>> User manual

FRstress

FlexRay Stress Module

Version 1.0

> English

vector
the art of engineering

Imprint

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1 Preliminary Notes

This chapter contains the following information:

1.1 About this user manual

1.1.1 Access helps and conventions

To find information quickly

This user manual provides you with the following navigational aids:

- At the beginning of each chapter you will find a summary of the contents
- The header shows which chapter and paragraph you are located in
- The footer shows which version the user manual refers to
- The index, located at the end of the manual on page , helps you to find information quickly

Conventions

The following two charts show the spelling and symbol conventions used in this manual.

Style	Utilization
bold	Fields, interface elements, window and dialog names in the software. Accentuation of warnings and notes. **[OK]** Buttons are denoted by square brackets **File** | **Save** Notation for menus and menu entries
FRstress	Legally protected proper names and side notes.
`Source code`	File name and source code.
Hyperlink	Hyperlinks and references.
<STRG>+<S>	Notation for keyboard shortcuts.

Symbol	Utilization
	You can obtain supplemental information here.
	This symbol calls your attention to warnings.
	You can find additional information here.
	Here is an example that has been prepared for you.
	Step-by-step instructions provide assistance at these points.
	Instructions on editing files are found at these points.
	This symbol warns you not to edit the specified file.

1.1.2 Certification

Certified Quality Management System

Vector Informatik GmbH has ISO 9001:2000 certification. The ISO standard is a globally recognized standard set by the British Standards Institution.

1.1.3 Warranty

Limitation of warranty

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1.1.4 Support

Need support?

Our business hours are Monday to Friday from 9:00 am to 5:00 pm (CET):

- telephone: +49 711 80670-200
- fax: +49 711 80670-555
- email: support@vector-informatik.de

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2 Introduction

In this chapter you find the following information:

2.1 Overview

At a glance

With FRstress the user can intentionally and reproducibly disturb the FlexRay bus, its physical characteristics and the logical level.

FRstress offers the following capabilities:

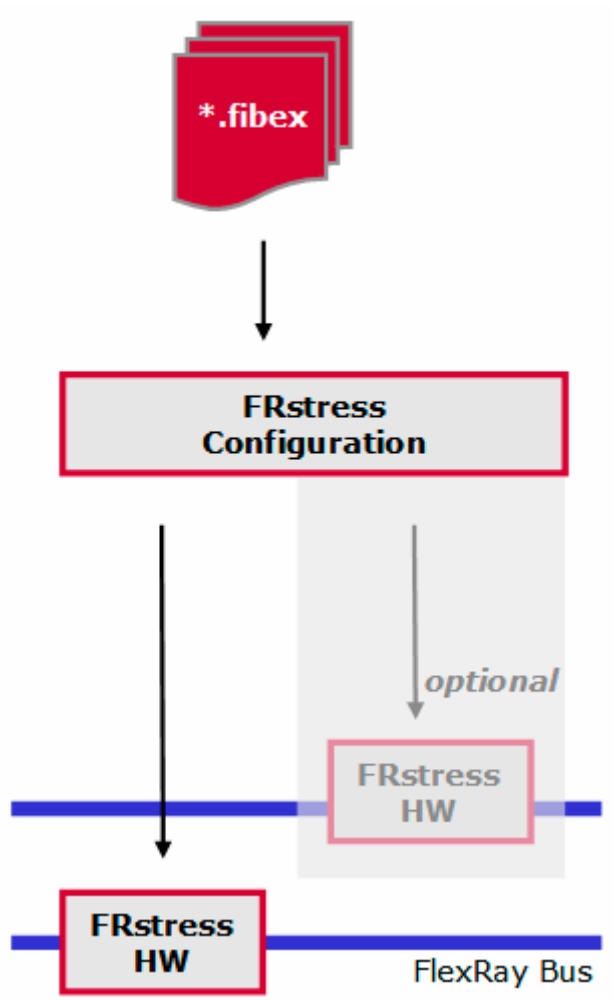
- Forcing shortcuts between the bus lines, power or ground
- Disturbing specific messages
- Manipulating single bit fields of a FlexRay messages
- Frame deletion
- Frame delay

The test scenarios consist of the definition of trigger conditions and corresponding actions like disturbance or activation of a trigger output. With the start of measurement a set of four tests can be transferred to the hardware for execution.

Although hardware can only disturb one channel it is possible to configure test scenarios for both channels of a FlexRay cluster. The software provides the support of two hardware devices.

The graphic shows the block diagram of FRstress:

FRstress block diagram



2.2 Installation of FRstress

Overview

To work with FRstress you have to install:

1. The USB driver of the hardware unit.
2. The FRstress configuration software.

2.2.1 Driver installation

Install driver

1. Connect FRstress to the PC with a USB cable.

   Windows starts the **Found New Hardware** wizard.
   Please follow the instructions found there.
2. Choose **Install** from a list or specific location.
3. Click the **[Next]** button.
4. During installation by CD you must specify the location of the drivers by clicking **[Browse]**.
   Therefore please select **Include this location** in the search.
   You will find the files required for driver installation in the directory: `\Drivers`
5. Please click the **[Next]** button and follow the instructions of the Hardware.

   The wizard finishes its work with a confirmation of success.

2.2.2 Check driver installation

Check driver

1. Start the Device Manager.
2. Check to see whether the device Vector FRstress is shown as a subgroup of **Vector Hardware**.
3. Verify the proper installation by double clicking the Vector FRstress item.

   After the successful installation of the driver you will see the device status “**This device is working properly**” on the **General** page.

2.2.3 Software installation

Install software

Proceed as follows to install the FRstress configuration software:

1. Insert the installation CD in your CD drive.
2. Call up the installation program SETUP.EXE.
3. Follow the instructions of the installation program.

Info: The language of the menus and dialogs can be switched at any time after the installation (see Appendix B: Vector.ini, page).

2.2.4 FRstress online help

Access the online help file

FRstress provides a comprehensive online help function which can be called from the **Help** menu, the **[Help]** button or the <F1> key.

Info: If you choose the **Help|Using Help** command or press the <F1> key while FRstress online Help is active, you get information on using and configuring the online help function.

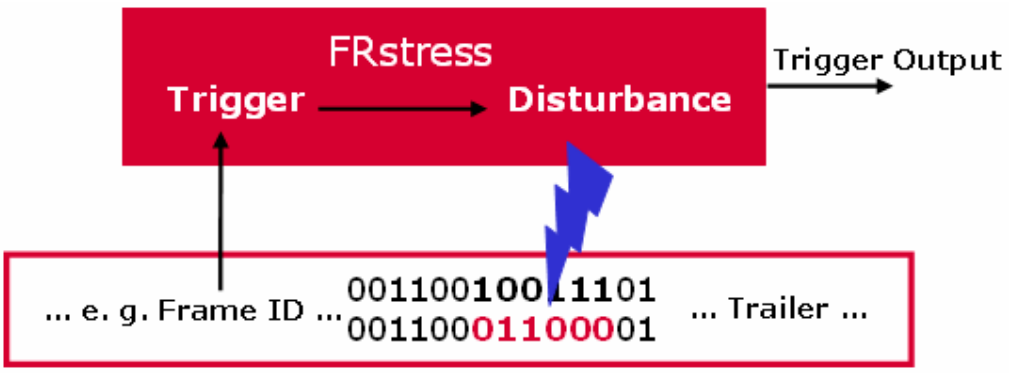
2.3 Basic concepts of FRstress

Basic Concepts

For the test and the validation of FlexRay networks and ECUs it is important to analyze the behavior in presence of errors. FRstress supports you to generate reproducible disturbances in the FlexRay network. Disturbances on protocol level as well as disturbances on physical level are possible.

The graphic below demonstrates the basic function of FRstress. The hardware analyzes the bit stream on the FlexRay bus and compares the data with the active trigger streams. As soon as a trigger condition matches, the trigger output is activated. Additionally to the active trigger signal a dedicated disturbance manipulates the FlexRay bus. The kind of disturbance depends on the active operation mode of FRstress.

Basic Functions



FRstress provides three different operation modes. The following chapters give an overview about the trigger definition and the operation modes.

2.3.1 Trigger definition

Trigger Definitions

Altogether four parallel trigger definitions can be defined. The trigger is defined by a sequence of **0**, **1** and **don't care**. With the detection of this sequence on the FlexRay bus the trigger will be activated.

The software provides a FlexRay frame oriented input mask for the trigger definition. All elements of the FlexRay frame and the frame coding (e.g. Byte Start Sequence) are available for the trigger definition.

These are examples for possible trigger definitions:

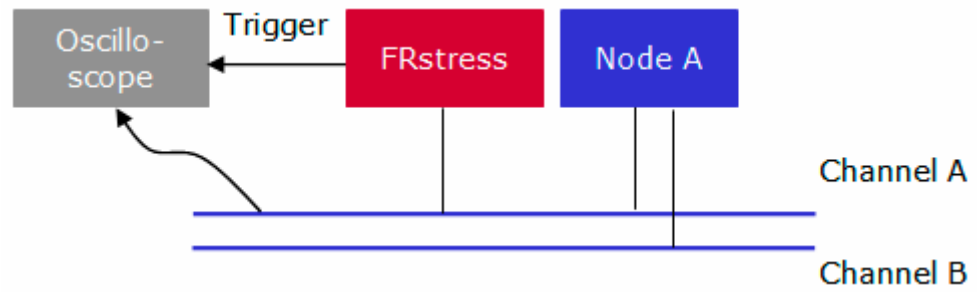
FlexRay frame in a certain slot	The field **frame ID** of the frame header must be filled up with the desired slot number.
FlexRay frame in a certain slot and cycle number	The fields **frame ID** and **cycle number** of the frame header must be filled up with the desired values.
All sync frames	The field **Sync flag indicator** of the frame header must be set to **1**.

2.3.2 Operation modes

Pure Scope Mode

In this mode FRstress is passive to the FlexRay bus. It analyses the bit stream on the bus and generates the appropriate trigger signals. The disturbance part is switched off.

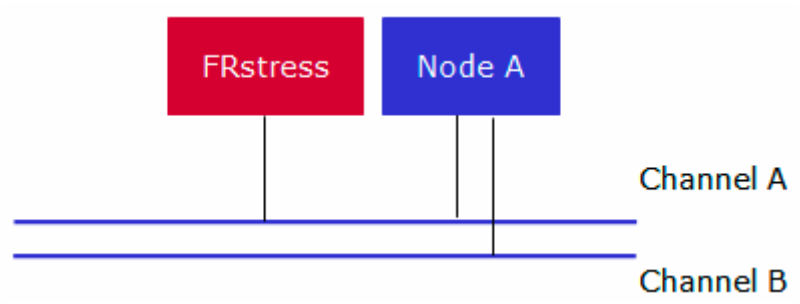
This mode is useful for pure triggering where no disturbances are required. An oscilloscope is a typical receiver of the trigger signal.



Analog Connection Mode

Additionally to the trigger definition it is possible to define disturbance sequences. These sequences will be activated after the detection of the assigned trigger. This means that the earliest point in time for the start of a disturbance sequences is immediately after the trigger the detection of the last trigger bit.

FRstress is connected to the bus in normal node.



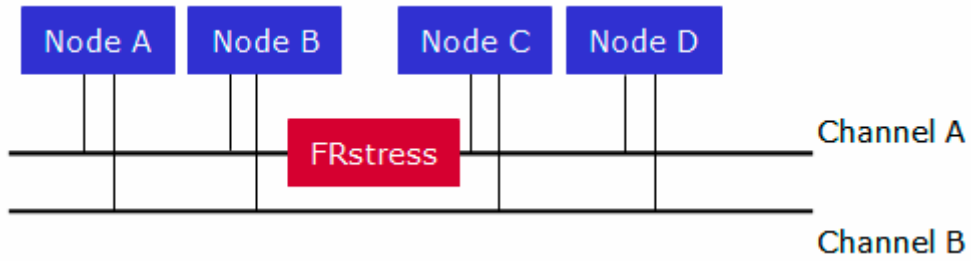
Info: In this mode the transceivers of FRstress transmit in one case against the transceiver of the sending node and in the other case with the sending transceiver. This is reflected in the fact that depending on the line position in some case the desired disturbance can not guaranteed. This means the disturbance can be influenced by the length of the bus cable, the termination, the transceivers and the position of the receiver node.

The functions of this mode are:

- Injection of disturbance pattern after a trigger.
  This can be used to destroy a specific frame. In this mode a bit synchronous frame manipulation is not possible.
- Modification of the bus physics through the configuration of additional resistors between the bus lines, parallel to the bus lines, to ground and power supply.
  This is useful for the simulation of various line lengths, shortcuts to ground or power supply and different capacities.

Digital Connection Mode

FRstress divides the network into two segments. The hardware operates similar to an active star. Frames will be transmitted from one segment to the other segment and vice versa. In contrast to the **Analog Connection Mode** disturbances with bit accuracy are possible too. The optional CRC recalculation completes the function set in that way that bit accurate manipulations are possible. E.g. the Sync flag of a Sync frame from segment A can be set to 0 and the frame CRC will be recalculated. The receiver segment B sees now a valid frame without a sync flag set.



Additional functions are:

Frame filter between the segments

Frame delay between the segments

Extension of the Transmission Start Sequence

3 FRstress Configuration Software

In this chapter you find the following information:

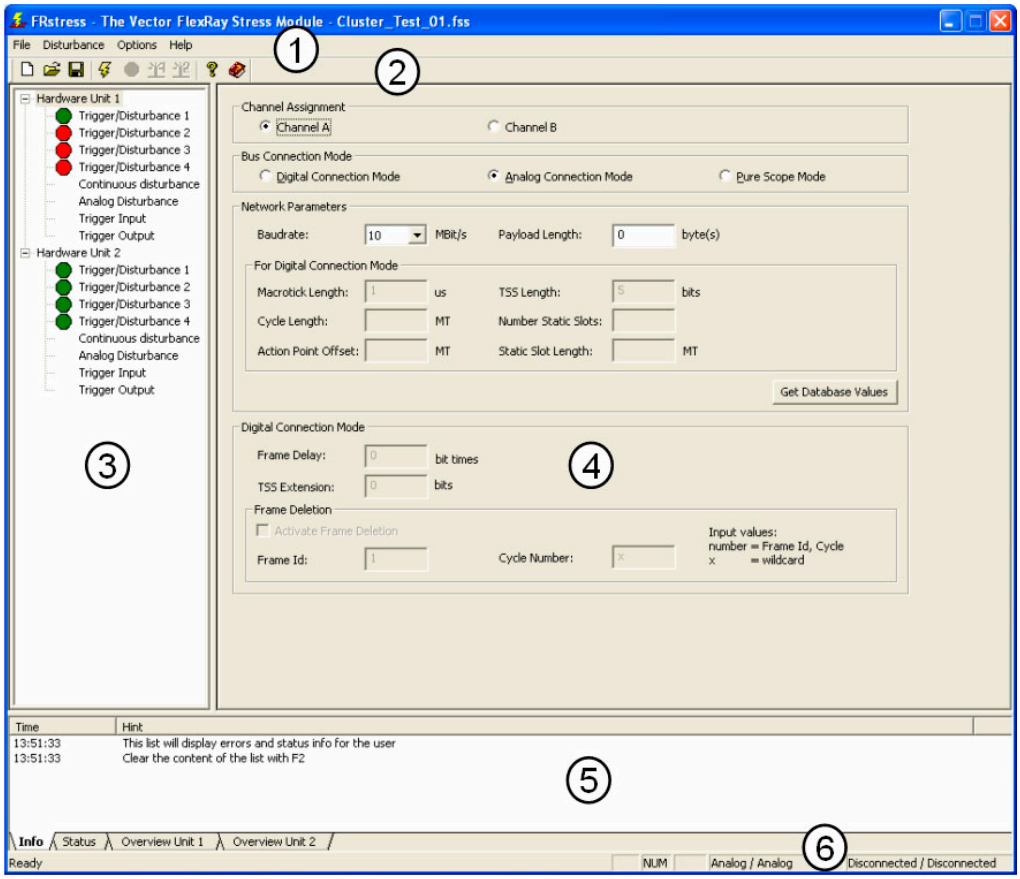
3.1 Overview

Overview

The configuration software window consists of 6 parts:

1. Menu bar
2. Toolbar
3. Configuration tree
4. Configuration pages
5. Message/Status window
6. Status bar

Main Window with 6 parts



3.2 Menus

3.2.1 File

File menu

The **File** menu provides commands for loading and saving configurations, for associating a data-base and for exiting the program.

New
An empty configuration is created.

Open
A previously saved program configuration can be read from a file.

Save
The entire program configuration can be saved to file.
All trigger and disturbance settings are written to a file.

Save as…
The active configuration can be saved to a new directory and/or with a new name.

Associate database…
In this dialog you define which FIBEX databases you wish to work with.

Exit
This menu entry closes FRstress.

3.2.2 Disturbance

Disturbance menu

The **Disturbance** menu provides the commands for the disturbance control.

Start
The disturbance scenario will be transferred to the hardware and the hardware starts its execution.
The connection to the hardware will be set automatically.

Trigger Hardware Unit 1
This command executes the software trigger of the FRstress hardware 1.
This function is available only during a measurement session and if the software trigger is configured on the trigger input configuration page.

Trigger Hardware Unit 2
This command executes the software trigger of the FRstress hardware 2.
This function is available only during a measurement session and if the software trigger is configured on the trigger input configuration page.

Stop
The measurement is stopped by selecting this menu item or by pressing the <ESC> key.
It can be restarted afterwards by pressing <F9> key.

3.2.3 Options

Options menu

The **Options** menu switches between one and two hardware support.

Use one channel configuration
This menu item activates the one hardware support.
The disturbance scenario for one channel can be configured.

Use two channel configuration
This menu item activates the two hardware support.
The disturbance scenario for two channel can be configured.
To start the disturbance scenario two hardware units must be available.

Use Autoselect status tab on start
When this option is selected, the status tab of the status window will automatically be selected when starting a trigger/disturbance.

Use Autoselect hw unit overview
When this option is selected, the correct overview tab of the status window will automatically be selected depending on the cursor position in the selection tree on the left side of the main window

3.2.4 Help

Help menu

The **Help** menu provides the contents of FRstress' context-sensitive help function.

Contents

About…
The **[More Info]** button in the disclaimer window displays the serial number, the firmware version, the DLL version and the driver version in the info tab of the Status window.

3.3 Toolbar and Shortcuts

Toolbar / Shortcuts

The global toolbar contains general FRstress functions. In addition, it includes functions for starting and stopping measurement.

Symbol	Description	Menu command	Key(s)
	New	**File|New**	<Ctrl>+<N>
	Open	**File|Open**	<Ctrl>+<O>
	Save	**File|Save**	<Ctrl>+<S>
	Start	**Disturbance|Start**	<F9>
	Stop	**Disturbance|Stop**	<ESC>
	Trigger Hardware Unit 1	**Disturbance|Trigger Hardware Unit 1**	<F7>
	Trigger Hardware Unit 2	**Disturbance|Trigger Hardware Unit 2**	<F8>
	About	**Help | About**	—
	Help contents	**Help | Contents**	<F1>

3.4 Configuration tree

Configuration tree

The tree view on the left side allows the navigation between the different configuration pages of FRstress.

Trigger Disturbance 1−4

The selection of this entry activates the Trigger/disturbance configuration. A double click on this entry activates (green symbol) or deactivates (red symbol) the Trigger/disturbance set.

Special case for sequence 1: In case of that the disturbance sequence 1 is used by the software trigger a deactivation is not possible. A yellow symbol is displayed to show that the trigger is not used but the disturbance part.

Continuous disturbance

Definition of a special disturbance sequence (see 3.5.3 Continuous Disturbance, page).

Analog disturbance

This entry activates the configuration page **resistor and capacity network** (see 3.5.4 Analog Disturbance, page).

Trigger Input — This entry activates the configuration page for the external and the software trigger (see 3.5.5 Trigger Input, page).

Trigger Output — This entry handles the source and the level configuration of the trigger output (see 3.5.6 Trigger Output, page).

3.5 Configuration pages

3.5.1 Hardware Unit

Hardware Unit page — This configuration page holds the definition of the global configuration of the FRstress environment.

Channel Assignment — The connected FlexRay channel (Channel A or Channel B).
This setting is important for the dynamic CRC calculation function (see 3.5.2.4 Disturbance Parameter, page).

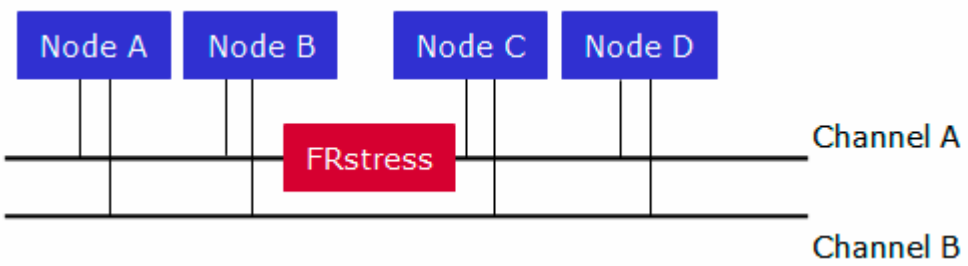
Bus Connection Modes — With the several connection modes (Digital Connection Mode, Analog Connection Mode, Pure Scope Mode) different functions are available:

- **Digital Connection Mode**

  FRstress divides the bus into two segments. It observes the communication and can influence the bus with disturbances on bit level.

  Main functions in this mode are:

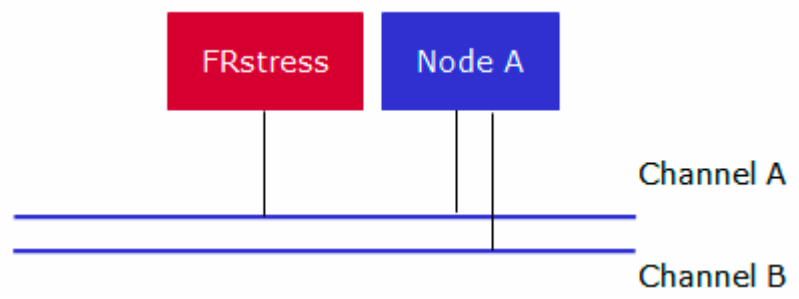
  - Frame modification on bit level
  - Dynamic CRC calculation after a Frame modification
  - Frame deletion from one segment to the other segment
  - Frame delay from one segment to the other segment
  - Extension of the Transmission Start Sequence (TSS) part of a frame.



- **Analog Connection Mode**

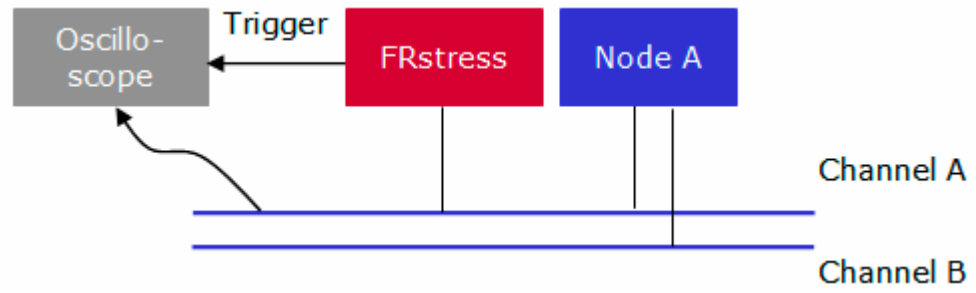
  FRstress is connected as usual node. In this connection mode are available:

  - Resistor and capacity modification
  - Asynchronous disturbances



- **Pure Scope Mode**

  In the Pure Scope Mode only the trigger functions are available. The bus connection in this mode realizes a connection with a minimal influence to the bus.



Network Parameters

- **Baudrate**

  For all modes the appropriate baud rate has to be selected. For each baud rate a dedicated firmware must be downloaded to the hardware (see 6 Appendix A: Firmware Update, page).

- **Payload Length**

  This field contains the payload length in bytes of the static frames in the network. All payload fields in the trigger and disturbance configuration pages will be preset with this number.

- **For Digital Connection Mode only**

  These settings are only available in the **Digital Connection Mode**. Otherwise they are inactive

  - Macrotick Length
  - TSS Length
  - Cycle Length
  - Number Static Slots
  - Action Point Offset
  - Static Slot Length

The **[Get database values]** button extracts all values described above from the assigned FIBEX database.

Digital Connection Mode

These settings are only available in the **Digital Connection Mode**:

➔ **Frame Delay**

Incoming frames will be delayed before they are sent to the output segment.

➔ **TSS Extension**

At the output segment all frames will be sent with the extended Transmission Start Sequence.

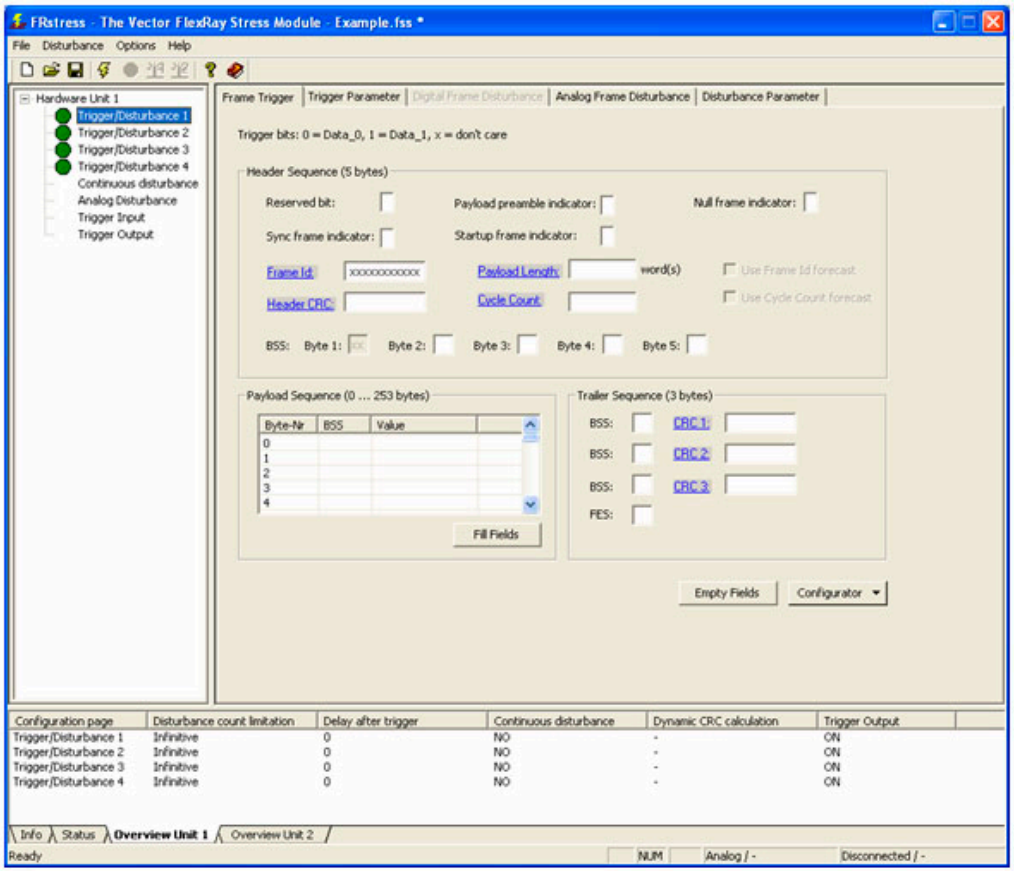
➔ **Frame Deletion**

This filter blocks for the output segment all frames specified with frame id and cycle number. The concrete number and the wildcard symbol **x** are valid input values.

3.5.2 Trigger/Disturbance 1-4

Overview

The configuration tree offers four sets of Trigger and Disturbances.
Each of these sets has several configuration pages.



Frame Trigger page

On this page a trigger is to be defined for a disturbance. All fields of a FlexRay message can be used. Each trigger bit can have the values Data_0 (0), Data_1 (1) or don't care (x). For frame ID, payload length, header CRC, cycle count, CRC 1, CRC 2 and CRC 3 the values can be entered numerical (hex or dec) by clicking on the link left of the corresponding edit box.

Header Sequence

Field	Length	Range
Reserved Bit Payload preamble indicator Null frame indicator Sync frame indicator Startup frame indicator	1 bit	—
FrameID	11 bit	1…2047
Payload Length	7 bit	0…127 words
Header CRC	11 bit	—
Cycle Count	6 bit	0…63 cycles
BSS1–BSS5	2 bit	Default bit sequence: 10

Option	Description
Use Frame ID Forecast / **Use Cycle Count Forecast**	The forecast functions can only be used in Digital Connection Mode. The purpose of the forecast mechanism is to trigger on bits in a particular frame which are located before the frame id/cycle count. To use the forecast function, at first it has to be to defined which frame id /cycle count shall be forecasted. Then trigger bits have to be defined which are located before frame id/cycle count in the frame. These bits define the place where the trigger occurs. When a forecast mechanism is activated, the frame id and/or the cycle count are not treated as trigger bits. Note that the network parameters for digital connection mode have to be specified to use the forecast mechanism.

Payload Sequence

The payload sequence compares only the number of data bytes which is defined in the list!

Field	Length	Range
BSS x	2 bit	Default bit sequence: 10
Data byte x	8 bit	0…255

Button	Description
[Fill Fields]	Fills the payload sequence with “don’t care” bits. The relevant payload length is taken from the Payload length field.

Trailer Sequence:

Field	Length	Range
BSS 1–3	2 bit	Default bit sequence: 10
CRC 1–3	8 bit	—
FES	2 bit	Default sequence: 01

Button	Description
[Empty Clear Fields]	Clears all fields on frame trigger page.
[Configurator]	The configurator allows the symbolic configuration of the Frame ID and Payload length from the database. The selection dialog lists all FlexRay fames with the associated node. ➔ Load Frame Id ➔ Load Payload length ➔ Load Frame Id and Payload Length

3.5.2.1 Trigger Parameters

Trigger Parameters

Additional parameters for the trigger configuration are located on this page.

Connection Mode Independent

In this section you can configure the trigger count and the delay between the trigger detection and start of the disturbance.

➔ **Disturbance count limitation**

If activated the number of triggers can configured in a range between 0 and 255. The trigger action will be executed unlimited if the setting is deactivated.

➔ **Delay after trigger detection**

The time between the trigger detection and the start of the disturbance execution is configurable. The value range is from 0 to 16777215.

Info: When delay after trigger detection is not 0, the analog frame disturbance tab is activated because a frame synchronous disturbance is only possible when no trigger delay is set

➔ **Auto increment**

The delay between the trigger and the disturbance will be incremented automatically with each trigger occurred. The step size will be set in these fields.

Digital Connection Mode

The active port for the trigger detection is modifiable in the **Digital Connection Mode**. It is possible to select between both ports, port A and port B.

3.5.2.2 Digital Disturbance

Digital Disturbance

In the **Digital Connection Mode** this configuration page is active and in the other connection modes this page is not configurable.

The configured disturbance sequence represents a frame modification on bit level. Only those fields that follow the trigger fields (**T**) can be disturbed.

As disturbance values for the bits Data_0 (0), Data_1 (1) and undisturbed (u) are allowed. The frame fields with its meaning and representation are explained on the **Frame Trigger Configuration** page. For frame ID, payload length, header CRC, cycle count, CRC 1, CRC 2 and CRC 3 values can be entered numerical (hex or dec) by clicking on the link left of the corresponding edit box.

Exception 1: When delay after trigger detection or auto increment isn't **0** (trigger parameter page), the analog frame disturbance tab is activated.

Exception 2: Trigger/Disturbance 1 and Trigger Input → Disturbance sequence 1 is selected → analog frame disturbance tab is activated

Clear fields

This button clears all fields on digital frame disturbance page.

Show Trigger Bits

This button shows all frame fields which are already used by the trigger definition. These bits can not be used in the disturbance sequence. Normally the disturbance sequence follows the trigger sequence.

Configurator

The selection dialog for database messages is started. A symbolic message can be selected. The data of the frame will be inserted in the corresponding fields after selection:

- Load Frame Id
- Load Payload length
- Load Frame Id and Payload Length

Use Continuous Disturbance

If selected all frame disturbance fields will be deactivated. Instead of the synchronous disturbance the continuous disturbance is executed when the trigger occurs. The continuous disturbance can be defined on the corresponding configuration page.

3.5.2.3 Analog Disturbance

Analog Disturbance

This page holds the settings for the disturbance sequence in the **Analog Connection Mode**. In all other connection modes this page is deactivated.

The disturbance sequence in the **Analog Connection Mode** runs asynchronous to the detected trigger sequence. Due to reflection effects on the bus line it is possible that not all nodes in the net-work see the same disturbance on the bus.

Exception1: This page is also activated in the digital connection mode, when delay after trigger detection or auto increment is not **0** (trigger parameter page).

Exception 2: This page is also activated when Trigger/Disturbance 1 and Trigger Input → Disturbance sequence **1** is selected.

Disturbance sequence

The field contains the disturbance sequence. The maximum length is 4095 bits.

Frame based input mask

In this section you can enter all bit fields of a FlexRay frame. This input mask helps you to define a disturbance pattern which follows a typical frame pattern. After the input of the frame the sequence has to be applied to the Disturbance sequence.

Calculate Header CRC	This button calculates the Header CRC basing on the fields Startup indicator, sync frame indicator, slot id, payload length and header CRC.
Calculate Frame CRC	This button calculates CRC checksum over the complete FlexRay frame including the header CRC. Important for this calculation is the channel assignment on the hardware unit page.
Apply sequence	This button copies the entered frame to the disturbance sequence. Fields with free undefined bits will be filled up with 0 bits.
Reset fields	The button resets the fields of the input mask and clears the disturbance sequence.
Use Continuous Disturbance	If selected all frame disturbance fields will be deactivated. Instead of the synchronous disturbance the continuous disturbance is executed when the trigger occurs. The continuous disturbance can be defined on the corresponding configuration page.

3.5.2.4 Disturbance Parameter

Disturbance Parameters	Additional parameters for the disturbance can be found on this page.
Dynamic CRC calculation	In the **Digital Connection Mode** only the dynamic CRC calculation is useful to produce a valid frame after some bits in the frame have been modified.

Info: The channel setting on the hardware unit page is important for the Dynamic CRC calculation function.

3.5.3 Continuous Disturbance

Continuous Disturbance	The continuous disturbance consists of a sequence and a repetition.
Disturbance Sequence	0…8 bit to define a disturbance pattern.
Disturbance Repetition	Number of repetitions of the defined disturbance sequence.
Other information	The corresponding duration depending on the baud rate and the configuration is displayed. Additionally to this the list displays the sources that activate the continuous disturbance.

3.5.4 Analog Disturbance

Analog Disturbance	The resistor and capacitor network for analog disturbance is defined here. Analog disturbances may be caused by the following in a real FlexRay network: ➔ Short circuits ➔ Isolation faults ➔ Poor contacts

Disturbance Parameters

The following disturbance parameters may be used to configure the disturbance state:

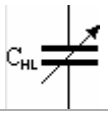
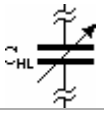
- **R_HL**
  for simulating contact resistances between wires (e.g. isolation faults, humidity, short circuits)
- **R_H**
  for simulating contact resistances to disturbance voltages
- **R_L**
  for simulating contact resistances to disturbance voltages
- **R_SH**
  for simulating length resistances in wiring (e.g. poor contacts or wire breaks)
- **R_SL**
  for simulating length resistances in wiring (e.g. poor contacts or wire breaks)
- **C_HL**
  for simulating longer bus lines at low baud rates (only makes sense for Low-Speed buses)

Hints

Essentially the individual disturbance parameters can be connected or disconnected by clicking the relevant component in the circuit diagram.

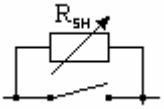
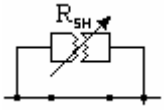
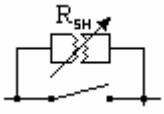
If a resistor is disconnected the associated input field, in which the user enters a resistor value for this resistor, is disabled for user input.

The resistors and the capacity are active as soon FRstress is connected to the hardware. During a disturbance session the values can be modified and manually adapted with the **[Apply to Hardware]** button.

Connected Component		
Disconnected Component		

States of the resistances

The resistances R_SH and R_SL can have the following three states:

Series resistance in the FlexRay line: R_SH (R_SL) normal in operation	
Switched off: R_SH (R_SL) deactivated and associated switch closed	
Break of the FlexRay line: R_SH (R_SL) deactivated and associated switch open	

Disturbance Voltage

By default the supply voltage and disturbance voltage are jumpered together in the supply connector. However, the disturbance voltage can also be fed in separately. In the circuit diagram you can specify whether the resistor should be connected to the positive (V_D+) or negative (V_D-) pole of the disturbance voltage; this is done by clicking the switch next to R_H or R_L. The maximum disturbance voltage that may be used, and which is utilized to check the configured layout, is displayed next to **Max. disturbance voltage**.

3.5.5 Trigger Input

Trigger definition

The **External Trigger** and the **Software Trigger** can be defined on this page.

Use External Trigger

The usage of the external trigger can be switched on or off.

External Trigger Usage

For the external trigger input it is possible to define whether the input should be used as an external trigger or as a trigger enable signal.

When used as an external trigger the user can choose whether the input should be a **Level trigger** (with LOW or HIGH level) or an **Edge trigger** (with triggering on the transition from LOW→HIGH or from HIGH→LOW). Additionally the assigned disturbance can be configured. You can decide for one of the following settings: no disturbance, disturbance sequence 1 or continuous disturbance.

When used as a trigger enable signal, the user can decide whether, when a trigger condition is satisfied, there must also be a low (LOW) or a high (HIGH) voltage level at the input to permit triggering.

Use Software Trigger

The usage of the software trigger can be switched on or off.

Software Trigger Action

This setting describes the general behavior of the software trigger.

- **Button pressed (single shot trigger)**:

  The trigger is executed by the button pressed action.

- **Button pressed (on/off functionality)**:

  The software trigger is switched on by the software trigger action and can be switched off with a second click on the software trigger button.

  The assigned disturbance is executed until the trigger is switched off.

Software Trigger reaction: In this section the specific behavior of the software trigger is defined.

- **Trigger disturbance**:

  As possible disturbances are the disturbance sequence 1 and the continuous disturbance available.

- **Trigger enable (when button pressed)**:

  When the software trigger is connected to the trigger output to desired enable trigger level can be configured: **Low** or **High**.

3.5.6 Trigger Output

Trigger Output

The trigger output of FlexRay Stress needs an action source and a specific output level.

Activated by
The list contains all possible sources which can set the Trigger Output.
A checked item means that the Trigger output is set if a trigger on the specified source is activated.

Trigger output level
The output level **Low** and **High** can be selected.

3.6 Message and Status window

Message window
In the lower part of the FRstress main window is the message window located. It has four panes:

Info
Notifications, status messages and error are printed into this window.

Status
The status pane holds the trigger counter for the sequences 1–4. The counter starts with the configured number of trigger detections. On each trigger detection the number is decreased.

Overview unit 1 / Overview unit 2
The overview pane shows at a glance all configured settings of FRstress.

3.7 FRstress COM Interface

COM Interface
The FRstress COM Server allows you to control FRstress from external programs. Besides applications, scripts can also be used as external programs. Certainly the most well-known script and programming languages available to you are: VBScript, JScript, Perl, VBA, Visual Basic, Delphi and C/C++.

COM configuration
Open the MS-DOS console and switch to the FRstress installation directory.

- To **register the COM Server** you have to type
  `FRstress /register`
- If you want to **unregister the COM Server** you have to type
  `FRstress /unregister`

FRstress object hierarchy

FrsApplication
FrsConfiguration
HardwareUnitCollection
HardwareUnit
TriggerDisturbanceCollection
TriggerDisturbance
AnalogBoard

Cross reference: The online help contains a full description of FRstress related COM Server elements.

4 FRstress Hardware

In this chapter you find the following information:

4.1 Interfaces

Supported Interfaces

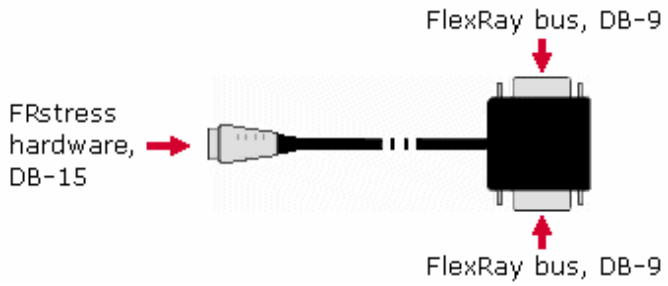
The FRstress hardware has the following interfaces:

- Y-Adapter to the FlexRay bus
- Trigger Output
- Trigger Input
- Sync Line
- USB
- Power Connector

4.1.1 Y-Adapter to the FlexRay bus

Bus connection

The bus connection is similar to the way CANstress is connected to the bus. An adapter cable connects the FRstress hardware to a bus. The cable converts the 15 pin connector to two DB-9 connectors (one male connector and one socket).



Signal	DB-9 connector
BM Fr1	2
BP Fr1	7
GND	3

4.1.2 Trigger Output

Trigger Output

The trigger output is realized as BNC connector. The output uses the same ground like the trigger input. The output generates TTL signals.

4.1.3 Trigger Input

Trigger Input

The trigger Input is realized as BNC connector. The input accepts TTL signals. The input is electrically isolated to the remaining hardware.

4.1.4 Sync Line

Sync Line

The Sync interface is realized as BNC connector. The sync line interface uses the same ground like the trigger interfaces. The interface bases on TTL signals.

4.1.5 USB

USB

The USB port is fed out via a four-pin connector (Binder Series 711) and conforms to the USB standard 2.0.

4.1.6 Power Connector

Power Connector

The connector is realized as a 5 pin plug of the plug series “Binder 711”.

Using Pin 5 of the Supply connector it is possible to set the housing ground to a defined voltage level. When utilized in a motor vehicle, a direct connection to the negative supply voltage (vehicle ground) presents itself as an option. If relevant to the specific area of use, it may be advisable to make a connection to the ground conductor of the installation. If Pin 5 is left unconnected (this is the case on the voltage cable provided), no voltage level is applied to the housing.

4.2 LED Indicators

Status indication

Four LEDs display the current state of the FRstress hardware.

The first LED (Power/Run) is located nearest to the side with the plugs.

Startup mode	The LEDs flash together until the hardware is detected by the PC.
Normal mode	→ **Power/Run** (flashing) → **Trigger-Enable** (On = external trigger is active) → **Active** (On = next trigger activates a disturbance) → **Disturbance** (On = Generation of a disturbance)

5 Technical Data

In this chapter you find the following information:

5.1 General

Parameter	Conditions	Min.	Typ.	Max.	Unit
Ambient temperature (Operation)		−10		+70	°C
Ambient temperature (Storage)		−40		+85	°C
Total Weight					
Dimension	Aluminum case	151 × 168 × 53			mm
(length × width × depth)	total	163 × 172 × 57			mm

5.2 Trigger Input

Parameter	Conditions	Min.	Typ.	Max.	Unit
Threshold voltage: HIGH		2.9			V
Threshold voltage: LOW				1.6	V
Maximum Input Voltage			24	30	V
Input current: HIGH	Uin = 24 V			7	mA
Input current: HIGH	Uin = 5 V		0		mA
Input current LOW	Uin = 0 V			−0.4	mA
Continuous current limiting (thermal)			50		mA
Isolation voltage to supply		500			V

5.3 Trigger Output

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output voltage HIGH	I ≤ +25 mA	2.4			V
Output voltage LOW	I ≥ −6 mA			0.6	V
Output current HIGH	Uout ≥ 2.4 V			25	mA
Output current LOW	Uout ≤ 0.8 V			−8	mA
Continuous current limiting (thermal)			50		mA
Isolation voltage to supply		500			V

6 Appendix A: Firmware Update

Firmware Update

A new version of the firmware can be updated with a special utility. The command line tool **GinIoad.exe** downloads the firmware to the hardware. The following command has to be entered in the command line:

```
GiNload -vV xxx.cod (for example: GiNload -vV FRS_028.cod)
```

If available new versions of the Backup Firmware (FRSB_xxx.cod) and the Bootcode (FRSBCxxx.cod) can be downloaded in the same way by calling **GinIoad.exe**:

```
GiNload -vV FRSB_028.cod
```

```
GiNload -vV FRSBC028.cod
```

If more than one of these files is new the download order is important:

1. **Firmware**

   ```
   GiNload -vV FRS_xxx.cod
   ```

2. **Backup firmware**

   ```
   GiNload -vV FRSB_xxx.cod
   ```

3. **Bootcode**

   ```
   GiNload -vV FRSBCxxx.cod
   ```

7 Appendix B: Vector.ini

Vector.ini

The following options for FRstress can be configured in VECTOR.INI:

Language of the menus and dialogs (Section: `[Language]`, Line: `Country=`)

```
[Language]
Country=01
```

Info: If the language of your Windows version is not the same as the language set for FRstress, certain dialogs and buttons may appear in the language of your Windows version.
For example, if you have configured English as the language for FRstress under a German version of Windows, the German dialog **Öffnen** (**Open**) appears, since Windows resources are referenced here.

8 Appendix C: Address Table

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