer to chapter 5.3.2.1.

Note: Any changes in settings, made during the operation of the HDLC Receiver, take effect only after restarting the receiver.

### 5.3.1.2 Recording Options

If you want to record incoming HDLC stream to files, please go to “recording options” tab.

How to add a trace:

Please click on “Add” button. A new trace comprising the board’s name and number and the Li number will appear (Figure 190).



Figure 190

To record the data to the file you should enable current trace and specify the name of the file, in which the information will be recorded (Figure 191).

For easy browsing the file can be automatically splitted when its size exceeds the specified limit.

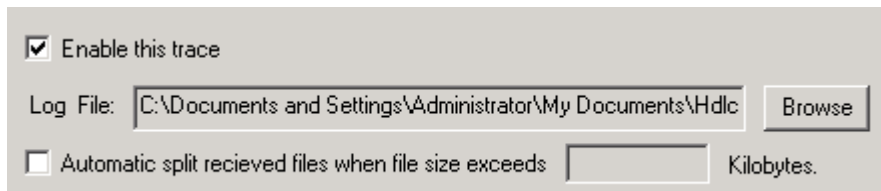


Figure 191

Set Event String Format (Figure 192):

You can set Event String Format manually using tags (refer to chapter 4.1.4.1.9), or select one of the predefined string templates.

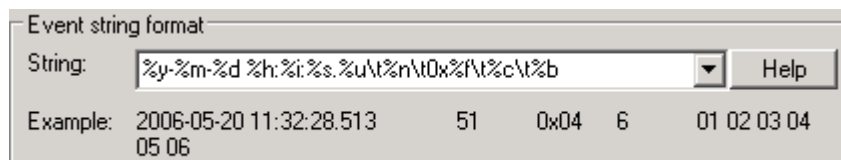


Figure 192

You can set the Filter options (Figure 193) (as in chapter 5.3.1.3.1):

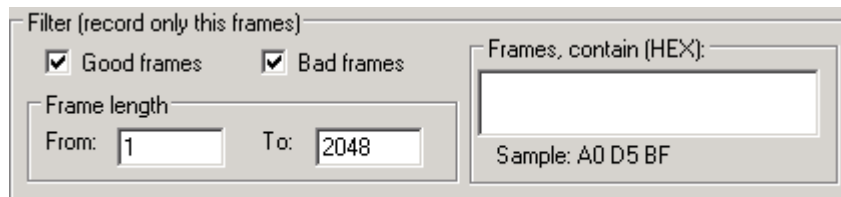


Figure 193

The Analyzer allows the automatically record to new files according to the schedule (Figure 194).

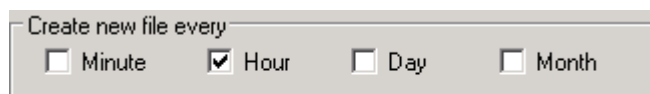


Figure 194

By using this option the recording into the new file will be carried out every minute, hour, day or month correspondingly. In this case a time mark is added to the file's name.

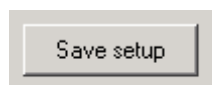


Figure 195

To save the changes click on the “Save Setup” button (Figure 195). To cancel the changes just close this dialog.

### 5.3.1.3 HDLC Receive Real-time Viewer Console

When HDLC Rx is started, HDLC Receiver Real-time Viewer Console monitors real-time information about received frames, FPS, number of bad HDLC Frames, received FISU and LSSU frames (Figure 196).

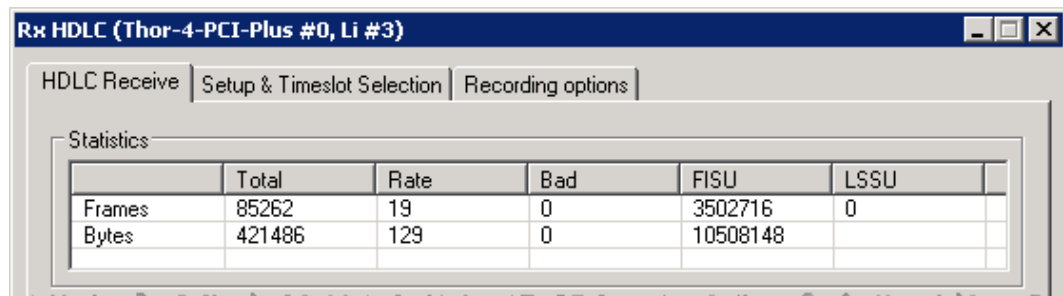


Figure 196

HDLC Receive Viewer Console also shows content of received HDLC data frames (Figure 197):

Timestamp	Event	Sequence #	Length	Data
10:39:58.551	HDLC Frame Received	44895	17	ED E6 0E 85 F1 A3 FC E1
10:39:58.552	HDLC Frame Received	44896	3	ED E6 00
10:39:59.543	HDLC Frame Received	44897	3	EE E6 00
10:40:00.381	HDLC Frame Received	44898	14	EE E7 0B 85 F1 A3 FC 31

Figure 197

In the bottom of HDLC Receive window there is a group of buttons of HDLC Receiver control (Figure 198):

“Stop Receiving” and “Start Receiving” buttons,  
 “Clear” button (is active when Receiver is stopped),  
 also HDLC frames filter button is available.



Figure 198

#### 5.3.1.3.1 HDLC Display Filter

HDLC Display Filter is applicable for filtering HDLC frames according to variety of different parameters.

You can set filter on frames type in events (Figure 199):

Good frames – to show frames only without errors.

Bad frames – to show frames with HDLC protocol errors. The most common error is CRC. Also in several HDLC operation modes frames could be truncated.

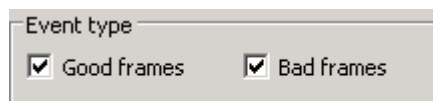


Figure 199

You can set filter on Frame length (Figure 200):

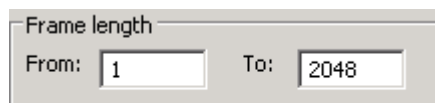


Figure 200 shows a dialog box titled "Frame length". It contains two input fields: "From:" with the value "1" and "To:" with the value "2048".

Figure 200

Frames can be filtered by length. In this case there will be shown only those frames the length of which corresponds to the specified range.

You can set filter if frames contains some HEX sequence (Figure 201):

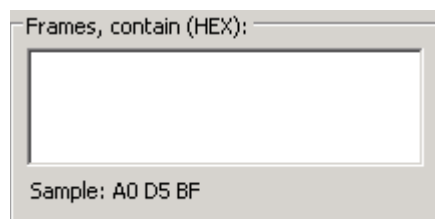


Figure 201 shows a dialog box titled "Frames, contain (HEX):". It has a large empty text area for input. Below the text area, it displays a sample: "Sample: A0 D5 BF".

Figure 201

This filter allows to show only those frames which contain specified HEX string.  
Note: CRC bytes (16 or 32 bits) separate by hardware and are not available for search.  
For their analysis simple recording of the given timeslot can be used.

#### 5.3.1.4 Main Window HDLC RX Status Information

During runtime of HDLC RX module you can see real-time statistics (Figure 202); it is displayed on the main screen opposite right to the active spans.




Figure 202 shows the HDLC RX Status Information. It includes a table of timeslots (20, 21, 22, 23, 24) with status indicators (IFA, BPV, and a green arrow). To the right, it displays real-time statistics: "HDLC: Frames: 97910, Bytes: 513248, BAD: 0, FPS: 13, BPS: 101".

Figure 202

#### 5.3.2 HDLC Transmitting (TX)

The HDLC TX function encodes HDLC frames into one or more timeslots of the outgoing T1/E1 span.

It is possible to send frames manually (send simple text string) or from prerecorded trace files as they has been recorded. It is possible to use log files from many other applications including OTX HDLC demos or Third-Party products without any conversion.

### 5.3.2.1 Setup and Timeslot Selection

Timeslots selection (Figure 203): To select some timeslot(s) just click on their caption name(s) one-by-one. Note that higher timeslots are grayed for T1 mode. There are TS1... TS24 are available in T1 mode. In E1 mode only TS0 is grayed, other timeslots are available for use.

You can simplify timeslots selection by clicking "Select All" or "Clear All" buttons. Timeslots selection will be memorized even if the Analyzer was restarted until you will reset mode.

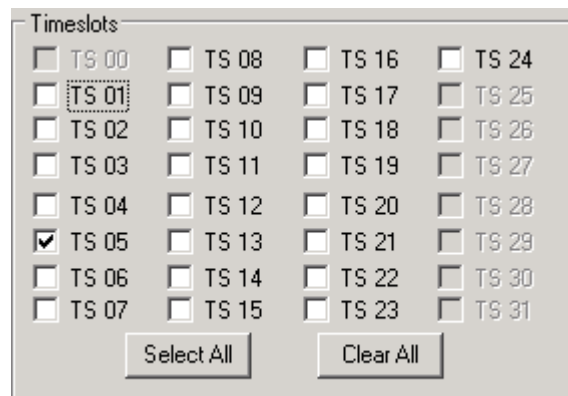


Figure 203

The Analyzer supports setup of timeslot's capacity (sub-channels) (Figure 204). You can set the connection speed to 64, 56, 48, 32, 16 or 8 kbps. You can also manually set ordinary HEX mask commonly used in OTX platform. Every bit means 8 kbps channel bandwidth and bit order means timeslot's data arrangement in byte. You can work with HDLC sub-channels using the connections different then 56 or 64 kbps.

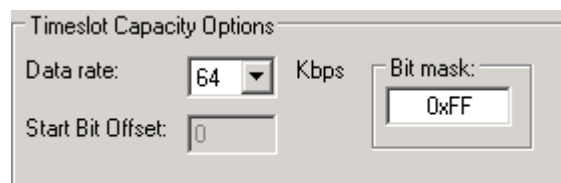


Figure 204

Other options (Figure 205):

The **Bit inversion** mode allows you to inverse all significant data bits in the timeslot mask.

The **Reversed bits order** mode allows you to send first the high bit of the original data byte into the HDLC bit-stream.

**CRC mode:** there is a possibility to add CRC16 or CRC32 fields to the end of the transmitted frame in accordance with HDLC protocol. It allows to control the transmitted data integrity.



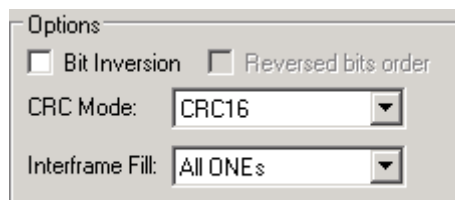


Figure 205

Minimum Interframe timefill characters are illustrated in Figure 206. HDLC frames starts and ends with 01111110 (0x7e) bit sequence. In idle state HDLC sender sends some filling characters. Minimal number is 2. Common interframe fillers are: All Ones (0xff) and Flag (0x7e). Special case if Fill character is Flag (0x7e) – that case we have always 01111110 between HDLC stuffed data. Analyzer supports both types of filler characters. There is a special mode:

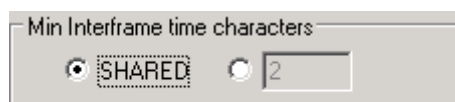


Figure 206

In this case there is a SHARED interfill characters. In this mode sequential frames use one Flag character as a divider between frames to save link bandwidth.

SS7 mode (Figure 207) is an HDLC protocols subset. Signaling System #7 is used to connect switches in real time. That is why real-time communication problems of data links are so crucial for this connection type. In this mode the transmission is conducted in the SHARED flag mode. In this mode Idle mode is implemented different way. There are special HDLC filler frames: FISU (3 bytes) and LSSU (4-5 bytes). These frames fill all unused bandwidth capacity of link while there are no information messages (MSU) available to send.

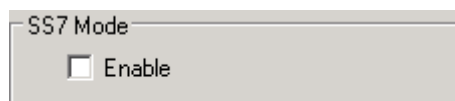


Figure 207

### 5.3.2.2 HDLC Transmit Source Options

You can use the previously recorded file (refer to chapter 5.3.1.2) as a source for HDLC frames transmit (Figure 208). Silence periods between frames can be used from source file or can be overridden manually. If string format is not specified in recorded file or if you want to override it, please add it to the new format in the “Custom format” field. You can read more about HDLC files strings in the chapter 4.1.4.1.9. You can also transmit the manually entered HDLC string consisting of HEX numbers divided with spaces (Figure 208).

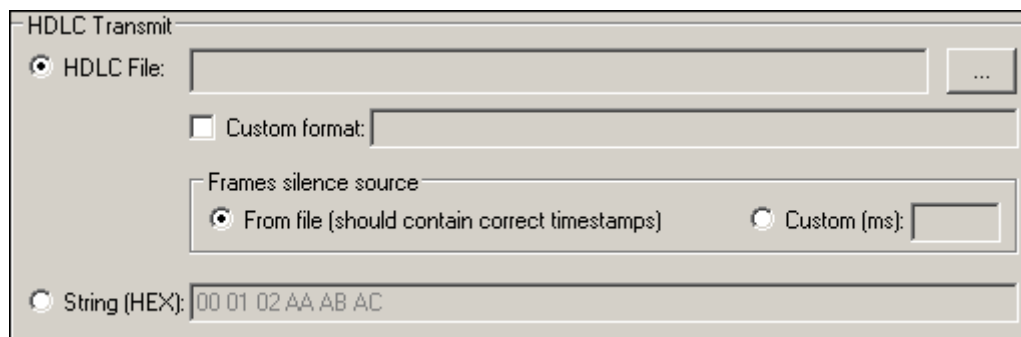


Figure 208

Examples of string to transmit:

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16  
AA AB AC AD AE AF FF FE FD FC FB FA  
A1 00 58 ED 6A 44 BF 36

Runtime controls (Figure 209) are very simple:

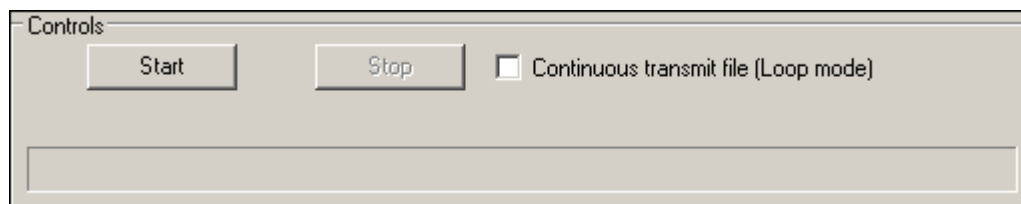


Figure 209

Press “Start” to start HDLC frames transmitting. Press “Stop” to complete.  
“Continuous transmit file” option allows to repeat HDLC send procedure from the beginning in the Loop mode.

Progress (Figure 210):

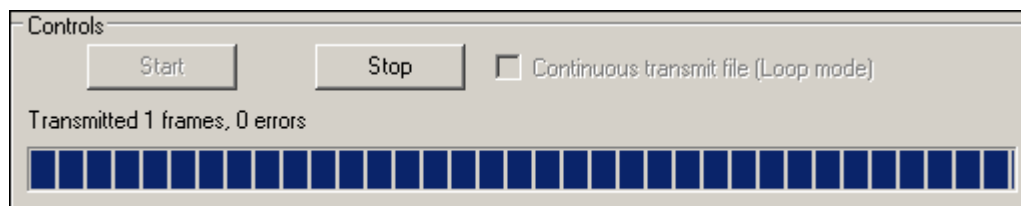


Figure 210

During the runtime there are several progress indicators available on-screen. You can see total progress and number of HDLC frames sent to Li.

There is also the statistics of the possible transmission errors in the DSP mode.

Note: Odin TeleSystems Inc guarantees fault-free module functioning in DSP mode if the number of channels does not exceed the supported number of channels of this DSP type.  
There are no such limits for Burst mode.

### 5.3.2.3 Main Window HDLC TX Status Information

During run of HDLC Tx module you can note that there is real-time statistics on the main-screen opposite right to the active spans (Figure 211).



Figure 211

Number of Transmitted frames is the base parameter here. Transmission errors information is also available. For further information refer to chapter 5.3.2.2.

## 5.4 L1 Alarms Generation Add-on Module

This section describes the L1 Alarms Generation module features. L1 Alarms Generation module is only working for spans.

### 5.4.1 L1 Alarms Receiving (RX)

The L1 Alarms receiver function decodes L1 Alarms frames from the incoming T1/E1 bit stream.

This module is not only allows you to monitor incoming L1 Alarms frames, but also to record it.

Click the “Enable L1 Alarms Rx” button (Figure 212), and then “Setup L1 Alarms Rx” button on the toolbar (Figure 213).

L1 Alarms Receiving (RX) dialog will be displayed (Figure 214).

Note: L1 Alarms Rx and L1 Alarms Tx are two different modules; they should be enabled separately.

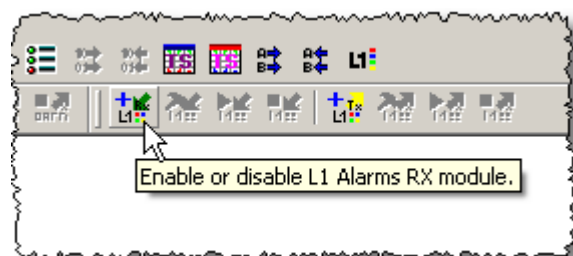


Figure 212

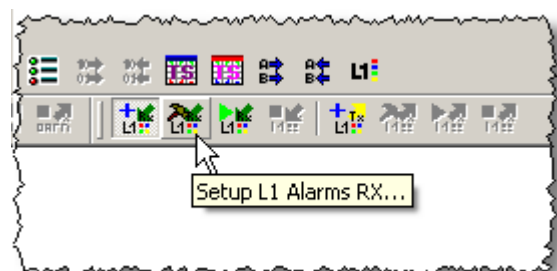


Figure 213

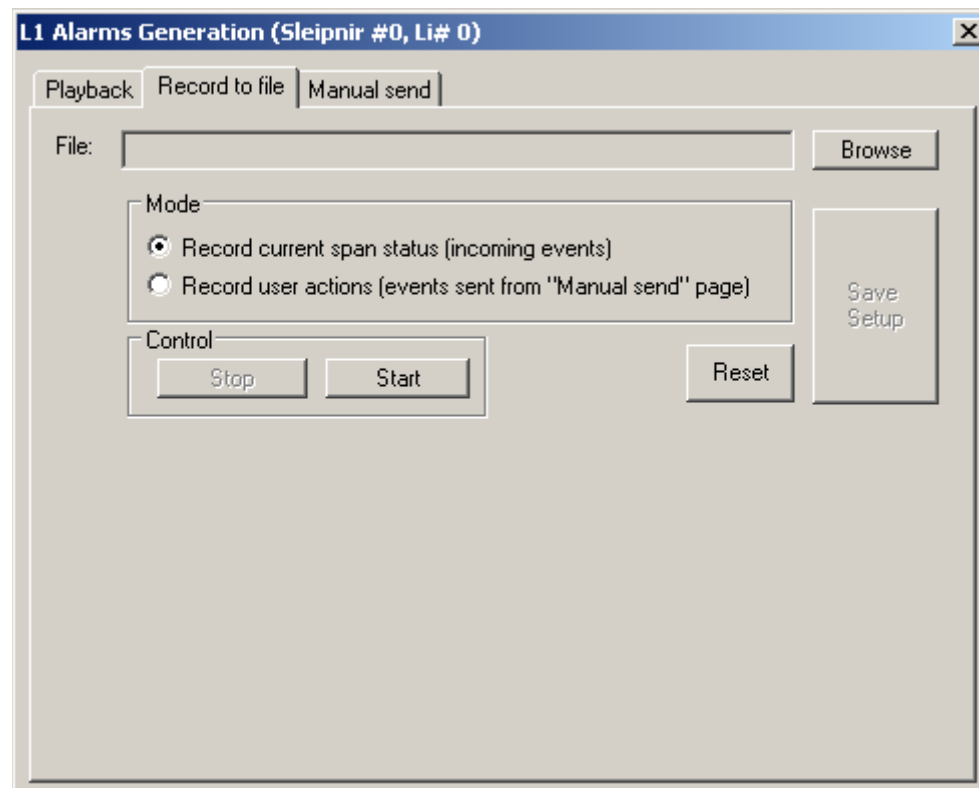


Figure 214

#### 5.4.1.1 Configuration and Control

To use L1 Alarms Rx feature – first you have to specify a file to write by clicking on the “Browse” button next to the Output file text field (Figure 215).

After clicking on the “Browse” button, a standard screen will be displayed where you have to specify a file to save.



Figure 215

Next you need to determine the recoding option by choosing the proper Option button to set the desired recoding mode (Figure 216):

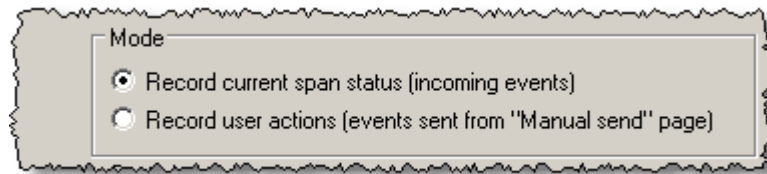


Figure 216

**Record current span status** – to record all incoming events.

**Record user actions** – to record only the sent events from the “Manual send” page.

After these configuration changes are made, you are able to start the L1 Alarm event recording by clicking on the “Start” button (Figure 217).



Figure 217

**Save Setup** – to save the recording configuration settings you made.

**Reset** – to reset the last saved configuration settings (Figure 218).

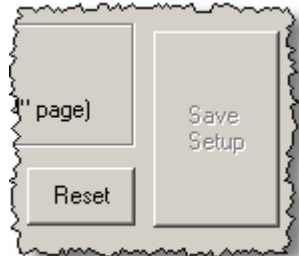


Figure 218

#### 5.4.1.2 Main Window L1 Alarms RX Status Information

During runtime of L1 Alarms RX module you can see real-time statistics (Figure 219); it is displayed on the main screen opposite right to the active spans.

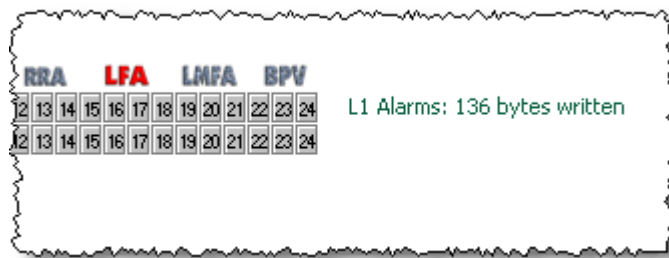


Figure 219

### 5.4.2 L1 Alarms Transmitting (TX)

Click the “Enable L1 Alarms Tx” button (Figure 220), and then “Setup L1 Alarms Tx” button on the toolbar (Figure 221).

Note: L1 Alarms Rx and L1 Alarms Tx are two different modules; they should be enabled separately.

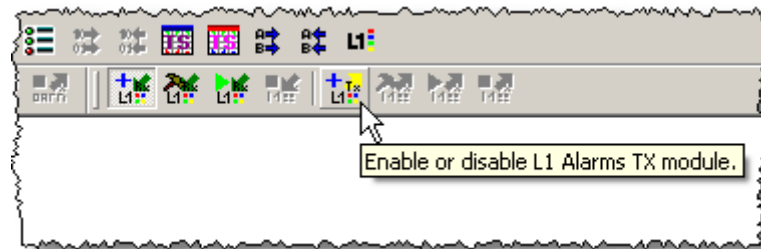


Figure 220



Figure 221

L1 Alarms Receiving (TX) dialog will be displayed (Figure 222).

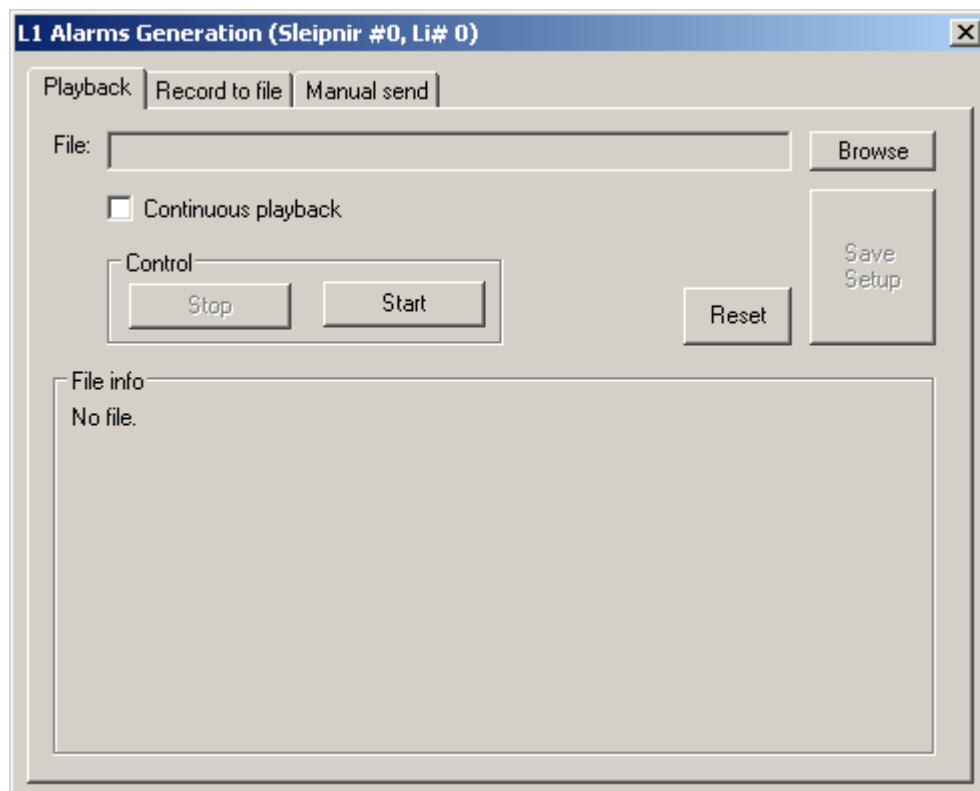


Figure 222

#### 5.4.2.1 Configuration and Control

To use L1 Alarms Tx feature – first you have to specify a file to play by clicking on the “Browse” button next to the Input file text field (Figure 223).

After clicking on the “Browse” button, a standard screen will be displayed where you have to choose a file to read.



Figure 223

Check the check-box for continuous playback (Figure 224).

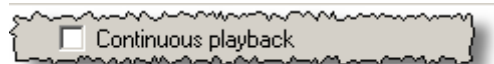


Figure 224

After these configuration changes are made, you are able to play the captured L1 Alarm events by clicking on the “Start” button (Figure 225).



Figure 225

**Save Setup** – to save the playback configuration settings you made.

**Reset** – to reset the last saved configuration settings (Figure 226).



Figure 226

Selected input file information will be shown at the bottom of the playback tab window, in the “File info” frame (Figure 227).

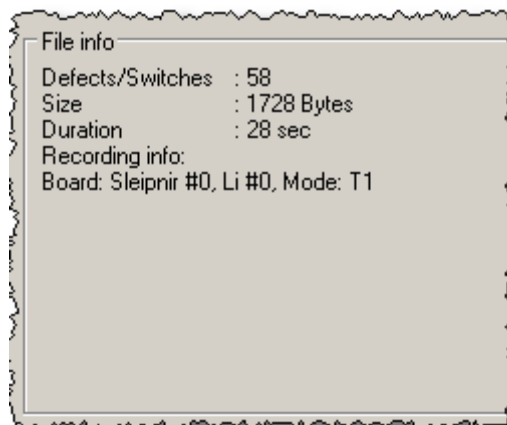


Figure 227

#### 5.4.2.2 Main Window L1 Alarms TX Status Information

During runtime of L1 Alarms TX module you can see real-time statistics (Figure 228); it is displayed on the main screen opposite right to the active spans.

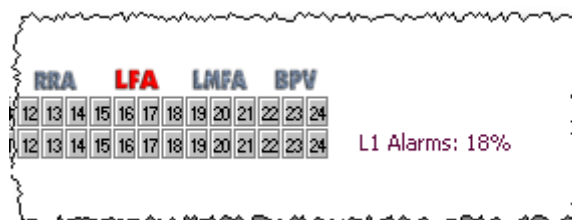


Figure 228



### 5.4.3 L1 Alarms Manual Sending

This section describes manually generating L1 Alarms by sending a specified alarm.

Click the “Manual sending L1 Alarms” button on the toolbar (Figure 229).

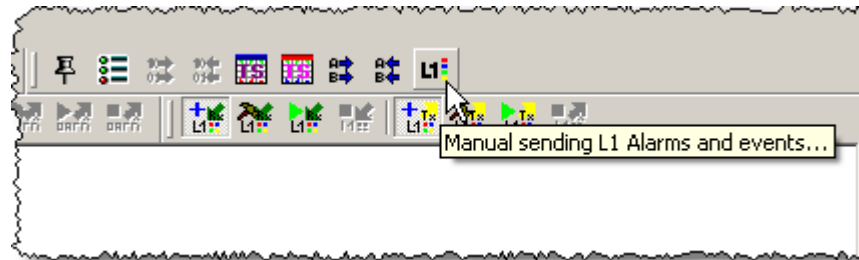


Figure 229

Manual sending L1 Alarms dialog will be displayed (Figure 230).

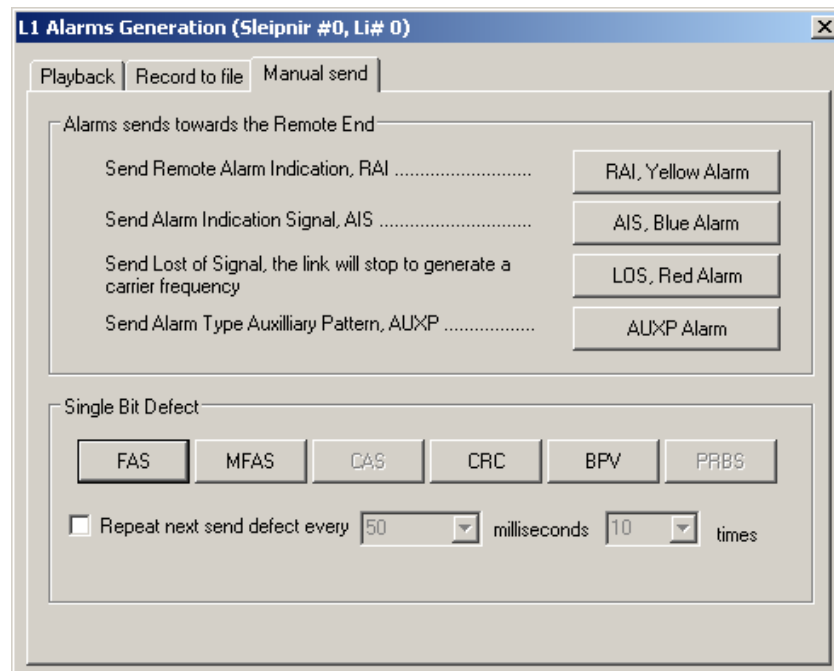


Figure 230

#### 5.4.3.1 Alarms sends towards the Remote End

Take a look at the Figure 231 where “Alarms sends towards the Remote End” options are illustrated:

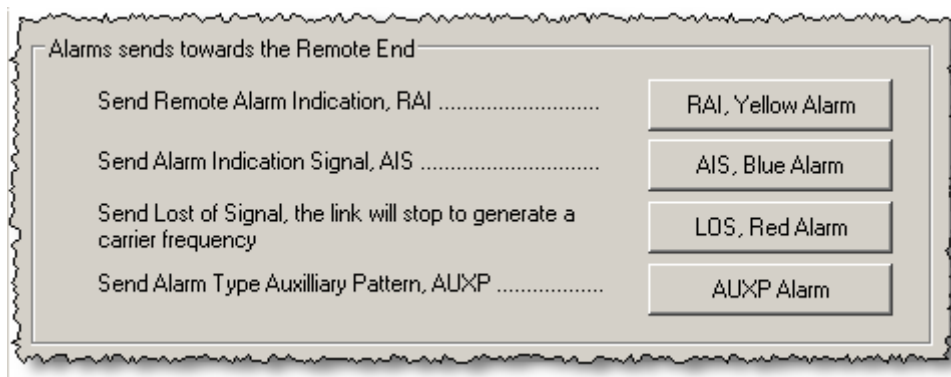


Figure 231

**Send Remote Alarm Indication (RAI)** – to send a Remote Alarm Indication to the board click on the “RAI, Yellow Alarm” button (Figure 232).



Figure 232

**Send Alarm Indication Signal (AIS)** – to send an Alarm Indication Signal to the board click on the “AIS, Blue Alarm” button (Figure 233).



Figure 233

**Send Alarm Type Auxiliary Pattern (AUXP)** – to send an Auxiliary Pattern Alarm Type to the board click on the “AUXP Alarm” button (Figure 234).



Figure 234

**Send Lost of Signal (LOS)** – to stop the generation of the carrier frequency for the link click on the “LOS, Red Alarm” button (Figure 235).

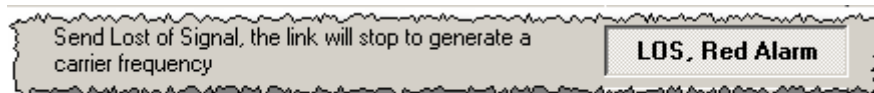


Figure 235

### 5.4.3.2 Single Bit Defect

This frame is using to generate a single bit defect (Figure 236).

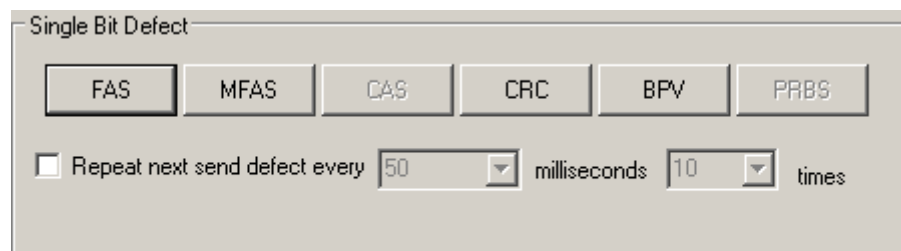


Figure 236

**Frame alignment sequence (FAS)** - FAS ensures the synchronization of frames and is represented by a repeated pattern of 001011.... In case of losing proper synchronization, the receiver needs to listen to five consecutive SFs and find the correct sequence to synchronize - to send Frame alignment sequence (FAS). It can be done by clicking on the “FAS” button.

**MultiFrame Alignment Signal (MFAS)** - when Timeslot 16 of the E1 frame is used for Channel Associated Signaling purposes, Frame 0 contains information that is used by the receiver to identify the incoming frame. Specifically, this pattern in Timeslot 0, Frame 0 is called the MultiFrame Alignment Signal (MFAS). To send MultiFrame Alignment Signal (MFAS), click on the “MFAS” button.

**Channel Associated Signaling (CAS)** - to transmit Channel Associated Signaling (CAS) information, click on the “CAS” button.

**Cyclic Redundancy Check (CRC)** – is a method to verify for errors in data transmitted to the card. To send Cyclic Redundancy Check (CRC), click on the “CRC” button.

**Bipolar Violation (BPV)** - a line problem cause a pulse to be deleted or an unintended pulse to be transmitted, two consecutive pulses with the same polarity on the line results. To send Bipolar Violation (BPV) , click on the “BPV” button.

**Pseudorandom Bit Sequence (PRBS)** - errors running a pseudorandom bit sequence test. To send Pseudorandom Bit Sequence (PRBS), click on the “PRBS” button.

Repeat next send defect – select the check-box to send more than one single bit defect for a specified time period and for a specified total number of times (Figure 237).

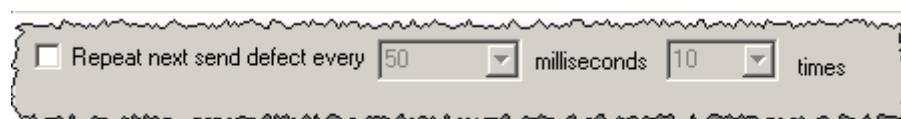


Figure 237

The Figure 238 below shows an example of a CRC defect transmission repetition with a total numbers of 10 times in every 50 milliseconds.



Information about the process is shown at the bottom of the frame with a “Stop repeating” cancellation button.

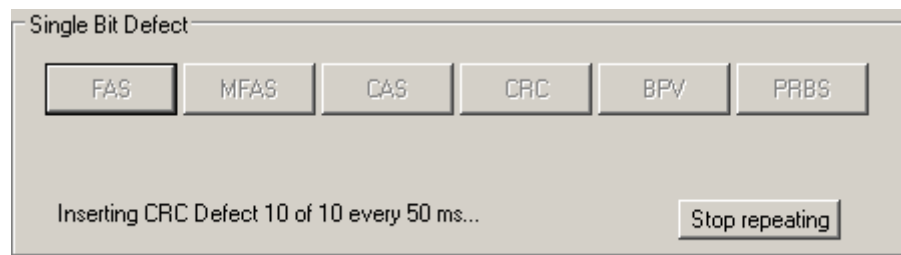


Figure 238



## 6 References

List valid references, such as:

- Programmer's Guide for OTX Hardware Driver (Odin document # 1412-1-SAA-1006-1)
- API Reference Guide for OTX Generic Hardware Driver (Odin document # 1211-1-SDA-1006-1)
- Installation Guide for OTX PCI Adapters (Odin document number 1512-1-HCA-1001-1)

Etc.



## 7 History

Rev. 1.0 2006 A First Version. Prepared by Hanz Johansson.

Rev. 1.1 2008 Prepared by Alexey Arhipov.

- Added supported Operating Systems: Windows 2000/XP/2003 Server.
- Added Bert Patterns: Gamma Test, User Defined.

Rev. 1.2 2009 Prepared Victoria Kovalchuk.

- Added supported Operating Systems: Windows Vista/2008.
- Added supported OTX Boards: Gimle-16-PCIe.
- Added “Configuring the Analyzer” chapter.
- Added new dialogue windows with description: TX HDLC, TX HDLC Setup.
- Added Transmit/Receive Frame Formats.
- Changed formatting.

Rev. 1.3 2010 Prepared by Victoria Kovalchuk.

- Added supported OTX Boards: Alvis-CSI series.
- Added “Remote Access to the Alvis-CSI board” chapter.
- Added Bert Pattern: Timeslots test.
- Added “License” chapter.
- Updated the “OTX Boards and other Odin Software” picture.



## 8 Glossary

- OTX – Odin Telecom FrameworkX
- Li – Line Interface device (T1/E1 device in this particular document)
- DSP – Digital Signal Processor
- BERT – Bit Error Rate Tester
- HDLC - High-Level Data Link Control is a bit-oriented synchronous data link layer protocol developed by the International Organization for Standardization (ISO).
- SDK – Software Development Kit
- TS – timeslot
- RX – receive direction
- TX – transmit direction
- API – Application Programmer Interface
- CPU – Central Processing Unit. Refers to the host PC (laptop) in this document.
- EEPROM – Electrically Erasable Programmable Read Only Memory.
- FPGA – Field Programmable Gate Array.
- LED – Light Emitting Diode
- LS – Least Significant
- MS – Most Significant
- SS7, SS#7 – Signaling system #7.

## 9 OTX Boards and other Odin Software



**Odin TeleSystems Inc**

*Open Telecom for Open Minds*

### T1/E1/J1 Interface Boards:



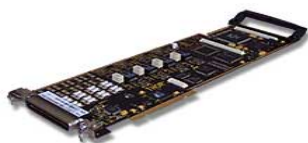
Sleipnir-1-PCI-Plus is a half-size PCI card with a single T1/E1/J1 interface



Thor-2-ExpressCard is a ExpressCard/54 card with 2 T1/E1/J1 interfaces.



Thor-2-PCI-Plus is half-size PCI card with 2 T1/E1/J1 interfaces.



Thor-4-PCI-Plus is full-size PCI card with 4 T1/E1/J1 interfaces.



Thor-8-PCI-Plus is full-size PCI card with 8 T1/E1/J1 interfaces.



Gimle-16-PCI-Plus is full-size PCI card with 16 T1/E1/J1 interfaces. Monitoring only



Sleipnir-1-PC104-Plus 1xT1/E1/J1 card in a PC104+form factor.



Daughter Board Modules providing DSP resources



THOR-2-PCMCIA-PRO is a PCMCIA card with 2 T1/E1/J1 interfaces.

### T1/E1/J1 PCIe Board:



Gimle-16-PCIe is full-size PCI-Express card with 16 T1/E1/J1 interfaces.

### Stand-alone Boards:



Alvis-4-CSI is a complete stand-alone processing system with 4 E1/T1 interfaces, Ethernet and USB



Alvis-8-CSI is a complete stand-alone processing system with 8 E1/T1 interfaces, Ethernet and USB