pilz

Programmable Safety Systems
PSS-Range

PSS SB TESTER
Operating Manual
Item No. 20 757-03

The spirit of safety.

While every effort has been made to ensure that the information in this manual is accurate, no responsibility can be accepted for errors or omissions contained within it.

We reserve the right to amend specifications without notice. We are grateful for any feedback on the contents of this manual.

Contents

Contents

Introduction

This operating manual is intended to give users all the information they need to use the PSS SB TESTER.

To fully understand this manual you will need to be conversant with the information found in the general documentation for the SafetyBUS p PSS-range. In particular you should read the SafetyBUS p System Description and SafetyBUS p Installation Manual.

This documentation is intended for instruction and should be retained for future reference.

Validity of documentation

This documentation is valid for the PSS SB TESTER from Version 2.0.
It is valid until new documentation is published. The latest documentation is always enclosed with the unit.

Overview of documentation

The manual is divided into the following chapters:

1 **Introduction**
The introduction is designed to familiarise you with the contents, structure and specific order of this manual.

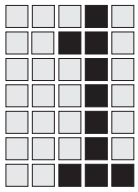
2 **Overview**
This chapter provides a brief overview of the unit's most important features and its application range.

3 **Safety**
This chapter **must** be **read** as it contains important information on safety regulations and intended use.

4 **Operation**
This chapter contains detailed information on how to operate the unit.

5 **Tests/Measurements**
This chapter describes the separate tests than can be performed using the PSS SB TESTER.

6 **Software**
This chapter describes the software used to read the test results.



7 Fault Diagnostics
When a fault is detected on SafetyBUS p, this chapter helps you find the source of the fault and rectify it.

8 Technical Details

Definition of symbols

Information in this manual that is of particular importance can be identified as follows:

DANGER!

This warning must be heeded! It warns of a **hazardous situation that poses an immediate threat of serious injury and death** and indicates preventive measures that can be taken.

WARNING!

This warning must be heeded! It warns of a **hazardous situation that could lead to serious injury and death** and indicates preventive measures that can be taken.

CAUTION!

This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.

NOTICE
This describes a situation in which the unit(s) could be damaged and also provides information on preventive measures that can be taken.

INFORMATION
This gives advice on applications and provides information on special features, as well as highlighting areas within the text that are of particular importance.

Overview

The PSS SB TESTER is a hand-held device that can be used to carry out various tests and measurements on SafetyBUS p. Each test may comprise several separate tests.

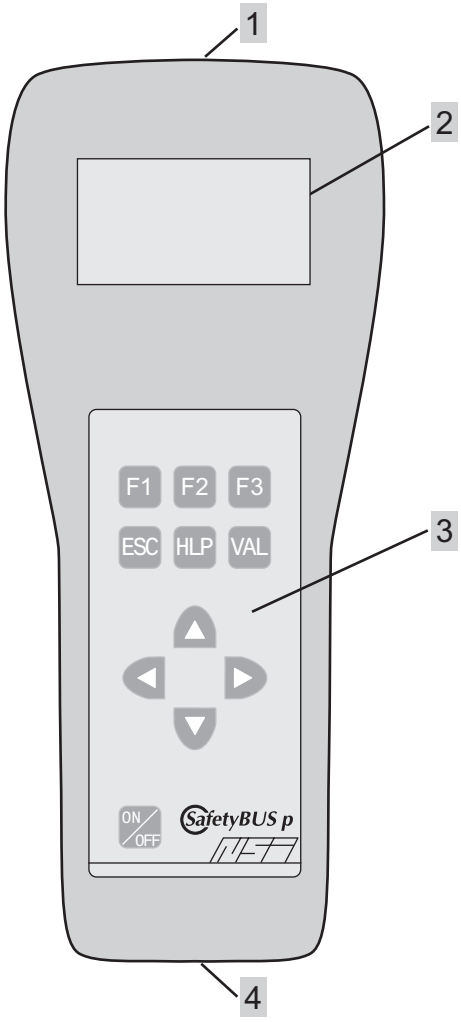
- Connection test
  - Checks the terminating resistors
  - Checks the bus cable wires for short circuits
- Screening test
  - Checks the cable screening for open circuits
- Length measurement
  - Measures the length of the bus line
  - Determines the location of a short circuit between CAN_H and CAN_L
- Signal test
  - Tests the transmission rate
  - Tests the electrical signal level on the lines CAN_H and CAN_L
  - Tests the signal edges on the lines CAN_H and CAN_L
- Real-time mode
  - Measures the bus load
  - Measures error rate, failure rate and number of errors

Once a test has been completed, the results can be read directly from the device's display or can be uploaded to a PC using the software provided.

Range

The PSS SB TESTER is supplied in a carry case. Items supplied are as follows:

- PSS SB TESTER incl. battery
- Shorting plug for the screening test
- Adapter cable for connecting the PSS SB TESTER to SafetyBUS p
- USB cable for connecting the PSS SB TESTER to a PC
- Battery charger
- Operating Manual: PSS SB TESTER
- CD:
  - Software for recording the test results on a PC
  - Operating manual in PDF format
  - Acrobat Reader



1: SafetyBUS p interface
2: Single-colour graphic display with backlight
3: Operator panel
4: USB port for uploading the test results to a PC

Fig. 2-1: View

Safety

Intended use

The PSS SB TESTER is designed for use in SafetyBUS p networks.

Specific data for the PSS SB TESTER is given in the chapter entitled “Technical Details”. Use of the device outside the specifications given here will be deemed as improper use.

Any component, technical or electrical modifications carried out will be deemed as improper use.

Use of the PSS SB TESTER outside the areas described in this manual will be deemed as improper use.
Intended use includes following the information in this manual.

The PSS SB TESTER is not a safety-related device.

EMCD

The device is designed for use in an industrial environment. Interference may occur if used within a domestic environment.

Warranty and liability

All claims to warranty and liability will be rendered invalid if

- The module was used contrary to the purpose for which it was intended
- Damage can be attributed to not having followed the guidelines in the manual
- Operating personnel are not suitably qualified.
- The housing was opened
- Any type of modification has been made (e.g. exchanging components on the PCB boards, soldering work etc.).

Disposal

The module must be disposed of properly when it reaches the end of its service life.

Operation

Supply

The PSS SB TESTER is supplied via a battery, which is located in the back of the housing.
A charged PSS SB TESTER can be operated for 1 to 2 hours, depending on the application conditions. If the battery charge drops to a particular value during testing, the message “Charge battery” will be displayed and a beep will sound. If the battery charge becomes so weak that the supply can no longer be guaranteed, the PSS SB TESTER will switch off automatically. The battery will need to be recharged. This takes approx. 1.5 hours.

INFORMATION
When the PSS SB TESTER is used for the first time or after storage periods of more than 6 months, the battery will need to be charged for at least 4 hours.

Charging the battery

- Plug the charger’s mains connector into a socket (110/230 VAC, 50 Hz).
- Take the PSS SB TESTER battery and plug it into the charger. The charger is designed in such a way that the battery can only be inserted at the correct polarity.

The start of the charging process is displayed via a red LED on the charger’s connector (100 % on).
When the main charge is complete, the charger automatically switches to “Conservation charging” mode and the LED flashes (25 % on, 75 % off).
If the main charge cannot be completed within 2 ½ hours, the charger automatically switches to “Conservation charging” mode.
If the battery is extremely depleted, the LED will flash (50 % on, 50 % off) when the battery is plugged into the charger. The battery is then charged with a reduced charging current until the battery is regenerated and can be switched to “normal” main charge mode.

Operation

INFORMATION
The battery should not be left in the charger over a long period of time (several weeks).

- Charge the battery until the LED on the charger flashes (25 % on, 75 % off)
- Remove the battery and place in the PSS SB TESTER.

Commissioning

Switching on

INFORMATION
Before the PSS SB TESTER is used for the first time, the battery must be charged for at least 4 hours.

The PSS SB TESTER is switched on via the “ON/OFF” button.
When it is switched on, the unit description “PSS SB TESTER” and its version is displayed briefly.

The “Start” window then appears. From this window you can access various menus.

Key to the symbols and function of the buttons in the “Start” window:

: Select test/measurement

: Set transmission rate

F1: Display unit version

F2: Make one of the following settings:
- Set the contrast
- Switch the backlight on/off
- Set the time and date
- Set the signal runtime
- Calibration

F3: Save or delete test results

HLP: Call up help

ESC: Cancel function/close window

VAL: Carry out function

Setting the contrast

- Press F2 in the “Start” window.
- The “Settings” window opens. Use the arrow keys to move the cursor to the symbol for “Contrast”  and press VAL.
- Now you can use the “left” and “right” arrow keys to increase or reduce the display’s contrast.
- Press VAL to save the setting.

The current setting is saved. A message confirms that the setting has been saved. The “Settings” window is then displayed again. You can return to the “Start” window by pressing ESC.

The contrast setting is stored in a memory that is supplied by the battery. If the battery is removed, the contents of the memory will be retained for 10 minutes. If it takes longer for the battery to be replaced, the contents of the memory will be lost.

Switching the backlight on/off

- Press F2 in the “Start” window.
- The “Settings” window opens. Use the arrow keys to move the cursor to the symbol for “Backlight”  and press VAL.
- Two symbols will appear.
  If you wish to switch the backlight on, use the arrow keys to highlight the  symbol.
  If you wish to switch the backlight off, highlight the  symbol.
- Press VAL to save the setting.

The current setting is saved. A message confirms that the setting has been saved. The “Settings” window is then displayed again. You can return to the “Start” window by pressing ESC.

The information on the backlight is stored in a memory that is supplied by the battery. If the battery is removed, the contents of the memory will be retained for 10 minutes. If it takes longer for the battery to be replaced, the contents of the memory will be lost.

Setting the time and date

- Press F2 in the “Start” window.
- The “Settings” window opens. Use the arrow keys to move the cursor to the symbol for “Time and Date”  and press VAL.
- The time and date are displayed. The ex-works setting is 01.01.2000 for the date and 00:00 for the time.
  The weekday is highlighted within a grey field. Use the “up” and “down” arrow keys to set the required weekday.
  You can then use the “right” arrow key to move the grey field to the month; set the required month using the “up” and “down” arrow keys. Do the same for the year, hour and minute.
- Press VAL to save the setting.

The current setting is saved. A message confirms that the setting has been saved. The “Settings” window is then displayed again. You can return to the “Start” window by pressing ESC.

The setting is stored in a memory that is supplied by the battery. If the battery is removed, the contents of the memory will be retained for 10 minutes. If it takes longer for the battery to be replaced, the contents of the memory will be lost.

Setting the signal runtime

To measure the length of the bus cable you will need to enter the signal runtime. The ex-works setting for the signal runtime is 4.5 ns/m. This value is valid for the Pilz standard cable for SafetyBUS p (order no. 311 070). If you use a cable with a different signal runtime, you will need to amend the set value.

- Press F2 in the “Start” window.
- The “Settings” window opens. Use the arrow keys to move the cursor to the symbol for “Signal runtime”  and press VAL.
- Use the arrow keys to enter the password “7041” and press VAL.
- The signal runtime is displayed. Use the arrow keys to set the signal runtime to the required value.
- Press VAL to save the setting.

The current setting is saved. A message confirms that the setting has been saved. The “Settings” window is then displayed again. You can return to the “Start” window by pressing ESC.

The setting is stored in a memory that is supplied by the battery. If the battery is removed, the contents of the memory will be retained for 10 minutes. If it takes longer for the battery to be replaced, the contents of the memory will be lost.

Calibration

Calibration is reserved for Pilz customer service.

Operation

Performing the tests

All the tests are described in detail in the chapter entitled “Tests/ Measurements”. This section is only intended to explain how to save, upload and delete the test results.

Saving the test results

With the exception of the results for real-time mode, all the test results can be saved.
The connection test, screening test, signal test and length measurement each have a specific memory area available within the PSS SB TESTER. This division within the memory enables tests to be performed at different times; the respective results can be saved and then all the results can be uploaded to the PC together. When you save the results of a test, the old data in the test's memory area is overwritten.

Example: The user performs the connection test, saves the results and switches off the tester. Two hours later the user then performs the signal test, stores the results and again switches off the tester.
The current results from the connection test and signal test are saved within the tester, along with the results from an earlier length measurement.

- After carrying out a test, switch to the “Start” window and press F3.
- The “Memory” window opens. Use the arrow keys to move the cursor to the symbol for “Save”  and press VAL.
- The “Save” window opens. Press VAL.

The test results are saved. A message confirms that the results have been saved. The “Start” window is then displayed again.

The test results are stored in a memory that is supplied by the battery. If the battery is removed, the contents of the memory will be retained for 10 minutes. If it takes longer for the battery to be replaced, the contents of the memory will be lost.

Uploading the test results to a PC

The saved results can be uploaded to a PC, where they can be saved as a text file.

- Connect the PSS SB TESTER to a USB port on the PC.
- Start the “PSS SB TESTER” software (see Chapter 6).
- Click the “Upload” button.
- The “Save as” window is opened. Enter the directory and the name of the file in which the test results are to be saved.
- The data is uploaded and saved. When the upload is complete, close the “Upload of the results” window.

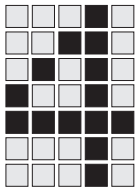
The file containing the results is displayed in a standard text editor.

Deleting the test results

Before each series of tests, the memory containing the test results should be cleared to avoid mixing up new results with the results from previous tests. Then it will no longer be possible to upload results to the PC.

- Press F3 in the “Start” window.
- The “Memory” window opens. Use the arrow keys to move the cursor to the symbol for “Delete”  and press VAL.
- The “Delete” window opens. Press VAL.

The test results are deleted. A message confirms that the results have been deleted. The “Start” window is then displayed again.



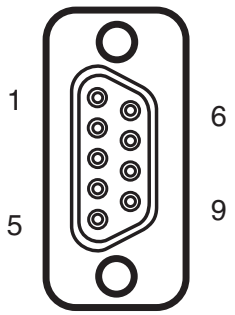
Notes

Tests/Measurements

The PSS SB TESTER can be used to perform various tests and measurements on SafetyBUS p:

- Connection test
- Screening test
- Length measurement
- Signal test
- Real-time measurements

These tests and measurements are described in this chapter.
To be able to carry out the measurements, the PSS SB TESTER will need to be added to SafetyBUS p. The PSS SB TESTER therefore has a SafetyBUS p interface. The 9-pin connector on the supplied cable is attached to this interface. The adapter on the other end of the cable is attached between a SafetyBUS p device and the SafetyBUS p cable. The point at which the PSS SB TESTER must be added depends on the test or measurement that is to be performed.



Female 9-pin D-Sub connector

1: n.c.
2: CAN_L
3: CAN_GND
4: n.c.
5: CAN_SHLD
6: n.c.
7: CAN_H
8: n.c.
9: Vcc

n.c. = not connected

Fig. 5-1: SafetyBUS p interface assignment

Tests/Measurements

Connection test

The connection test comprises the following separate tests:

- Measuring the resistance between CAN_H and CAN_L
- Test for short circuit between CAN_H and Vcc
- Test for short circuit between CAN_L and Vcc
- Test for short circuit between CAN_H and CAN_GND
- Test for short circuit between CAN_L and CAN_GND
- Test for short circuit between CAN_H and CAN_SHLD
- Test for short circuit between CAN_L and CAN_SHLD

The connection test corresponds to a resistance measurement.
The tester also detects components between the cables that are not resistors (diodes, capacitors, ...).
Where resistance values are low (0 ... 1000 Ohm), the measuring accuracy of the tester reaches the order of ± 5 %, if no capacitors or diodes are found.

Performing the connection test

- Add the PSS SB TESTER at any point within SafetyBUS p.
- Switch on the PSS SB TESTER.
- Highlight the  symbol in the “Start” window and press VAL.
- The “SafetyBUS p” window opens, in which you can select the test/ measurement. Use the arrow keys to move the cursor to the symbol for “Connection test”  and press VAL.
- The following question is displayed: “SafetyBUS p is switched off?”. Make sure that SafetyBUS p is switched off, i.e. all devices on SafetyBUS p must be switched off and there must be no voltage present on the “Vcc” line.
  Then press VAL.

The PSS SB TESTER then checks whether “Vcc” is without voltage. If this is the case, the test is performed and the following message appears on the display: “Connection test in progress”.
If voltage is present at “Vcc”, the test will not be carried out because the test results could be corrupted or the Tester could be damaged.

NOTICE
While the connection test is in progess, no voltage must be supplied to the “Vcc” pin and SafetyBUS p must not be switched on, otherwise there is the risk of the test results being corrupted or the Tester being damaged.

When the test is complete, the “Results” window is displayed. Each line corresponds to a separate test. A code is entered at the end of each line :

- “x”: Negative test result
- “v”: Positive test result
- “c”: Test was corrupted due to capacitance between the cables. The measured values should not be viewed as accurate.
- “d”: Test was corrupted due to a diode or similar component between the cables. The measured values should not be viewed as accurate.

To look at the result of a single test in more detail you can move the cursor to that test and then press VAL.
You can return to the “Results” window by pressing ESC.

Separate test: Resistance between CAN_H and CAN_L

Abbreviation for this separate test in the “Results” window:
R CAN_H/CAN_L

Measurement of the resistance between CAN_H and CAN_L. You can use this measurement to detect whether the terminating resistors are present and whether they are the correct size (120 Ω each).
In the upper section of the detailed display of results from this separate test, four pieces of information are displayed: the lower limit, the upper limit, the measured value and the result.

As the parallel connection of two 120 Ω ferrule resistors should have a resistance value of 60 Ω, a lower limit of 50 Ω and an upper limit of 85 Ω is pre-assigned. If the value measured on the resistor lies between the upper and lower limit, the resistor will be assessed as “OK”.

Example: lower limit value: 50 Ω
upper limit value: 85 Ω
measured value 119.3 Ω
result: not OK

If you scroll down in the detailed display you will be able to see whether the circuit between CAN_H and CAN_L is open, i.e. whether or not there is a terminating resistor.
Three pieces of information are displayed: the limit value, the measured value and the result.

The limit value of 250 000 Ω is pre-assigned. If the value measured on the resistor is greater than or equal to the limit value, the circuit is assessed as open.

Example: limit value 250 000 Ω
measured value 119.3 Ω
result: No open circuit

Separate tests: Short circuits between the bus cable wires

Abbreviations for these separate tests in the “Results” window:

- KS CAN_H/Vcc
- KS CAN_L/Vcc
- KS CAN_H/CAN_GND
- KS CAN_L/CAN_GND
- KS CAN_H/CAN_SHLD
- KS CAN_L/CAN_SHLD

Test for short circuit between the bus cable wires.
The PSS SB TESTER measures the resistance between the wires.
In the detailed display of results from these separate tests, three pieces of information are displayed: the limit value, the measured value and the result.

The limit value of 170 Ω is pre-assigned. If the value measured at the resistor is less than or equal to the limit value, a short circuit is detected.

Example: limit value 170 Ω
measured value 0 Ω
result: short circuit

INFORMATION
You can use the length measurement to establish the location of a short circuit between CAN_H and CAN_L, see the section entitled “Length measurement”.

Tests/Measurements

Screening test

The screening test can be used to check for breaks in the cable screening. You can therefore determine whether the cable screening is attached correctly to each bus connector.
The screening test corresponds to a resistance measurement between CAN_H and CAN_SHLD. The PSS SB TESTER is inserted at one end of SafetyBUS p, while at the other end a plug is inserted, which produces a short circuit between CAN_H and CAN_SHLD. If the value measured at the resistor is greater than the pre-assigned limit value of 200 Ω, an open circuit is detected.

NOTICE
The connection test must be performed before the screening test. This is the only way to be sure that there are no short circuits, which would corrupt the result of the screening test.

Performing the screening test

- Add the PSS SB TESTER and the shorting plug to SafetyBUS p as shown in Fig. 5-2.
- Switch on the PSS SB TESTER.
- Highlight the SB symbol in the “Start” window and press VAL.
- The “SafetyBUS p” window opens, in which you can select the test/ measurement. Use the arrow keys to move the cursor to the symbol for “Screening test” and press VAL.
- The following question is displayed: “SafetyBUS p is switched off?”. Make sure that SafetyBUS p is switched off, i.e. all devices on SafetyBUS p must be switched off and there must be no voltage present on the “Vcc” line.
  Then press VAL.

The PSS SB TESTER then checks whether “Vcc” is without voltage. If this is the case, the test is performed and the following message appears on the display: “Screening test in progress”.

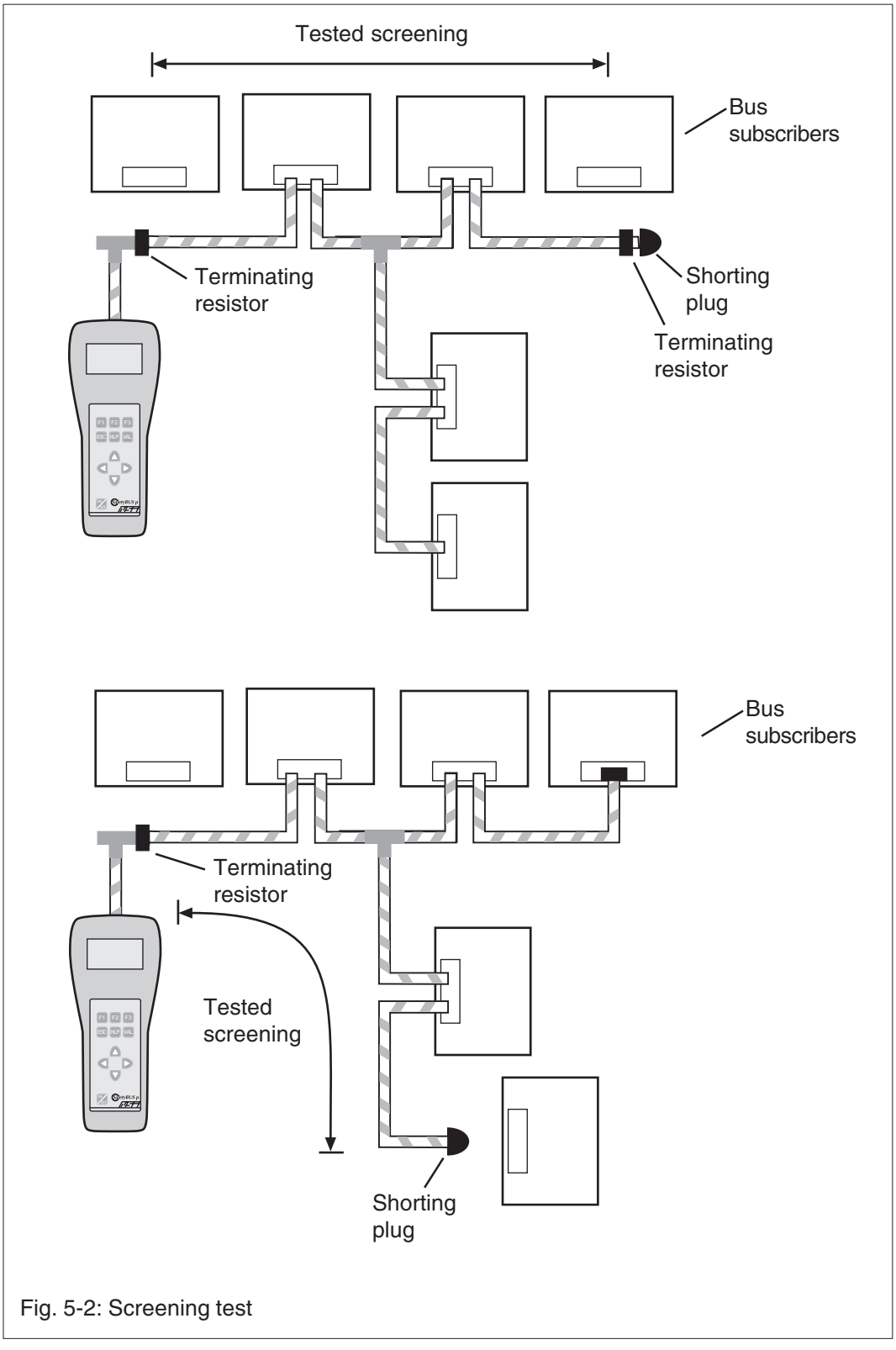


Fig. 5-2: Screening test

If voltage is present at “Vcc”, the test will not be carried out because the test results could be corrupted or the Tester could be damaged.

NOTICE
While the screening test is in progess, no voltage must be supplied to the “Vcc” pin and SafetyBUS p must not be switched on, otherwise there is the risk of the test results being corrupted or the Tester being damaged.

When the test is complete, three pieces of information are displayed: the limit value, the measured value and the result.

The limit value of 200 Ω is pre-assigned. If the value measured at the resistor is greater than or equal to the limit value, an open circuit is detected.

Example: limit value 200 Ω
measured value 10 Ω
result: no open circuit

Length measurement

The length measurement can be used to establish the length of bus lines longer than 25 m.
The Tester measures the runtime of a pulse on the bus line and uses this to calculate the cable runs. The basis for the calculation is the cable's signal runtime.

The ex-works setting for the signal runtime is 4.5 ns/m. This value is valid for the Pilz standard cable for SafetyBUS p (order no. 311 070). If you use a cable with a different signal runtime, you will need to amend the set value. See the "Operation" chapter, section entitled "Commissioning".

INFORMATION
If the following devices are connected to SafetyBUS p:

- PSS(1) SB CPU up to Version 2.1
- PSS SB 3006 IBS-S up to Version 1.8
- PSS SB 3006 DP-S up to Version 1.5
- PSS SB 3006 CN-A up to Version 1.2
- PSS SB 3056 up to Version 1.8
- PSS SB ROUTER up to Version 1.1
- PSS SB DI8O8 up to Version 1.6
- PSS SB DI16 up to Version 1.4

the measured value will deviate from the actual physical cable runs by 1.5 m per device. However, the measured cable runs correspond to the effective electrical cable runs on SafetyBUS p, i.e. the cable runs that are the key factor in selecting the transmission rate.

The bus topology must be taken into account in the measurement:

- **Main line without stub lines**
  The PSS SB TESTER is connected to one end of the bus line. The terminating resistors at both ends of the bus line must be removed.

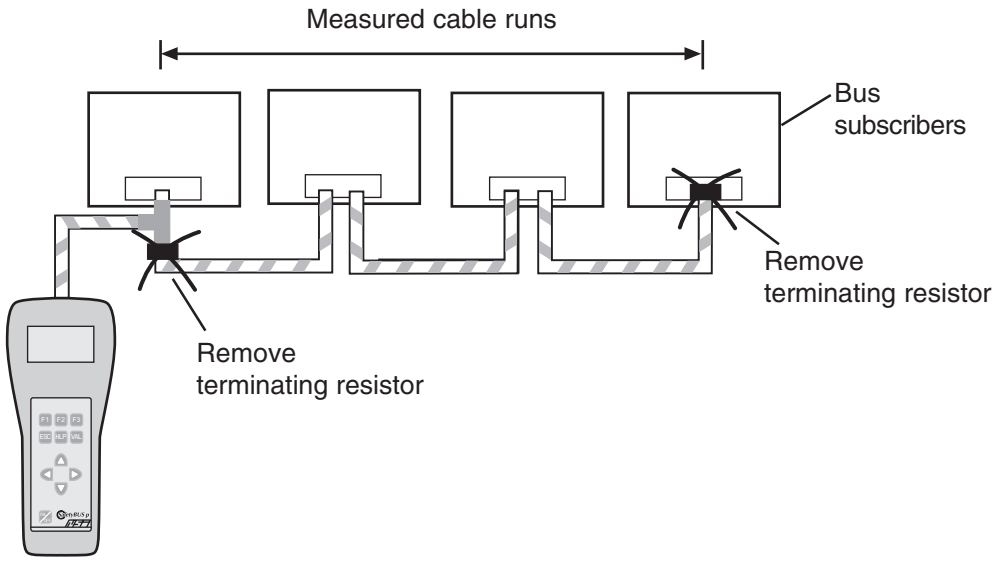


Fig. 5-3: Main line without stub lines

- **Main line with stub lines**
  It is not possible to perform a length measurement on a main line with stub lines. The stub lines have to be removed.

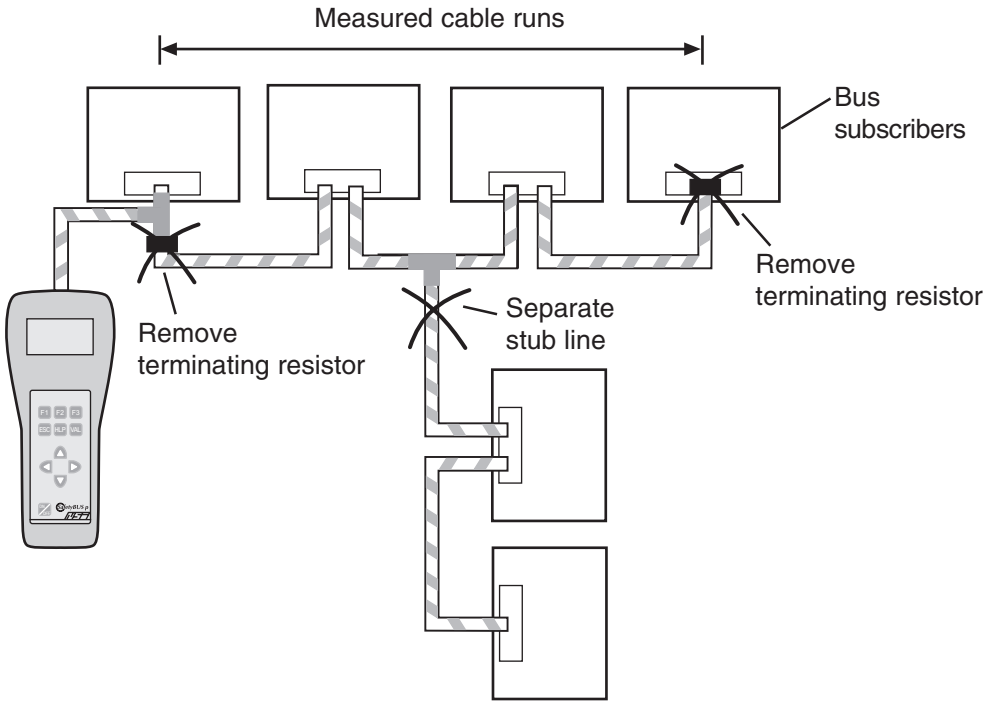


Fig. 5-4: Main line with stub lines

- **Main line with Bridge or Router**

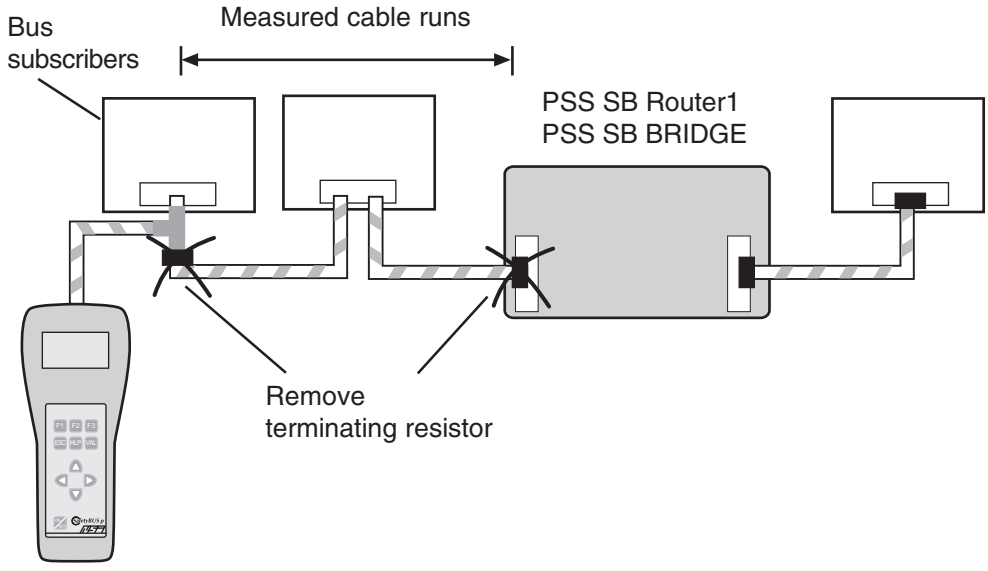


Fig. 5-5: Main line with Bridge or Router

- **Main line with sub branches**

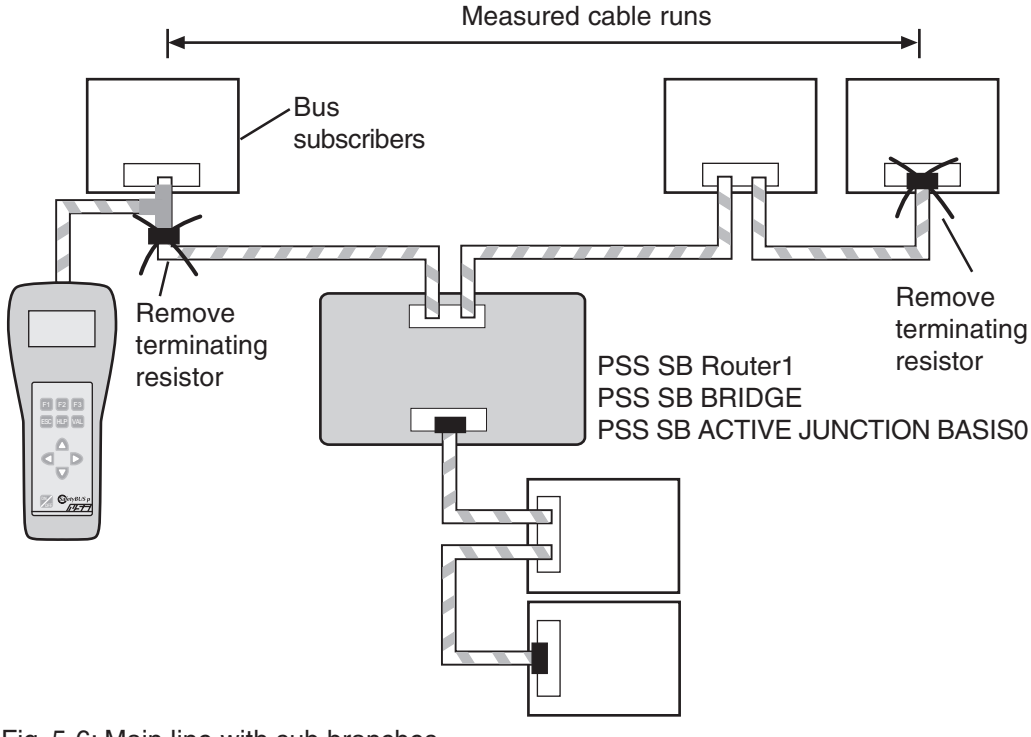


Fig. 5-6: Main line with sub branches

Performing the length measurement

- Add the PSS SB TESTER to SafetyBUS p as shown in Figs. 5-3 to 5-6.
- Switch on the PSS SB TESTER.
- Highlight the SB symbol in the “Start” window and press VAL.
- The “SafetyBUS p” window opens, in which you can select the test/ measurement. Use the arrow keys to move the cursor to the symbol for “Length measurement” and press VAL.
- The following question is displayed: “SafetyBUS p is switched off?”. Make sure that SafetyBUS p is switched off, i.e. all devices on SafetyBUS p must be switched off.
  On the PSS SB BRIDGE, both sides of the Bridge must be without voltage.
- Press VAL.

When the test is complete, a measured curve appears on the display. Fig. 5-7 shows a typical measured curve.

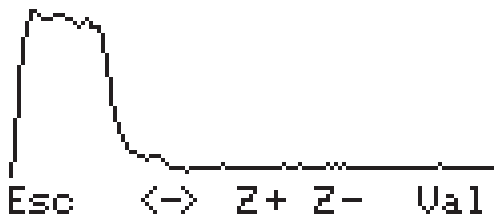


Fig. 5-7: Typical measured curve for length measurement

Function of the keys in this window:

F1: Activate/deactivate cursor (symbol <->)

F2: Enlarge view (symbol Z+)

F3: Reduce view (symbol Z-)

< >: Move view to left or right

VAL: Perform new measurement

ESC: Close window

The key factor in the measured curve is the falling edge.

- Press F1. The cursor is inserted. Using the arrow keys, move the cursor approximately to the start of the falling edge.
- Press F1 to deactivate the cursor. The view can only be enlarged when the cursor is deactivated.
- Now use F2 and F3 to adjust the view so that the falling edge is clearly visible.
- Press F1 to reactivate the cursor. Now move the cursor precisely to the start of the falling edge. The cable runs are then displayed beneath the measured curve.

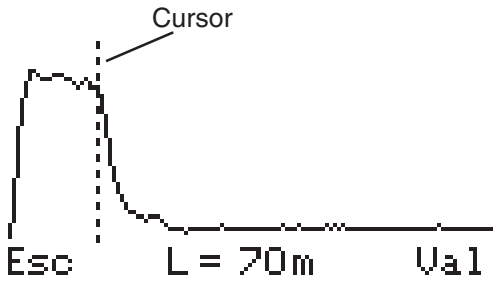


Fig. 5-8: Cursor position to determine the cable runs

If there is a short circuit on SafetyBUS p between CAN_H and CAN_L, the measured curve will deviate from the typical curve: a step is visible within the measured curve. On long bus lines, you will need to enlarge the view to make the step visible.
You can establish the location of the short circuit from this step. To do this, the cursor must be positioned on the rising edge of the step.

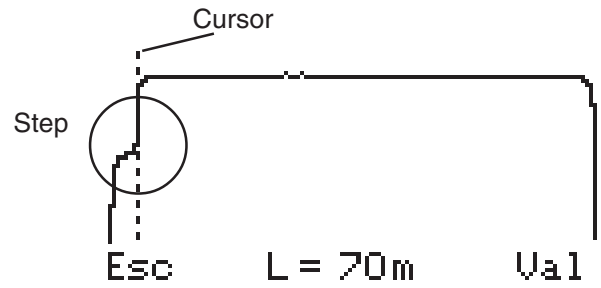


Fig. 5-9: Cursor position to determine the location of a short circuit

The measured curve also shows if a terminating resistor was not removed when the measurement was made: the measured curve is constant over the whole measuring range of 6.7 km.

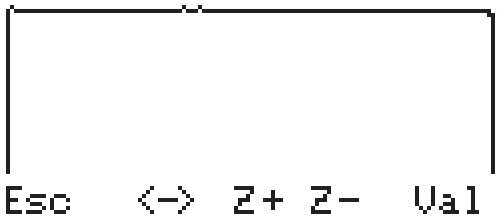


Fig. 5-10: Measured curve when terminating resistor is not removed

Tests/Measurements

Signal test

The signal test comprises the following separate tests:

- Measures the voltage at Vcc
- Tests the transmission rate for all devices
- Tests the electrical signal level on the lines CAN_H and CAN_L for all devices
- Tests the signal edges on the lines CAN_H and CAN_L for all devices

Performing the signal test

Before performing the signal test, the transmission rate must be set in the PSS SB TESTER.

- Switch on the PSS SB TESTER.
- Highlight the  symbol in the “Start” window and press VAL.
- A window opens, in which you can set the transmission rate. Use the arrow keys to move the cursor to the symbol for the required transmission rate and press VAL.

You can now perform the signal test. SafetyBUS p must be in operation.

- Add the PSS SB TESTER at any point within SafetyBUS p.
- Highlight the  symbol in the “Start” window and press VAL.
- The “SafetyBUS p” window opens, in which you can select the test/ measurement. Use the arrow keys to move the cursor to the symbol for “Signal test”  and press VAL.

The display will show the message “Signal test in progress” and the value of the voltage at Vcc. The test may take up to 5 minutes. The test can be aborted by pressing ESC.

When the test is complete, the “Results” window is opened. This displays a list showing all the devices on SafetyBUS p, i.e. all the devices that have been detected.
A code is shown behind each device:

- “v”: the device is error free
- “x”: the test has detected a fault for the device

You can use F2 to switch between the faulty devices.
To look at the result for a device in more detail you can move the cursor to that device and then press VAL.
The “Device xx” window is opened, which displays the results of the separate tests for the device.

A code is entered at the end of some lines :

- “v”: no fault detected
- “x”: fault detected

To look at the result of a single test in more detail you can move the cursor to that test and then press VAL.
You can return to the previous window by pressing ESC.

Separate test: Measuring the voltage at Vcc

The voltage at Vcc is measured once at the start of the signal test. This value is displayed while the signal test is running.

Separate test: Testing the transmission rate

Abbreviation for this separate test in the “Device xx” window:
Transmission rate

Each device on SafetyBUS p is tested to ensure it has the correct transmission rate.
In the detailed display of the result from this separate test, four pieces of information are displayed: the lower limit, the upper limit, the measured value and the result.

The limit values are pre-assigned for each transmission rate that can be set on SafetyBUS p.

Transmission rate in kBit/s	Lower limit in kBit/s	Upper limit in kBit/s
20	19.80	20.20
50	49.50	50.50
125	123.75	126.25
250	247.50	252.50
500	495.00	505.00

If the value measured for the transmission rate lies between the upper and lower limit, the transmission rate is assessed as good.

Example: lower limit: 247.5 KBit/s
upper limit: 252.5 KBit/s
measured value: 250,000 KBit/s
result: OK

Separate tests: Testing the electrical signal level

Abbreviations for these separate tests in the “Device xx” window:

- Rec. Level CAN_H
- Dom. Level CAN_H
- Rec. Level CAN_L
- Dom. Level CAN_L

Each device on SafetyBUS p is tested to ensure the signals it is sending have the correct level. The recessive and dominant level of CAN_H and CAN_L are tested.

In the detailed display of the result from these separate tests, four pieces of information are displayed: the lower limit, the upper limit, the measured value and the result.
The limit values for the recessive and dominant level are pre-assigned:

Level	Lower limit in VDC	Upper limit in VDC
Recessive level CAN_H	2.0	3.0
Dominant level CAN_H	2.8	4.5
Recessive level CAN_L	2.0	3.0
Dominant level CAN_L	0.5	2.3

If the value measured for the level lies between the upper and lower limit, the level is assessed as “OK”.
If the level is incorrect, an error message is issued.

Example for “Dom. Level CAN_H”:
lower limit: 2.8 V
upper limit: 4.5 V
measured value: 3.5 V
test result: OK

Separate tests: Testing the signal edges

Abbreviations for these separate tests in the “Device xx” window:

- Rising edge CAN_H
- Falling edge CAN_H
- Rising edge CAN_L
- Falling edge CAN_L

Each device on SafetyBUS p is tested to ensure the signals it is sending have the correct edges. The rise and fall time of the signals on CAN_H and CAN_L are measured.

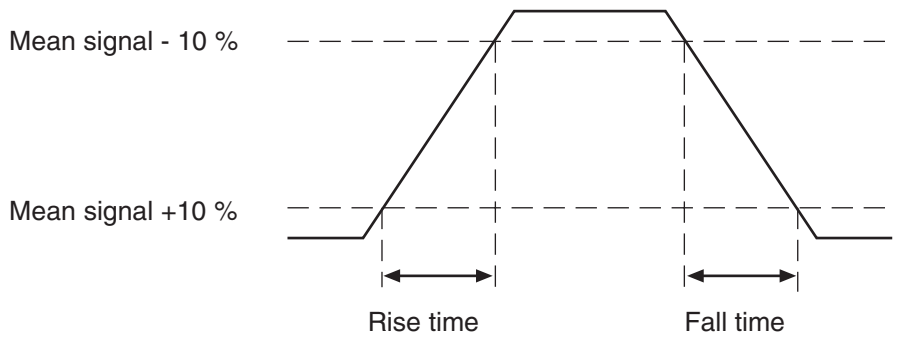


Fig. 5-11: Rise/fall time

The measured time is shown in the detailed display of the result from these separate tests.

Example for “Rising edge CAN_H”:
measured value: 86 ns

Real-time mode

Real-time mode comprises the following measurements:

- Bus load
- Error rate
- Failure rate
- Number of errors

Performing the real-time measurement

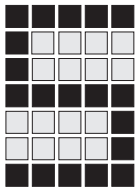
Before performing the real-time measurement, the transmission rate must be set in the PSS SB TESTER.

- Switch on the PSS SB TESTER.
- Highlight the  symbol in the “Start” window and press VAL.
- A window opens, in which you can set the transmission rate. Use the arrow keys to move the cursor to the symbol for the required transmission rate and press VAL.

You can now perform the real-time measurement. SafetyBUS p must be in operation.

- Add the PSS SB TESTER at any point within SafetyBUS p.
- Highlight the  symbol in the “Start” window and press VAL.
- The “SafetyBUS p” window opens, in which you can select the test/ measurement. Use the arrow keys to move the cursor to the symbol for “Real-time mode”  and press VAL.

The “Real-time mode” window appears and the results of the various measurements are displayed.
The test can be aborted by pressing ESC.
Press F1 to reset the number of errors.



Notes

Software

To transfer the test results from the PSS SB TESTER to a PC you will need to install the Upload-Software.

System requirements

- Operating system: Windows 98, ME, 2000 or XP
- Hard drive: Approx. 1 MB of available disk space
- USB port

Installation

- Insert the CD into the CD drive.
- Go to the “Upload-Software” directory and call up the file “setup.exe”.
- Follow the on-screen instructions.

Starting the software

Open the directory in which you installed the Upload-Software and call up the file “Results_MT.exe”.

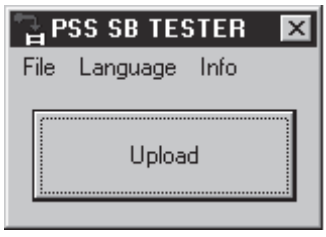
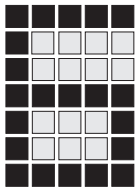


Fig. 6-1: Upload-Software

Chapter 4 describes how to upload the test results, in the section entitled “Uploading the test results to a PC”.



Notes

Fault Diagnostics

If you detect faults on SafetyBUS p, the following tables may help you to find the source of the fault and to rectify it.

Connection test

Problem	Cause	Correcting the problem
Resistance between CAN_H and CAN_L < 50 Ω	A terminating resistor has an invalid value or there are too many terminating resistors present	Check the terminating resistors, both terminating resistors must have a value of 120 Ω
Resistance between CAN_H and CAN_L > 85 Ω	A terminating resistor is missing or has an invalid value	Check the terminating resistors, both terminating resistors must have a value of 120 Ω
Short circuit detected	Short circuit	Check the wiring

Length measurement

Problem	Cause	Correcting the problem
Error message “Measurement not OK” is displayed	Length of bus line < 25 m	Cable runs < 25 m cannot be measured

Fault Diagnostics

Signal test

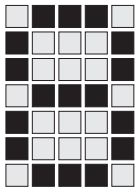
Problem	**Cause**	**Correcting** the problem
Device's signal level lies outside the measurable range	Connection is faulty or device is defective	Check the connection. If nothing helps, change the device
Error message "Problem CAN_L" is displayed	Short circuit between CAN_L and earth	Check line from CAN_L
Error message "Measurement not OK" is displayed	Connection between PSS SB TESTER and SafetyBUS p is interrupted or SafetyBUS p is inactive	Check whether SafetyBUS p is active (SafetyBUS p status LED on the PSS and devices must be lit), check the connection
Device's transmission rate is incorrect	Device is defective	Change the device
Error message "Network config"	The transmission rate set on the PSS SB TESTER may not match the actual transmission rate on SafetyBUS p	Check the transmission rate setting

Real-time mode

Problem	**Cause**	**Correcting the problem**
Failure rate (fr/s) > 0	The transmission rate set on the PSS SB TESTER may not match the actual transmission rate on SafetyBUS p	Check the transmission rate setting

Technical Details

Electrical data	
Supply voltage	Battery: Ni-Cd 4.8 VDC, 2100 mAh Charger: 110/230 VAC, 50 Hz
Display	
Display type	Single-colour graphic LC display
Resolution	128 x 64 pixels
Contrast adjustment	Yes
Back lighting	Yes
Operator elements	
Keyboard type	Short-stroke keys with positive feedback
No. of keys	3 function keys, 3 special keys (ESC, HLP, VAL), 4 cursor keys
Interfaces	
Interfaces	SafetyBUS p, USB
Environmental data	
Protection type	IP30 with battery inserted
Ambient temperature	0 ... 50 °C
Storage temperature	-20 ... +70 °C
Condensation	Not permitted
EMC	EN 61326-1, EN 61000-4-2/-3, EN 55022 A
Mechanical data	
Housing material	ABS
Weight	510 g
Dimensions (H x W x D)	232 x 97 x 52 mm



Notes

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