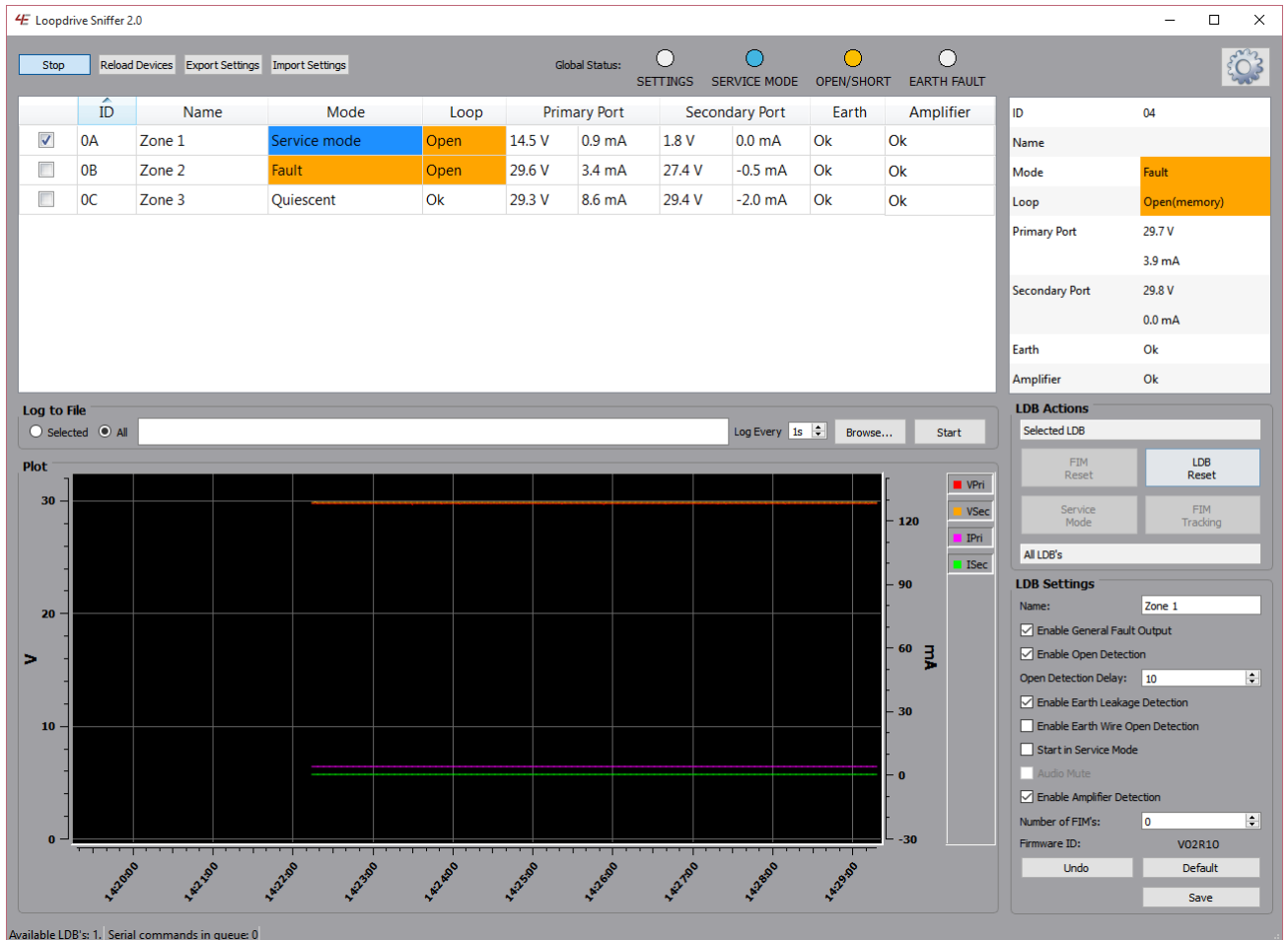


LOOPDRIVE SNIFFER



USER MANUAL

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1. Purpose of this document

This document is designed to inform users of the Loopdrive Booster (LDB) about the usage of the Loopdrive Sniffer application. This document is written for people that are familiar with the LDB and know the terminology. Each screen of the application will be discussed separately. This document contains a section about common problems and solutions. The last part of this document contains information for advanced users and explains how the configuration files can be configured to change the background color of the table cells when faults are detected.

2. Overview of the application

The application comprises of eight parts that show the user different information. Each of these parts is numbered and shown in Image 1. The function of each of these parts will be individually discussed below.

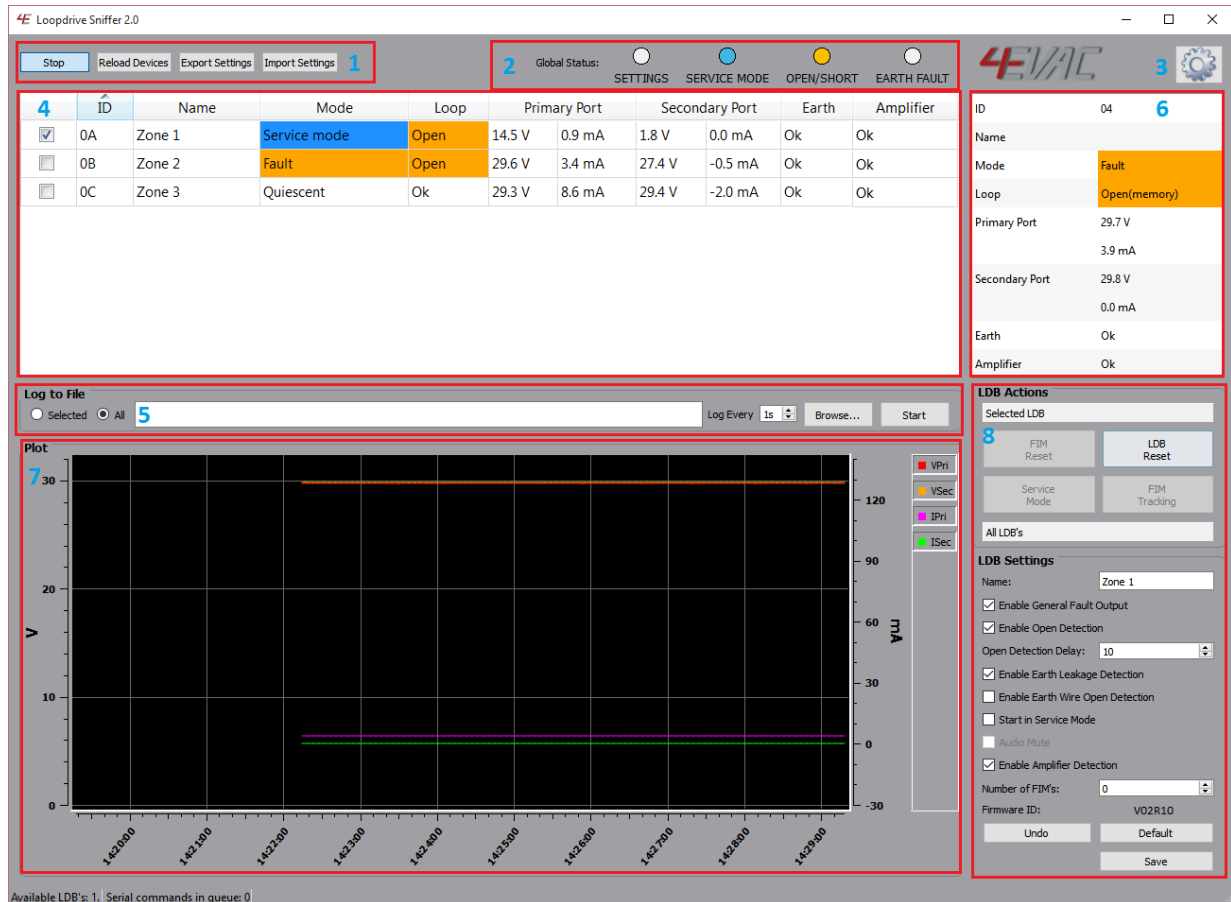


Image 1 Application main window

2.1. General Action Buttons

This part contains four different buttons. Two are used to start the live monitoring of the Loopdrive RS-485 bus with the application. The start/stop button is used to start and stop the live monitoring. The application however will not look for newly connected LDB's after restarting live monitoring. A newly connected LDB will only be found and shown in the table of section 2.4 when the 'Reload Devices' button is pressed. This action will also start during the startup of the application.

When the third button 'Export Settings' is clicked, the important device information and settings are saved to a file. This file is saved to the user selected folder. The exported settings file can be imported again when the last button 'Import Settings' is clicked.

Attention!

- The live monitoring will automatically start when the 'Reload Devices' button is pressed even if the live monitoring was stopped.

2.2. Global status indicators

This part of the application is used to display faults that are detected on connected LDB's. The faults that are detected can be classified in three different groups. See Image 2. Global status indicators are common for all LDB's connected to the same RS-485 bus. If any of monitored LDB's changes its state, the global status indicator will inform you about it. The number of LDB's that detected a fault has no role in displaying the fault, so the user will only know that the fault is at least detected once. But it is also possible that multiple LDB's detected the same fault.

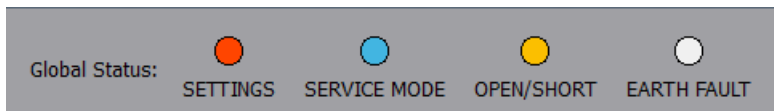


Image 2 Global status indicators

The first indicator (SETTINGS) is active if at least one LDB changed a potentially dangerous setting. This means that the fault contact is disabled, the open detection is disabled or the audio is muted.

The second indicator (SERVICE MODE) is active if at least one LDB is in 'Service Mode'.

The third indicator (OPEN/SHORT) is active if at least one LDB has detected an open and/or short. There is a distinction between a fault that is in the memory of the LDB and a fault that is still active.

The fourth indicator (EARTH FAULT) is active if at least one LDB has detected an earth fault. The same distinction is made here, between a fault that is in the memory and a fault that is still active.

The third and/or fourth indicator will blink fast (4 times per second) when a fault is active. The indicators will blink slow (1 time per second) when the fault is memory state.

The third and fourth indicator will only blink slowly when there are no active faults detected. This means that an active fault will be found faster, since this will always be shown by the indicators.

When there are only memory faults detected the indicators will blink slowly and when there are no faults detected on the entire bus, the indicators will be off.

2.3. Application settings

When the users clicks on the gear icon, a new window will be opened where the application settings can be changed. See Image 3. There are four different action that can be performed by the user.

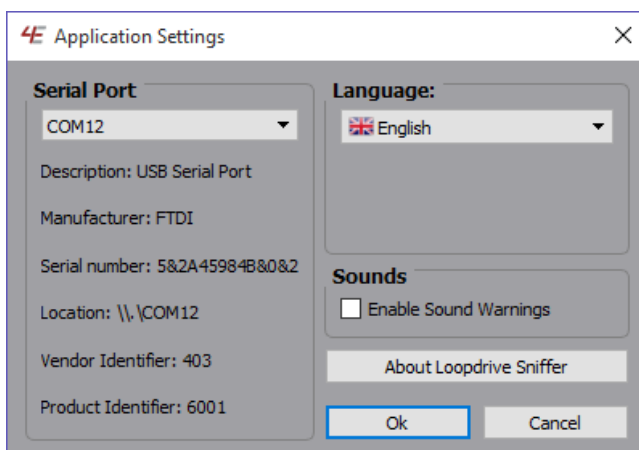


Image 3 Application settings

The first and most important action is choosing the serial port. The serial port can be selected from a list with available COM ports. The application will not be able to communicate with the LDB's when the incorrect COM port is selected. So when using the application make sure that the correct COM port is selected. The first time the application starts it will automatically use the COM port that is first found. When the application is restarted it will try to use the last known COM port again. If this port is not available, but another COM port is that one will be selected.

The second action is choosing the correct language for the application. When the application starts for the first time it will select English. The available languages will be shown in a list and the preferred language can be selected. The application will remember the selected language and will use it automatically the next time it starts up.

The third action is enabling or disabling the audio warnings in the application. This means that the user can select if a sound warning is activated when there is a message while tracking the number of connected FIM's to a LDB.

The last action is opening the 'about' window. This window shows the user information about the current application version and license information.

The settings that are changed are only used when the user presses the 'Ok' button and confirms that the settings should change.

2.4. Table with available LDB's

This part is used to show all available LDB's in a table. See Image 4. The latest values of each available LDB is shown in the table. Processing and collecting these values for one LDB takes around 130 ms, this means that it can take a while to update a specific LDB when there are a lot of LDB's connected.

	ID	Name	Mode	Loop	Primary Port		Secondary Port		Earth	Amplifier
<input checked="" type="checkbox"/>	0A	Zone 1	Service mode	Open	14.5 V	0.9 mA	1.8 V	0.0 mA	Ok	Ok
<input type="checkbox"/>	0B	Zone 2	Fault	Open	29.6 V	3.4 mA	27.4 V	-0.5 mA	Ok	Ok
<input type="checkbox"/>	0C	Zone 3	Quiescent	Ok	29.3 V	8.6 mA	29.4 V	-2.0 mA	Ok	Ok

Image 4 Table with available LDB's

It is possible to select a LDB in the table by clicking on the checkbox in the first column. Only one LDB can be selected in the table, so the previous selected LDB is unchecked when the user selects a new LDB. In the picture above, there are three LDB's connected and the LDB with ID 0A is selected. The selected LDB in the table is used in parts 6 to 9 of the application. The usage of the selected LDB for these parts is discussed separately below.

2.5. Serial communication status

This part gives information to the user about the status of the serial communication. See Image 5.

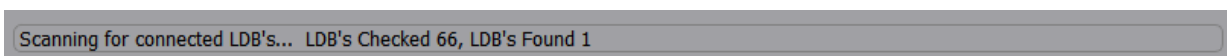


Image 5 Scan status

This status bar shows the users when the application is checking for available LDB's. While the LDB is checking for available LDB's, the current progress will be displayed with an increasing number from 0

to 256. When the application is done checking the status bar will show the number of LDB's that are connected. The status bar will also show a message when the serial communication has encountered an error and the connection cannot be established.

2.6. Data logging

It is possible with the application to save the data that is visible in the table to a csv file. The part that you can see in Image 6 is used to start and stop the logging.

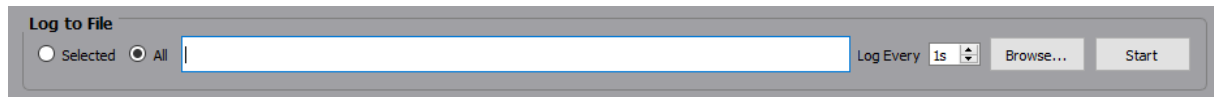


Image 6 Data logging

The first step is selecting which data should be logged. There are two options that the user can choose from. The first option is logging the data only from selected LDB. The other option is logging the data from all the available LDB's.

The next step is selecting how often information is logged to the file. The user can select what the minimum delay should be before new information is logged. When the data logging of all the connected devices is selected, the timestamp will be saved at the first LDB from the list. This timestamp is used while logging the rest of the connected LDB's, until the first LDB is reached again and a new timestamp is saved.

When the logging mode and the logging speed are set, the log file location should be selected. This can be done by clicking on the 'Browse' button. When this button is pressed it will open a window where the user can select an existing file or create a new log file. The path to the log file that is selected will be shown in the text field. This field can be edited manually, but it's recommended to change it with the browse window, since this way is less vulnerable for errors. The logging will start automatically after a file is selected.

The data that is logged is the same as the values in the table of section 2.4. This means that the ID, the name, the mode, the loop state, the voltage and current on the primary and secondary port, the earth state and the amplifier state are saved.

Attention

- When the live monitoring is stopped, the logging is paused.
- When the data is logged only from one selected LDB and the selection is changed, the data from the newly selected LDB will be logged.
- If data is logged while the application FIM Tracking is used, only the data from the selected LDB is updated and logged.

2.7. Detail table

This part shows the data of the selected LDB in section 2.4 in a separate table. This detail table will always show the latest data from the selected LDB. When the selected LDB is changed, the detail table will update the values as soon as new data is received from the selected LDB. See Image 7.

ID	0A
Name	Zone 1
Mode	Service mode
Loop	Open
Primary Port	14.5 V
	0.9 mA
Secondary Port	1.8 V
	0.0 mA
Earth	Ok
Amplifier	Ok

Image 7 Detail table

2.8. Plot window

This window shows the voltage and current of the primary and secondary side of the selected LDB in a graph. See Image 8. While the live monitoring is enabled, the graph cannot be manually zoomed and/or moved. However it is possible to stop rendering the voltage and/or current of the primary and/or secondary side. This can be changed by pressing the name of the corresponding line in the legend of the graph.

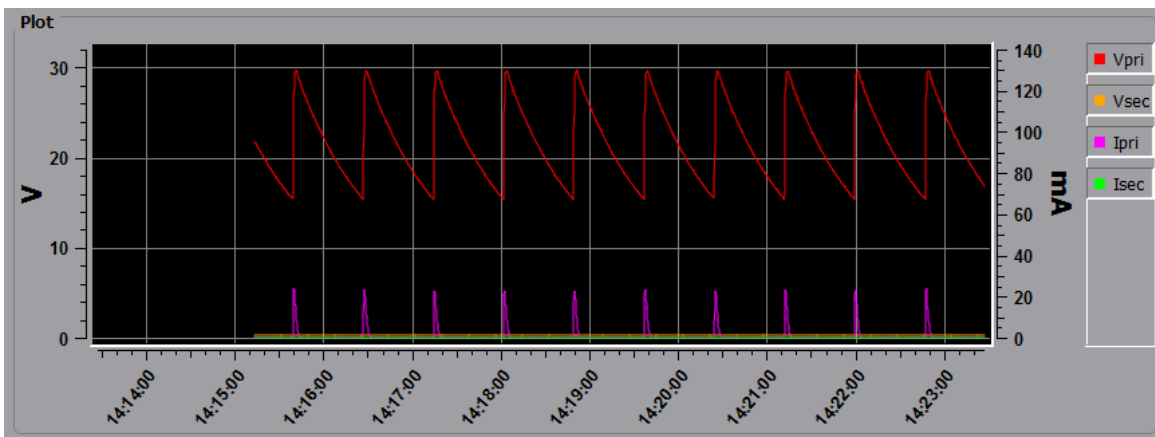


Image 8 Plot window

Attention!

- When the selected LDB is changed, the data in the graph is cleared.
- When the live monitoring starts, the data in the graph is cleared.

2.9. LDB interaction

This part contains the sections that are used to send messages to the selected LDB. These messages can be divided in two groups. The first group are the actions that can be executed on the LDB, an example of this action is sending a reset command. The second group is used to change the LDB settings. These two groups are explained in more detail below.

2.9.1 LDB actions

Different messages can be sent to a LDB, the buttons that are used for this are shown in Image 9 and Image 10. The purpose of each of these buttons is explained below the image.

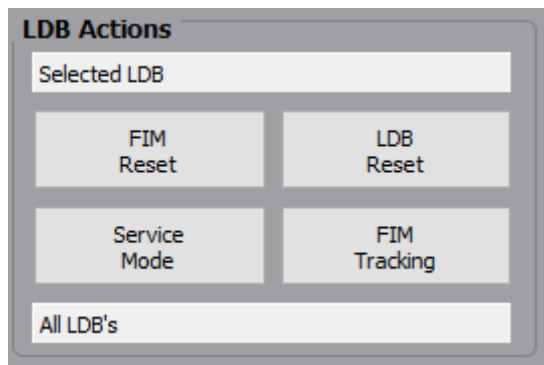


Image 9 LDB action buttons

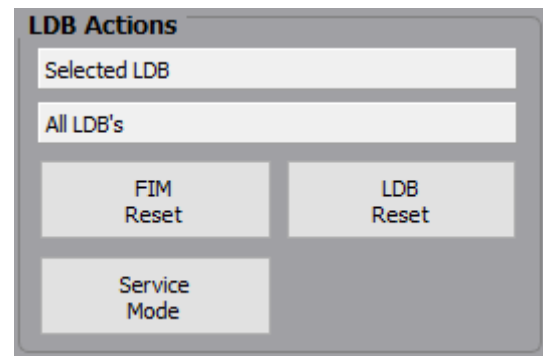


Image 10 LDB action buttons

2.9.1.1. LDB reset

The first action that can be executed on the LDB is the 'LDB Reset'. This action sends a reset command to the LDB, this means that the LDB will clear the faults in the memory and do a restart. This action can be used to clear faults that are still saved in the memory of the LDB, but is also used to put the LDB in normal operation mode. If there are still faults present after the reset, they will be detected and the LDB will indicate the fault state again.

2.9.1.2. FIM reset

The second action that can be executed on the LDB is the 'FIM Reset'. This action will also send a reset command to the LDB, but this command will also send a reset command to the FIM's. The reset command for the FIM's only works on the first FIM in fault memory state that is found on the primary and secondary side. This means that a maximum of 2 FIM's will get the reset command every time this action is used. When there are multiple FIM's with a fault memory state, the reset command should be send multiple times to reach all the FIM's. The FIM will only reset when there are faults only in the memory state and no active faults. The 'FIM Reset' command is constantly repeated if the LDB is in 'Service Mode'.

2.9.1.3. Service mode

The third command that can be sent to the LDB is the 'Service Mode'. This action will put the LDB in 'Service Mode'. The buttons 'FIM Reset', 'Service Mode' and 'FIM Tracking' will be disabled when this happens. These buttons are disabled since features they activate are useless during the 'Service Mode'.

LDB in 'Service Mode' indicates only the active faults and fault memory is inactive. This mode is very useful when connecting the loop during commissioning, since it's possible to instantly check if there are faults present. The audio is muted when the LDB is in 'Service Mode'. To leave the 'Service Mode' and enter quiescent mode, the 'LDB Reset' command should be send.

2.9.1.4. FIM Tracking

The last action that can be selected is the 'FIM Tracking'. This is not an actual command that is send to the LDB, but another module of the Sniffer application that can be used to track the number of FIM's on the loop connected to the selected LDB. When this button is pressed, the window shown on Image 11 is opened.

In this new window two buttons are visible. The 'Zoom in' button can be used to zoom in at the data for the first ten minutes.

The 'Start Tracking' button starts the tracking of the FIM's. When this button is pressed, the application will ask the user for confirmation. This is to make sure that the user knows that a 'Factory Reset' will be started. The next dialog allows the user to select commissioning or fault finding mode. When the mode is confirmed, the 'Factory Reset' command is send to the LDB and a timer is shown that indicates the time until the reset is completed. After the countdown the audio will mute and the 'FIM Tracking' starts. The moment the 'FIM Tracking' is started, general information about the LDB is shown to the user (Number 2).

The 'Factory Reset' command is only send from the primary side of the LDB. This means that if there is an open in the loop, only the FIM's before the open will receive the 'Factory Reset' command. The FIM's are only in 'Factory Reset Mode' when they are received from the manufacturer or when the 'Factory Reset' command reached the FIM.

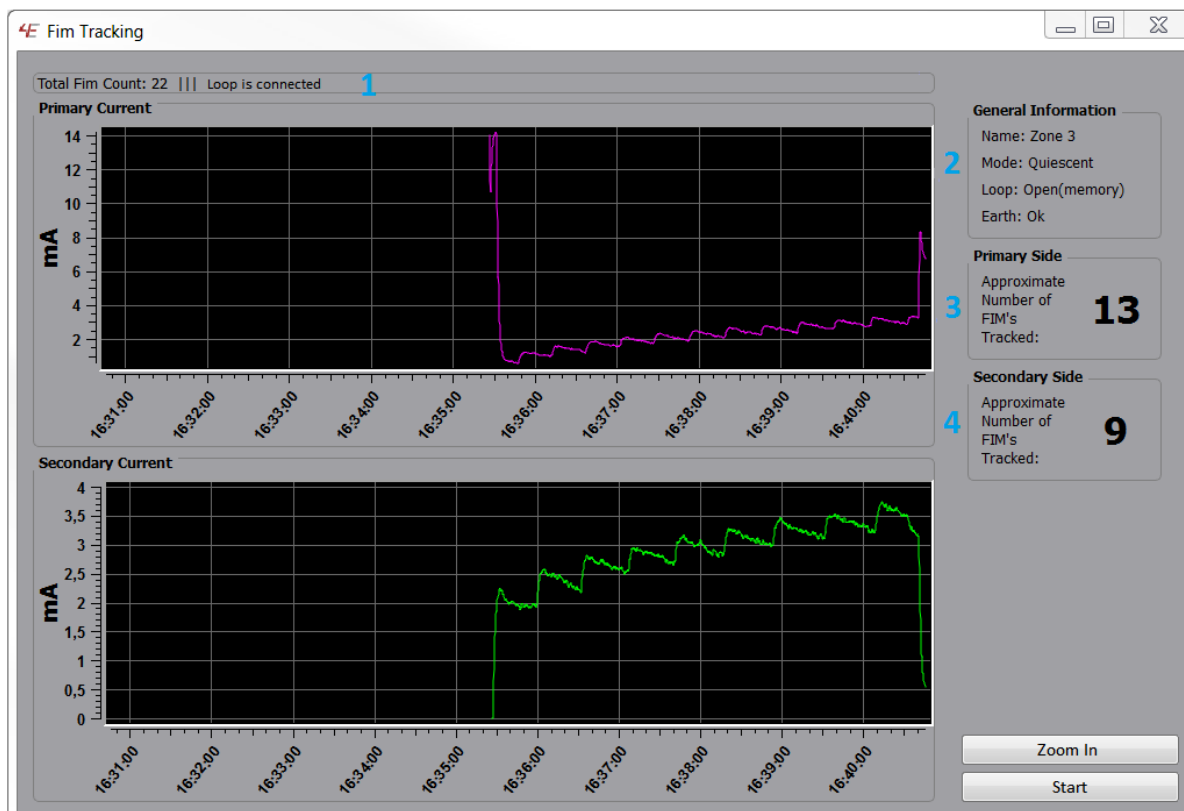


Image 11 FIM tracking window

Open detected

In almost every case when an open is detected during the 'FIM Tracking', the user should only look at the number of FIM's tracked on the primary side. Because if the application wants to detect a FIM it should be in 'Factory Reset Mode' and only the FIM's between LDB primary output and the line opening are in this mode. When a hard earth leakage is applied on the phase of the FIM T-branch, it is possible that the FIM isolates the T-branch and an open fault is indicated. During FIM Tracking this earth leakage is only detected after 1 minute and it can happen that the FIM Tracking already stopped before the earth leakage was indicated. Other earth leakage fault are normally indicated within 15 seconds.

Short detected

In almost every case when a short is detected during the 'FIM Tracking', the user should only look at the number of FIM's tracked on the primary side. Because if the application wants to detect a FIM it should be in 'Factory Reset Mode' and only the FIM's between LDB primary and the line short are in this mode. When the user start the 'FIM Tracking' again and the short is still in the loop, the number of FIM's tracked should decrease by one comparing to the number detected before. This is because the FIM's start isolating one FIM earlier every time the 'FIM Tracking' is executed.

Closed loop detected

When a closed loop is detected, the user should look at the number of FIM's tracked on the primary and secondary side. This information can be found in the status text field (number 1).

Earth leakage detected

When an earth leakage is detected, the current number of FIM's is saved and displayed. Earth leakage faults are best detected when the loop is closed and the secondary port is disconnected. When a hard earth leakage is applied on the phase of the FIM T-branch, it is possible that the FIM isolates the T-branch and an open fault is indicated. During FIM Tracking this earth leakage is only detected after 1 minute and it can happen that the FIM Tracking already stopped before the earth leakage was indicated. Other earth leakage fault are normally indicated within 15 seconds.

Detection reported

When an open, short or closed loop is detected a popup will be shown to the user. This popup shows the state of the loop and whether the problem is detected on the primary or secondary side. The number of FIM's that are tracked can be found on the right side of the window (number 3 & 4). When both sides have finished the tracking, the total number of FIM's tracked can be found in the status text field (number 1).

After a fault is detected it will stop tracking that side. (This does not happen with the earth leakage) After tracking has stopped for a side it is not possible to start tracking from that point again. When the location of new faults should be detected, all FIM's should be tracked again.

Attention!

- The application tries to give a good estimation, but does not always show the exact number of FIM's or fault location.
- The popups use a sound warning that can be turned off in the application settings.
- When a short is present directly on the LDB, it cannot be put in 'Factory Reset Mode' and the 'FIM Tracking' procedure cannot be started.

2.9.2 LDB settings

This is the second section that is used to send messages to the LDB. With this part it is possible to change settings on the LDB. See Image 12.

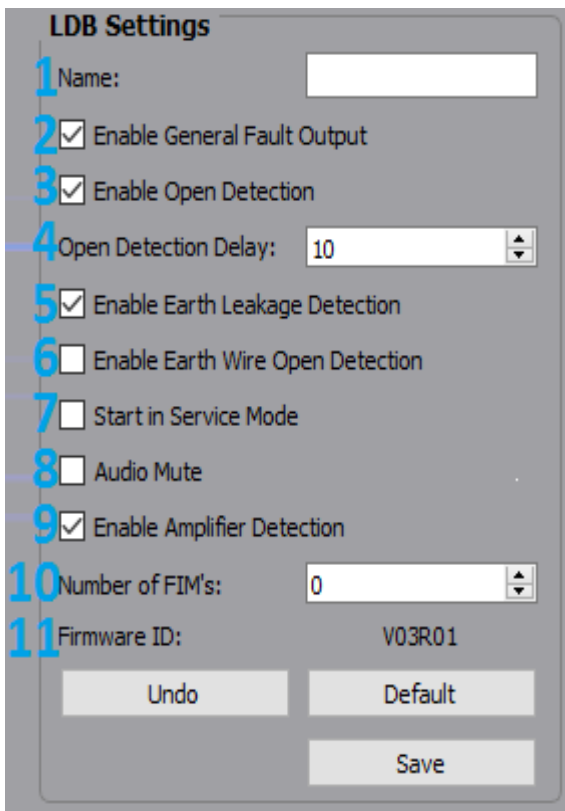


Image 12 LDB settings

There are also three buttons available to the user. The 'Undo' button will get the current settings from the LDB and revert the settings in the LDB settings section. The 'Default' button will restore the settings to the default values, but will not change the settings on the LDB. The 'Save' button will save the currently selected settings to the LDB. When the 'Save' button is pressed, the LDB action will be disabled for 3 seconds. This is to make sure that the application has enough time to send all the settings to the LDB.

Attention!

- The 'Default' button only restores the settings in the application, but will not save them on the LDB. To save new settings to LDB you have to press 'Save' button.
- When another LDB is selected, it can take a few seconds before the settings of the newly selected are retrieved.

3. Extra information about restarting the application

When the application is closed, the position of the main window and the application settings window are saved. The position of the sliders and table columns are also saved. The position of these elements is saved so it can be restored during the next startup of the application. However when the last known position and size of the application does not fit on the current window it will be moved to the primary window.

1. The name of the LDB.
2. The checkbox indicates if the general fault contact operation is turned on.
3. The checkbox indicates if the open detection is turned on.
4. The time between occurrence and detection of an open fault. This should be a number between 10 and 99 and can only be changed when the open detection is turned on.
5. The checkbox indicates if the earth leakage detection is turned on.
6. The checkbox indicates if the earth wire open detection is turned on.
7. The checkbox indicates if the LDB will startup in 'Service Mode'.
8. The checkbox indicates if the audio is muted.
9. The checkbox indicates if the LDB shows errors when the amplifier is disconnected. (In the first hardware revision an open loop will still be indicated when the detection is disabled)
10. The number of FIM's that are counted can be saved here by the user.
11. The current version of the firmware in the LDB.

When the application is restarted it does not remember the last selected LDB, so the first LDB that is found will be selected.

4. Problems and solutions

4.1. The application does not start and gives the error “MSVCP100.dll is missing”

- This problem can be solved by running “vcredist_x86.exe”. This can be found in the ‘resources’ folder of the application.

4.2. The application cannot find any LDB.

- Check if the correct serial COM port is selected in the application. This can be changed in the application settings (See section 2.3).
- Check if all connected LDB’s have a unique ID.
- Check if the USB to RS485 is connected properly.
- Check if there are LDB’s connected to the DIN rail.

4.3. The application cannot find the correct serial COM port.

- Check if Windows recognizes the serial port. This can be checked by opening the ‘Device Manager’. The serial port should be listed in this window at the section ‘Ports (Com & LPT)’.
- If Windows recognizes the serial port, the application may still need a few seconds to find it. The list of serial ports is refreshed by reopening the application settings window. So after reopening the window a few times, the serial port should be visible.

4.4. The LDB does not execute the actions right away.

- This can be caused by the application, if it’s still sending previously issued commands to the LDB. It should be fixed by waiting a few seconds and give the application some time to send the remaining commands.

4.5. A new LDB is not recognized

- The application only retrieves the connected LDB’s during startup. To get data from the new LDB, the ‘Reload Devices’ button should be pressed. This makes the application do a new search for all the connected devices.

5. Advanced: Changing the application configuration ini files.

It is possible to change the settings of the table in the ‘LDBSniffer.ini’ file. This file is used to select the background color of the table cells and can be used to detect certain faults easier in the table.

The background color cannot be changed for the first column with the selection checkboxes. For every other column it’s possible to assign a background color depending on the values in the ‘LDBSniffer.ini’ file. The default background color for the table cells is white. Assigning the background colors can be done in three ways.

- The received value is bigger or equal to the saved value.
- The received value is smaller or equal to the saved value.
- The received value is equal to the saved value.

The file structure that is used for these settings starts with the name 'column'. This is the name of the structure. This is followed by the number of the column and the keyword 'valueX' or 'colorX'. The keyword indicates if the next value is a value that should be compared or is the name of the background color that should be used. The X should be replaced with a number that tells the program how the value should be compared.

- When X has the value 0 it should be checked if the received value is bigger or equal to the saved value.
- When X has the value 1 it should be checked if the received value is smaller or equal to the saved value.
- When X has the value 2 to 15 it should be checked if the received value is equal to the saved value.
- When X has the value bigger than 15 it is not checked.

Every value of X should only exist one time for every column. A higher value for X means a higher priority. This means that if the same value is used in the column, the background color specified at the value with the highest X will be used. When values for X are not used, it is not necessary to leave them in the file. These lines can be removed from the file or changed to comments by adding a ';' in front of the row.

The name, column number and the keyword are separated with a '/'. An example of this for column 5, the column for the voltage on the primary side, can be seen on the next page.

- The cell background color will be red if the voltage is bigger or equal to 31.
- The cell background color will be blue if the voltage is smaller or equal to 26.
- The cell background color will be green if the value is equal to 28.
- The cell background color will be yellow if the value is equal to 27.

```
;Primary Port Voltage Column  
column/5/value0=31  
column/5/color0=red  
column/5/value1=26  
column/5/color1=blue  
column/5/value2=28  
column/5/color2=green  
....  
column/5/value15=27  
column/5/color15=yellow
```

When the background colors of the column of the voltage and/or current is changed the value that normally is displayed can be used. But this cannot be used when changing the background colors of the mode, the loop state or the earth state, since it's necessary to know what values are used for the states. The values for the states can be found in the tables below.

LDB Mode / Visible Text	Value
Booting	0
Quiescent	10
Measuring	20
Service Mode	30
FIM Reset Executing	40
FIM Reset Failed	41
FIM Reset Done	42
Factory Reset Executing	50
Factory Reset Failed	51
Factory Reset Done	52
Check Settings (Only when the LDB is in quiescent mode)	253
Fault (Only when faults are detected in quiescent mode)	254
Disconnected	255

Loop State / Visible Text	Value
Ok	0
Open	1
Open(memory)	2
Short	4
Short + Open(memory)	6
Short(memory)	8
Short(memory) + Open	9
Short(memory) + Open(memory)	10

Earth State	Visible Text	Value
Ok	Ok	0
Open	Open	1
Open(memory)	Open(memory)	2
Open detection off	Ok	3
Leakage	Leakage	4
Leakage + Open	Leakage + Open	5
Leakage + Open(memory)	Leakage + Open(memory)	6
Leakage + Open detection off	Leakage	7
Leakage(memory)	Leakage(memory)	8
Leakage(memory) + Open	Leakage(memory) + Open	9
Leakage(memory) + Open(memory)	Leakage(memory) + Open(memory)	10
Leakage(memory) + Open detection off	Leakage(memory)	11
Leakage detection off	Ok	12
Open + Leakage detection off	Open	13
Open(memory) + Leakage detection off	Open(memory)	14
Leakage detection off + Open detection off	Ok	15

Attention!

- A list with names for the colors can be found at:
<http://www.w3.org/TR/SVG/types.html#ColorKeywords>
- Only values of X from 0 to 15 are supported.
- When a wrong name is used for a color, the cell will probably get a black color.
- It is possible to use background colors for the name column, but it's not conventional because numbers have to be used to represent text.