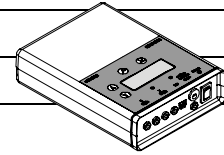


FDUL221



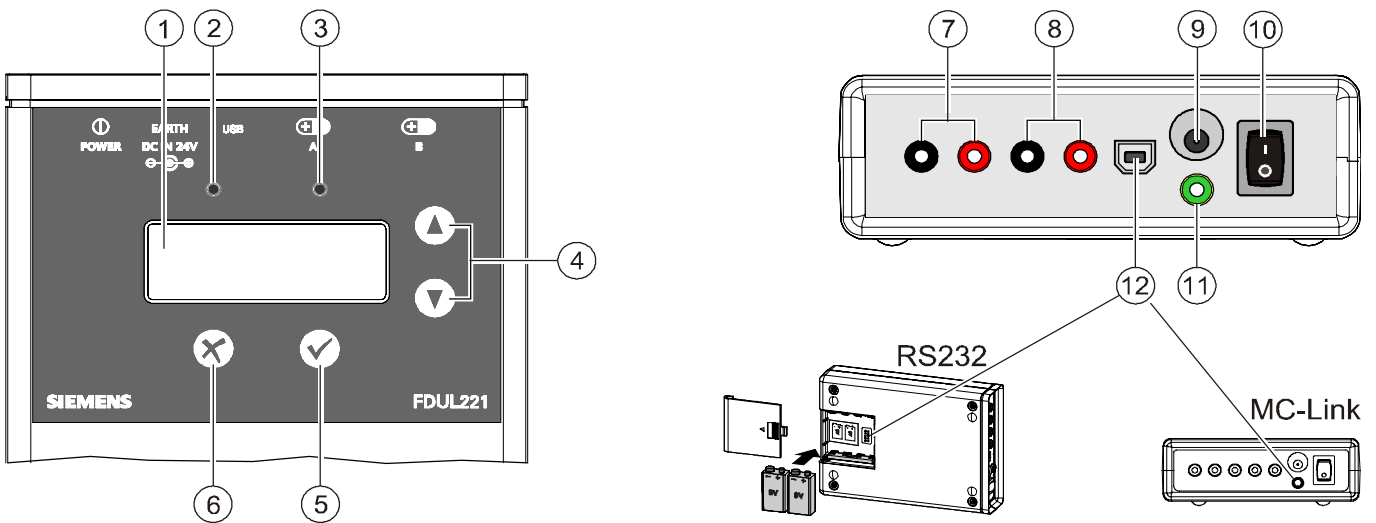
**en Line tester – operating instructions for electricians**

## 1. Intended use

The FDUL221 line tester is used to diagnose an addressed detector line in FDnet/C-NET. During diagnosis, the detector line must not be connected to the control panel.

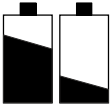






This document contains all necessary information on the FDUL221 line tester in the 'EL' operation mode. The 'EL' operation mode is only intended for use by electricians. The electrician has received specialist training in the area of building installation technology or electrical installations.











## 2. Control and connection elements



Item	Symbol/element	Description	Function
1		Display	<ul style="list-style-type: none"> <li>Adjustable backlight and contrast</li> <li>Scrolling plain text and symbol display</li> </ul>
2		LED red	<ul style="list-style-type: none"> <li>Flashes slowly in the event of an error during startup</li> <li>Flashes rapidly when PC is connected</li> </ul>
3		LED green	<ul style="list-style-type: none"> <li>Flashes faintly during normal operation</li> <li>Flashes brightly when reading in the line topology or when PC is connected</li> <li>Lights up when scrolling</li> </ul>
4		Buttons Up/down	<ul style="list-style-type: none"> <li>Scrolling (up/down) between the menus and within the menus</li> <li>Scrolling (right/left) within a function, e.g. in Device Info or in LCD Setup</li> </ul>
5		OK button	<ul style="list-style-type: none"> <li>Confirming a selection, e.g. entering a menu or a function</li> <li>Starting a procedure, e.g. activating tests</li> <li>Activating a function, e.g. switching relays, sounds and alarm indicators</li> </ul>
6		Exit button	<ul style="list-style-type: none"> <li>Quitting a function or a menu</li> <li>Cancelling a procedure</li> <li>Starting the 'Configuration' menu tree (together with the on/off) switch</li> </ul>
7		B (+) red B (-) black	Connection for line end for a loop
8		A (+) red A (-) black	Connection for line start for a loop/stub and for a single line device
9		Socket	External power supply via the supplied FDUL221-B power unit
10		Switch 'On/off'	I = On O = Off
11		Socket 'Yellow/green'	Connection for the ground wire or shielding
12		USB connection type B	Connection to PC (in the case of older FDUL221 line testers also RS232 interface or MC link)

3. Symbols on the display

Symbol	Meaning
	Charge state of the partially discharged batteries during battery operation <ul style="list-style-type: none"> <li>• Symbol on left for low battery charge state</li> <li>• Symbol on right for high battery charge state</li> </ul>
	External power supply (mains operation)
	Cursor position displays
	<ul style="list-style-type: none"> <li>• Down arrow → Start of a stub line</li> <li>• Up arrow → End of a stub line</li> <li>• No symbol → The line device is on a loop</li> </ul>
	Shows the previous line device
	Line device was removed after reading in the topology
	Fault/error on a line device

Symbol	Meaning
	Line device was replaced after being removed
	Line device displays an alarm
	Line device is on a sounder base
	Line device on a loop or stub
	Last line device on a stub
	First line device on a sub-stub
	Line device on a sub-stub
	Last line device on a sub-stub
	Single line device on a stub
	Ground fault

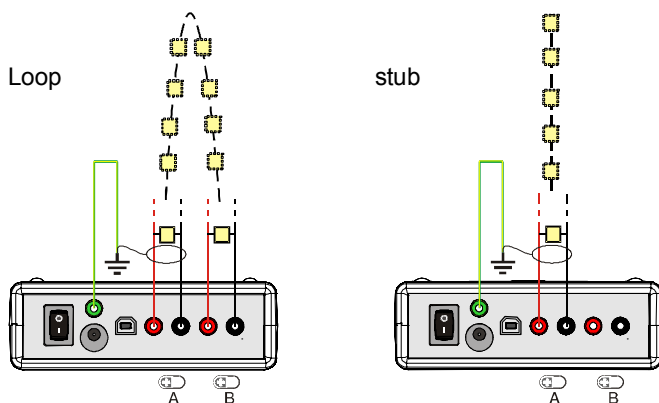
4. Power supply

The power supply is provided either by the supplied FDUL221-B power unit or two batteries (type: lithium manganese dioxide type U9VL Li/MnO<sub>2</sub> 9 V, 1 Ah).

5. Connecting the detector line to the line tester

**!** The fire control panel and the line tester must not be connected to the detector line simultaneously.

Connect the detector line which is disconnected from the fire control panel according to the following diagrams.



For a loop:

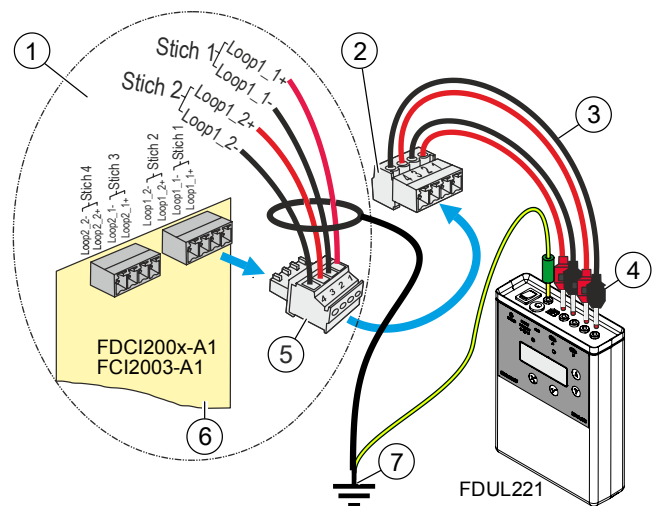
1. Connect both ends of the line to the line tester.
2. Connect the ends of the feed line to line 'A'.
3. Connect the ends of the return line to line 'B'.

For a stub or a single line device:

1. Connect the ends of the line to line 'A'.

Connect the ground wire. To detect shielding errors, connect the shielding to the ground wire.

Connection to terminal strip on FDI200x-A1 periphery board or FCI2003-A1 loop extension



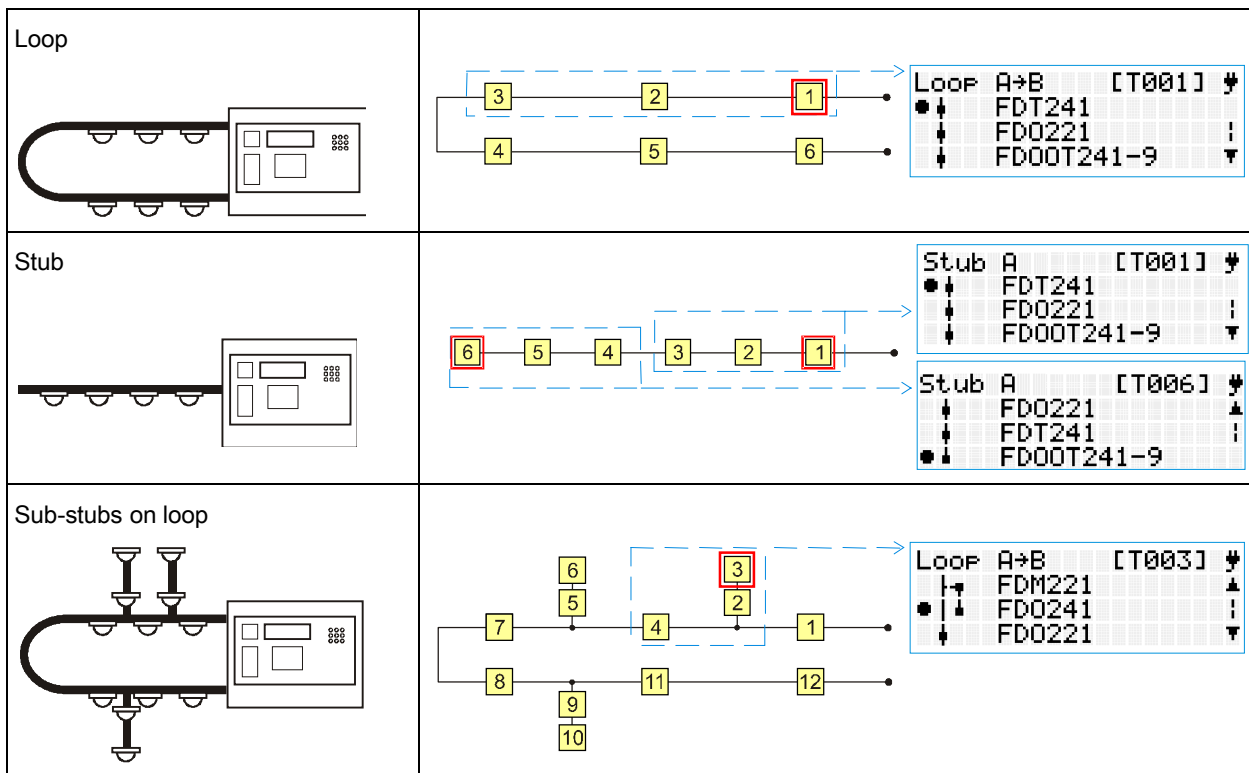
- 1 FC20xx/FC72x control panel
- 2 Terminal strip
- 3 Measurement line
- 4 Terminal plug
- 5 Terminal plug with feed/return line for the detector line
- 6 Periphery board or loop extension
- 7 Ground wire/shielding

6. Description of the line topology

The line devices are displayed in the order of the loop/stub. On the branch to the sub-stub, the line devices are displayed in the order of the sub-stub. The display shows the number of the line device in brackets.

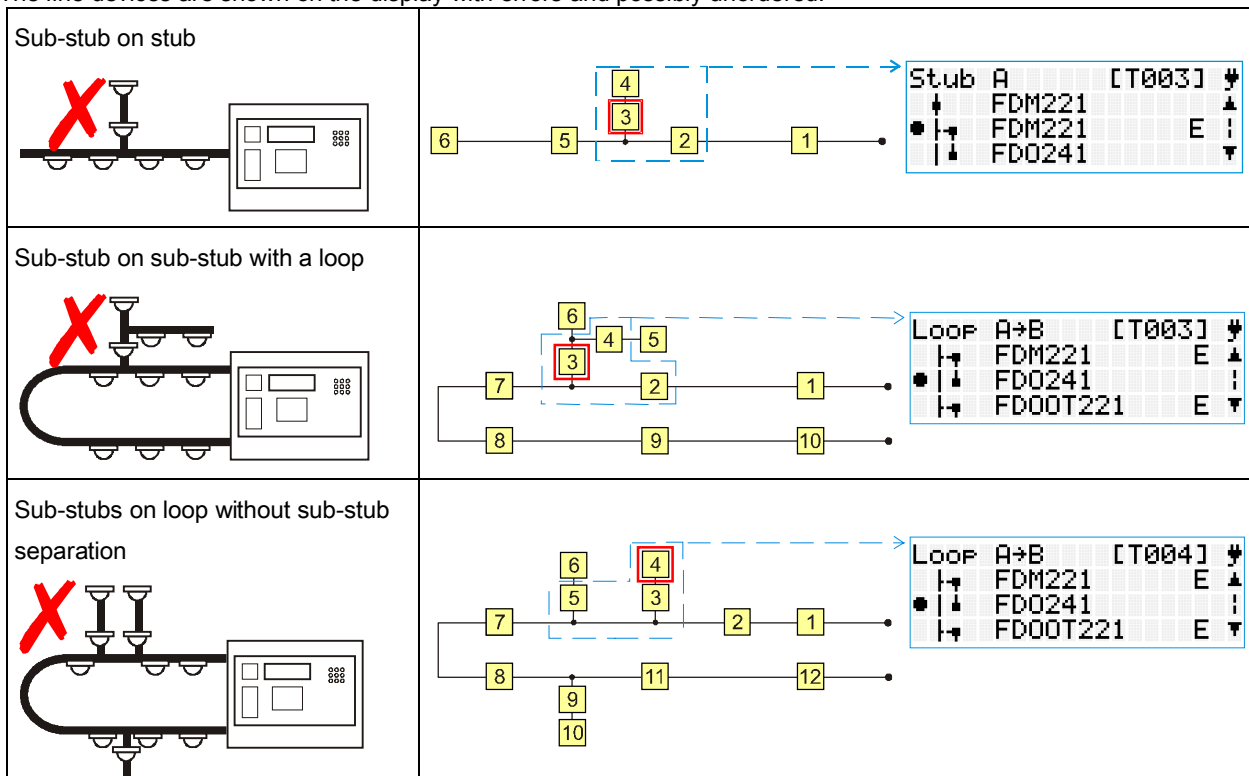
E.g. [T001] for the first line device. In the case of the red outlined devices, the internal alarm indicator flashes. If an external alarm indicator is connected to these devices, the external alarm indicator also flashes.

The following topologies are permitted in FDnet/C-NET:



The following topologies are not permitted in FDnet/C-NET:

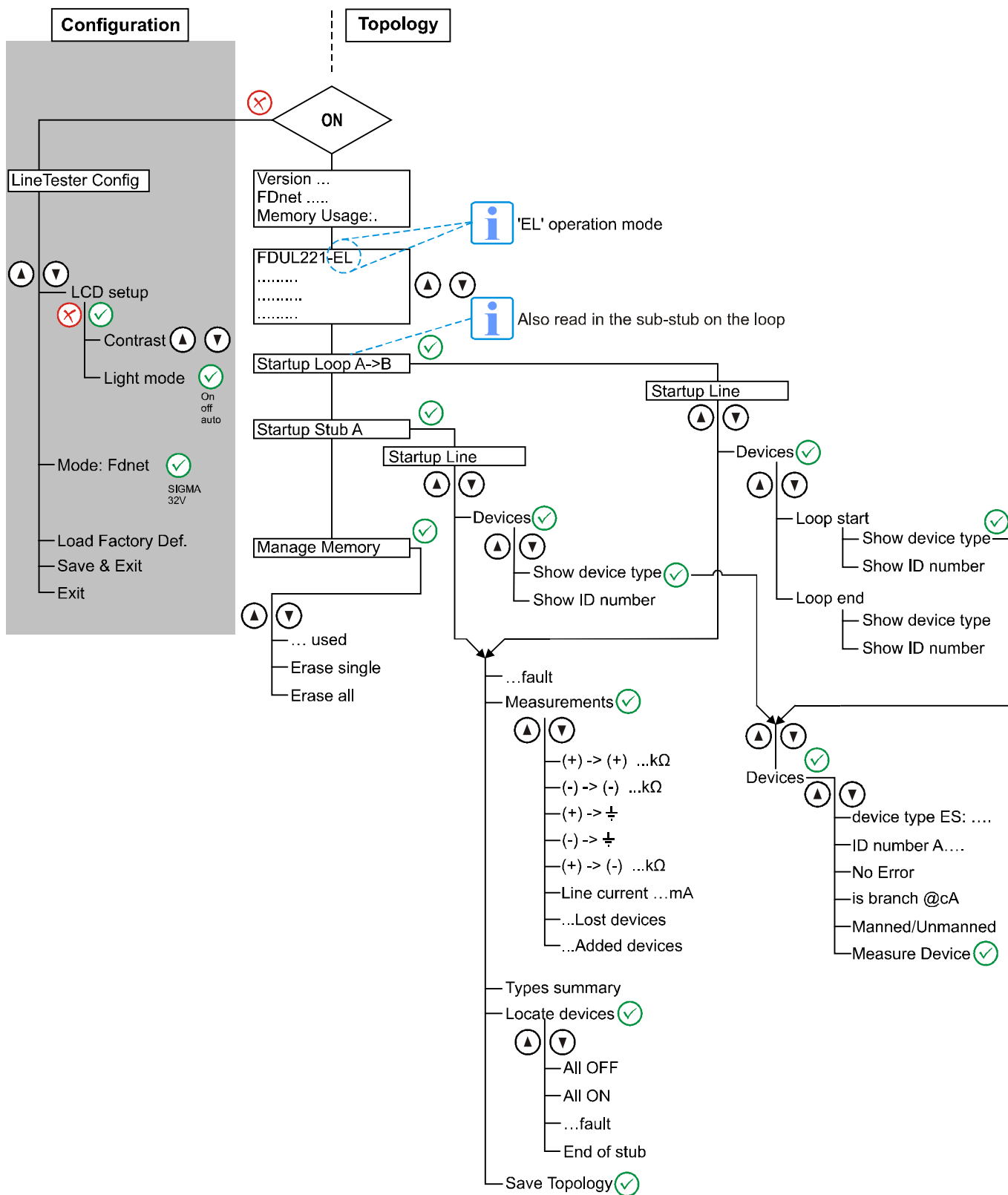
The line devices are shown on the display with errors and possibly unordered.



7. Navigating the menu tree in the 'EL' operation mode

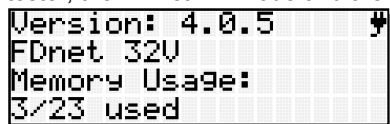
The figure below shows the structure of a menu tree and the navigation options. The possible commands are displayed. Use the  $\uparrow$   $\downarrow$   $\checkmark$   $\otimes$  buttons to navigate. Note the position indicators  $\bullet$   $\blacktriangle$   $\wedge$ .

To open the 'Configuration' menu tree, switch the line tester on while pressing and holding the  $\otimes$  button. You can exit the 'Configuration' via the 'Save & Exit' or 'Exit' menu. To switch between 'Configuration' and 'Topology', switch the line tester off and on again as described in chapter 8.



8. Switching the line tester on

Move the 'On/off' switch into position <I>. The display briefly indicates the software version of the line tester, the 'FDnet...V' mode and the memory usage.



Then the device designation is displayed with operation mode and the selection fields. The line tester is ready for operation.



To open the 'Configuration' menu tree, switch the line tester on while pressing and holding the button.



9. Reading in the line topology

To read in the line topology, proceed as follows:

1. Disconnect the detector line or the line section from the control panel.
2. Connect the line tester to the detector line or line section. Observe the polarity.
3. Switch on the line tester.
4. Check whether the 'FDnet...V' mode matches the detector line.
5. Select either 'Read in loop A->B' or 'Startup Stub A'.
6. Press the button.

The topology is read in and displayed automatically.

10. Calling up and checking the read-in line topology

Navigate to the required item in the menu tree. If a line device is selected, its internal and external alarm indicator flashes. All detected line devices flash if 'All ON' is selected in the 'Locate devices' menu.

12. Table of faults

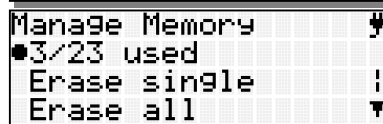
Below you will find an overview of the errors displayed by the FDUL221 line tester as well as possible causes and remedies for the errors.

- = Line device
- ? = Position of the line device not detected
- (D) = Line device is shown on the display, the internal and external alarm indicators flash
- = Line device is shown on the display with an error

11. Saving the line topology and transferring it to a PC

The memory capacity is limited and divided into 23 spaces. Extensive detector lines can occupy up to 4 spaces.

1. Make sure that you have sufficient memory capacity.
2. Delete data that is not required under 'Manage Memory' in the menu tree.



3. Navigate to 'Save' in the menu tree.
4. Press the button.

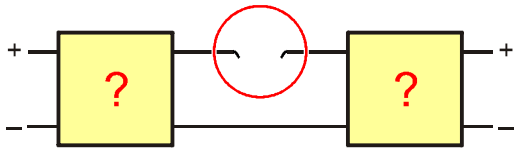
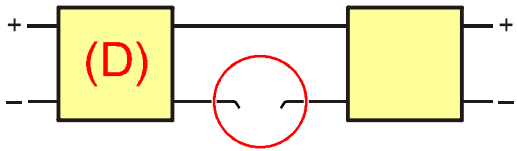
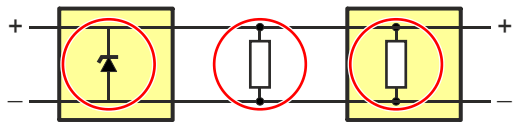
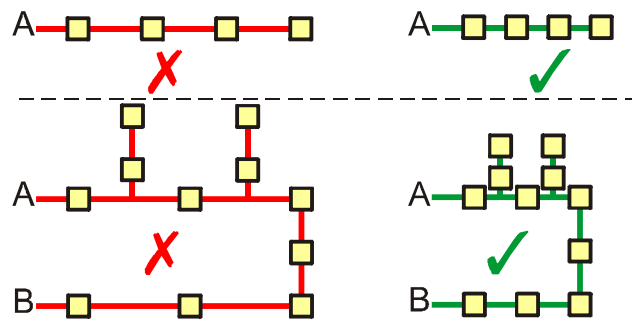
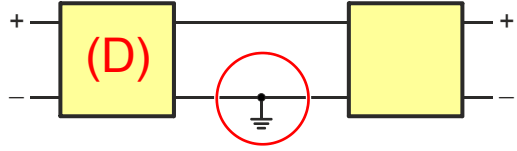
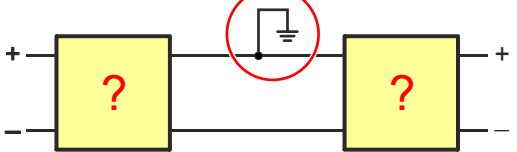
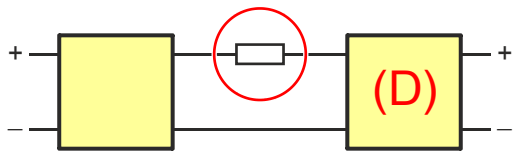


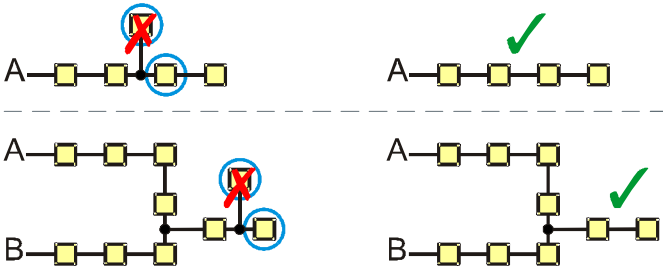
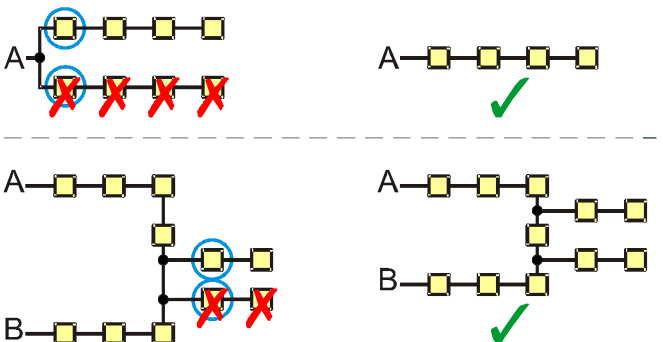
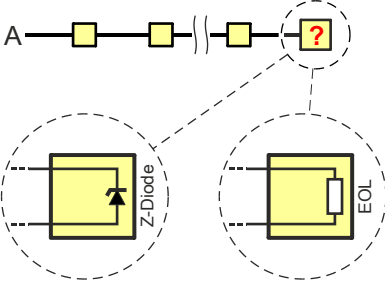
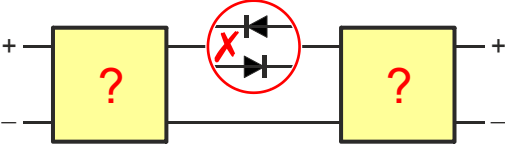
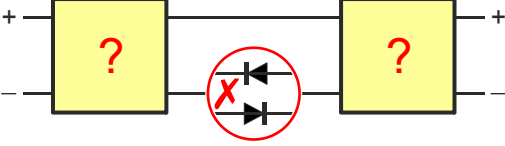
The saving process begins and the name of the storage space is displayed, e.g. M3. Note the assignment of the name to the detector line. The saved topology can be transferred to a PC using the 'PC Linetester Tool FXS2017' software.

Connect the PC to the item 12 socket using a USB cable. (See chapter 2 'Control and connection elements'). In the case of older devices use the MCL-USB adapter FDUZ221/MCL-USB adapter (radio) FDUZ227 or an RS232 cable.

You will find more information in chapter 5.11 of the Technical manual 008250 on the FDUL221 line tester.

Error	Possible cause	Remedy
E01	<p>Short-circuit on the detector line. The line separator is open for the device shown on the display.</p>	<p>Locate the short-circuit by checking the cable section behind the device shown on the display. In the case of a loop, the location is also shown as an 'open line'.</p>

Error	Possible cause	Remedy
E02	Open line in the $\oplus$ line. The exact position of the open line cannot be identified by the line tester. 	Check the cable. Search for the faulty location by disconnecting the detector line and re-checking the cable connection. Disconnect the return line and restart the detector line. The open line is located behind the last line device shown on the display.
E03	Open line in the $\ominus$ line 	Disconnect the return line and restart the detector line. The open line is located behind the last line device shown on the display.
E04	High leakage current  The typical leakage current is approx. 300 $\mu$ A (base current) and approx. 3 $\mu$ A per line device.	Check the cable insulation. In the case of migrated detector lines: <ul style="list-style-type: none"> <li>• Check whether old line devices are still installed on the detector line.</li> <li>• Check whether EOL elements, e.g. resistors, are still installed on the detector line.</li> </ul>
E05	a) High line capacity  b) Error during migration, e.g. due to forgotten line device	Line too long. Reduce the length of the loops or stubs, e.g. through division. The maximum line length is 3.3 km for FS20/FS720, 2.5 km for SIGMASYS and also depends on the line type. $R_{\text{max}} = 240 \Omega$ , $C_{\text{max}} = 750 \text{ nF}$
E06	a) $\ominus$ line is grounded b) The connection for the external AI is grounded 	Search for the ground fault. In particular, note connections for line devices with grounded components, shielded cables, etc.
E07	$\oplus$ line is grounded. The exact position of the error cannot be identified by the line tester. 	Find the faulty location by separating the parts of the detector line and checking the separated line parts (e.g. $\frac{1}{2}$ , $\frac{1}{4}$ , $\frac{1}{8}$ , etc.). Also observe the notices in the 'Error search' section.
E08	High resistance 	Resistance in the detector line is too high. Check the lines and the connection points (terminals). Ensure that the line is not too long. Limit values: See error E05 Use the 'Measure Device' menu item.
E09	The error list is limited to a maximum number of error messages that can be displayed. However, more errors are available than can be currently displayed.	Rectify the errors displayed and then read in the detector line again. The errors that were not originally displayed will then be shown.
E10	There are too many line devices on the detector line that has been read-in. A maximum of 252 line devices may be installed on a FDnet/C-NET detector line.	The read-in loop or stub must be divided into several loops or stubs with less line devices.

Error	Possible cause	Remedy
E11	<p>A sub-stub is not permitted in this location.                      Note: This error number indicates several line devices as faulty.</p> 	<p>A branch is not allowed. Change the wiring. Ensure that a 'Sub-stub on stub' topology has not been wired. Only one or several individual sub-stubs can branch from a loop.</p>
	<p>b) When switching a collective detector line with manual call points and point detectors, the diodes are still installed in the detector bases.</p>	<p>Remove the diodes from all detector bases.</p>
E12	<p>Several sub-stubs directly after one another without a line separator in between are not permitted.                      Note: This error number indicates several line devices as faulty</p> 	<p>Ensure that there is a line device, e.g. a line separator, between two sub-stubs branching off from the loop.                      Only one sub-stub may branch off from a loop between two line devices on the detector line.</p>
	<p>b) When switching a collective detector line with manual call points and point detectors, the diodes are still installed in the detector bases.</p>	<p>Remove the diodes from all detector bases.</p>
E13	<p>Error on the last line device of a stub: In the case of a closed line separator, an increased load current is detected on this line device.</p> 	<p>In the case of migrated lines: Check whether a resistor or a Z-diode is still installed on the line device.                      Remove the resistor or the Z-diode.</p>
E14	<p>Diode on the □ line</p> 	<p>The wire was incorrectly connected to the terminal for the external alarm indicator instead of the terminal for the detector line.                      Also observe the notices in the 'Measure line device' section.</p>
E15	<p>Diode on the □ line</p> 	<p>The wire was incorrectly connected to the terminal for the external alarm indicator instead of the terminal for the detector line.                      Also observe the notices in the 'Measure line device' section.</p>
E16	<p>An alarm has been triggered on the line device.</p>	<p>E.g. in the case of a manual call point, replace the defective glass insert and close the door.</p>
E17	<p>The line device is defective.</p>	<p>Replace the line device.</p>

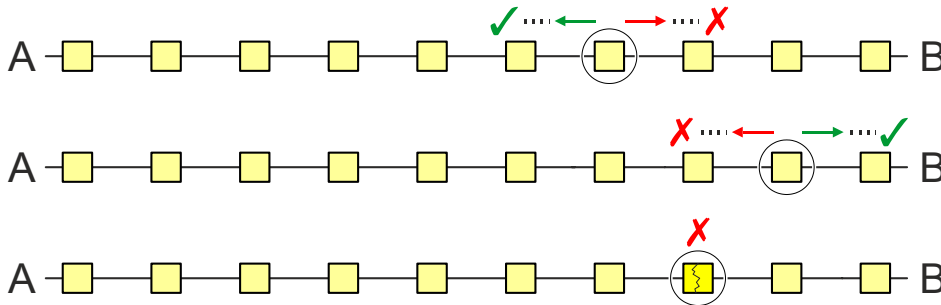
13. Error search

To switch on the internal or external alarm indicator of the detected line device, see chapter 10.

**Bisection method**

Separate the lines on a line device in the center of the loop or stub and create two stubs. Measure each stub. Divide the faulty stub in the center and connect the previously separated point. This will create two different sized stubs.

Measure each stub. This will enable you to identify the area with the error. Proceed as described with the division until you have located the error.



**Measuring the line device with the 'Measure Device' command**

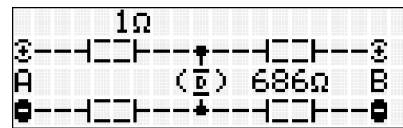
Recommended for errors E02, E14, E15. Using the measured value you can determine whether the error lies upstream or downstream of the selected line device. The location of the error can be rapidly determined by selecting the line devices. Proceed as follows:

1. Restart the detector line.
2. Navigate to the desired line device in the line tester display.
3. Press the button.
4. Select the 'Measure Device' menu item.
5. Perform steps 1 to 4 for more devices if required.

Measure the terminal resistances of the line device in the 'Measurements' menu. The values displayed are totals. The total value is affected by line resistance and diodes (e. g. external alarm indicators). Take this into account when analyzing the measurement.

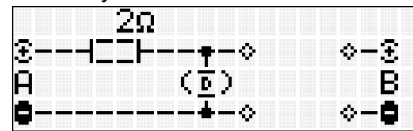
**Loop**

- Plus and minus lines are measured separately
- Cable from 'A' and 'B' separated
- Diodes are detected and localized (wire 'A' or 'B' and  $\oplus \ominus$ )



**Stub**

- Only the total resistance is measured
- Only used for stub and sub-stub



You will find more information on the FDUL221 line tester in the Technical manual 008250.

The 'PC Linetester Tool FXS2017' software offers optimum display and control options for the FDUL221 line tester.