SIEMENS

BT 200

Physical Bus Test Device
for PROFIBUS-DP

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for PROFIBUS-DP

Table of Contents

1 Description

Purpose of the BT 200

The BT 200 offers diagnostics for PROFIBUS-DP systems without having to use additional measuring aids (e.g., PC or oscilloscope).
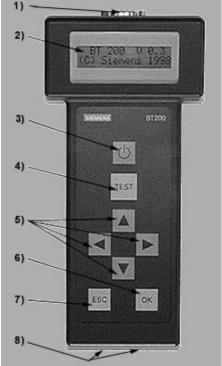
Operator control elements and display

Fig. 1   BT 200 operator control elements and display

1) PROFIBUS-DP connection (9-pin sub D)
2) LC display (2 x 16 characters)
3) ON/OFF button
4) TEST key (start test)
5) CURSOR keys
6) OK key (various functions)
7) ESCAPE key (terminate)
8) Charging contacts

2 Commissioning

Before **initial** commissioning, check your delivery, and charge the battery.

Scope of delivery

The delivery includes:
- 1 BT 200
- 1 battery
- 1 test plug connector (wiring test)
- 1 test cable, length: 2 m
- 1 user's guide

Charging the battery

- Open the battery compartment (see chapter on changing the battery), and check to detemine whether the battery is installed. Install the battery if necessary.
- Charge battery of the BT 200 via charging shell (approx. 4 hours).

⚠ **Attention!**
The battery is always delivered uncharged. The charging shell is not included and must be ordered separately.

- Remove the BT 200 from the charging shell. The device is ready for operation.

3 Normal Mode

The BT 200 is turned on with the **ON/OFF**
button.
Keep the **ON/OFF** button pressed until you
see a reaction on the display.

Standby display

The following display appears for approx. 3
seconds after the device is turned on.

```
 BT 200      V X.XX
(C) Siemens    1999
```

Battery display

The battery capacity display is then shown for
approx. 3 seconds.

```
Battery
■■■■■■■■■■
```

Operational display

After the battery display disappears, the BT
200 assumes normal mode and displays the
start screen for the wiring test.

```
Start Test
          ← TEST
```

Only the wiring test can be performed in nor-
mal mode.

Energy saver mode

If no keys are pressed for approx. 3 minutes
and no measurements are being performed,
the BT 200 goes off automatically.

3.1 Wiring Test

Principle of measuring

The wiring test for a bus segment is performed between the BT 200 and the test plug connector. During the initialization phase, a test can be performed from connector to connector. See figure 2. The test connector is always installed on the one end of the bus segment.
Short circuits can also be determined outside the test path. The bus segment may only be equipped with a terminating resistor at the beginning and at the end.
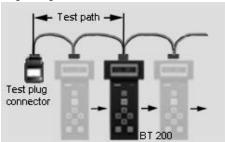

Fig. 2   Step-by-step measuring principle

Performing the test

No stations may be connected to the bus line. The test is started by pressing the **TEST** key. One of the following two messages is displayed if the test was concluded successfully.
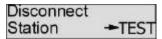
```
Cabeling  o.k.
( 1 R )        → OK
```

For one terminating resistor (as long as installation has not been completed, only one terminal resistor is present)

```
Cabeling  o.k.
( 2 R )        → OK
```

After installation has been concluded, two resistors must be inserted.

The test is concluded by pressing the **OK** key, and a new wiring test can be started.
The wiring test can also be concluded or terminated at any time by pressing the **ESC** key.

3.2 Error Messages of the Wiring Test

Station test

```
Disconnect
Station      ←TEST
```

Check to determine whether all plug connectors have been disconnected from the stations.
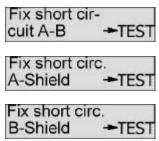
Wire mix-up

```
Change
A-B          ←TEST
```

Exchange the cores in the corresponding plug connector.

⚠ The wiring test must be performed each time a new PROFIBUS plug connector is connected. Otherwise an even number of wire mix-ups will not be recognized.

Short circuit

```
Fix short cir-
cuit A-B     ←TEST
```

```
Fix short circ.
A-Shield     ←TEST
```

```
Fix short circ.
B-Shield     ←TEST
```

Locate and correct the short circuit.
A frequent cause (e.g., of shield short circuits) is the incorrect application of shield braiding in the plug connectors.

Line or shield break

Fix all wire
━TEST

If several cores or at least one core and the shield are broken or not connected, the BT 200 cannot identify the interruption unambiguously.

Fix broken wire
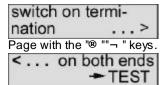A   ━TEST

Fix broken wire
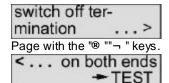B   ━TEST

Fix broken wire
shield   ━TEST

To obtain a correct measuring result for shield break, the shield may not be connected with ground.

With all four messages, first check the plug connectors in question. If these are okay, replace the cable.

None or more than two terminating resistors

switch on termi-
nation   ... >

Page with the "® ""¬ " keys.

< ... on both ends
━ TEST

Place a terminating resistor at the beginning and end of the bus segment.

switch off ter-
mination   ... >

Page with the "® ""¬ " keys.

< ... on both ends
━ TEST

Remove or deactivate all terminating resistors except the two at the beginning and end of the bus segment.

4 Specialist Mode

You can switch from normal mode to specialist mode by pressing **ESC** and **OK** at the same time.
The following functions are available in specialist mode.

- Wiring test. See normal mode.
    - Station test
    - Wire mix-up
    - Short circuit
    - Line or shield break
    - None or more than two
- Station test (RS 485 test)
- Branch test
- Distance measurement
- Reflection test
- Service menu

4.1 Operator Control

The BT 200 is menu-controlled via the input keys of the sealed keyboard (figure 1).

Cursor

The current cursor position in the display is shown as a flashing arrow and indicates the function which is being performed.

Menu items

Menu items are selected with the cursor and activated with the **OK key**. The **ESC key** can be used to terminate a running function or to jump back to the higher-level menu item.
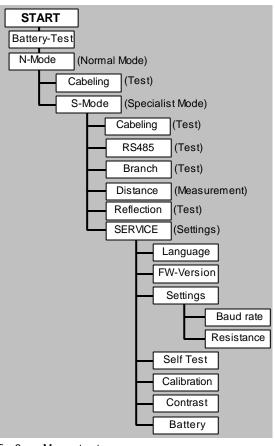
Menu structure

Fig. 3   Menu structure

4.2 Station (RS 485) Test

This test is used to test the RS 485 interface of a **single** slave.

Performing the test

Disconnect bus connector from the slave. Establish point-to-point connection between slave and BT 200. See figure 4.

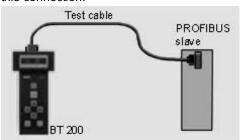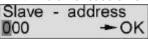⚠ Only the included test cable may be used for this connection.

Fig. 4   Point-to-point connection

Turn on the slave since the test must be performed with an active slave.

Start station test.

Set address of the slave to be tested as shown below.

"←" "→" Change cursor position.

"↑" "↓" Increment/decrement number.

```
Slave - address
000            ➤ OK
```

Accept the set three-position number with **OK**, and start test.

Test results

Possible test results are listed below.
- RS 485 okay (slave okay)
- RS 485 defective. (No continuous signal receipt; repeat test.)
- No response. (Nothing received; wrong slave address may have been set.)
- 5V: (corresponding measured value)
- RTS signal (YES or NO)

4.3 Branch Test

This can be used to check the availability of **all** slaves on PROFIBUS or to address an **individual** slave.
The branch test can also be performed beyond repeaters/LWL.

Performing the test

Disconnect all masters from the bus (e.g., PG, OP and CP). See figure 5.
Connect BT 200 to the bus.
Set the baud rate configured on the bus on the BT 200.
Set the desired address for individual slave test.
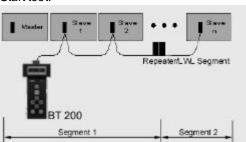Set address to "000" for the total test.
Start test.

Fig. 5   Measuring principle of the branch test

Test results

During the total branch test, each available slave is indicated in a list of available stations (i.e., LIFE LIST).

- LIFE LIST

  $$\begin{array}{ccccc} 1, & 4, & 5, & 9, 10, \\ 11, & 12 & & \rightarrow OK \end{array}$$

For an individual test
- No response. (e.g., No station with this bus address on the bus.)
- Faulty station. (e.g., a slave number has been assigned twice.)

4.4 Distance

The distance can be measured to determine the length of the PROFIBUS cable.

Performing the test

Disconnect all bus stations from the bus. Connect test plug connector to one end of the line and the BT 200 to the other end. (Remove termination for BT 200.)
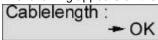
Start distance measurement.

After the start, the BT 200 requests three values which must be entered on the keyboard.

- Loop resistance (default = 110 Ω/km) The default value can be changed via menu item Service.
- Number of plug connectors with longitudinal inductivity (12 Mbaud connector)
- Resistance value per connector (default = 0.32 Ω)

After entry of the last value and confirmation with **OK**, measurement is performed.

Measurement results

The following appears on the display.

Cablelength :
                    ← OK

The following error messages can occur during measurement.

- No resistor inserted.
- Display "0 m" (no plausible length determined)
- More than 1 resistor inserted.

Possible causes of errors:

- Distance < 15 m
- Stub lines, located on the measuring path

Correct the error, and repeat the measurement.

4.5 Reflection Test

The reflection test can be used to determine faults (e.g., short circuits and interruptions) or to confirm the distance measurement.

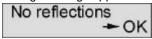Reflexions can occur in the following situations:
- Stub lines exist.
- Too many terminating resistors have been inserted, or none have been inserted.
- Change to a wrong type of cable occurs within the measuring path.
- Cable installation is not correct (e.g., luster terminal connection and so on).
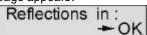
Performing the test

Disconnect master from the bus, and make sure that no bus communication occurs. Connect BT 200 to one end of the line. Start reflection measurement.

Test results

If no reflection (i.e., fault) is detected, the following message appears.

```
No reflections
            ← OK
```

If a reflection is detected, the following message appears.

```
Reflections in :
            ← OK
```

The number in the display specifies the distance in meters from the measuring point to the faulty point.
If the distance of the reflection measurement corresponds to a previous distance measurement, this distance measurement is confirmed. The wiring of the bus segment which was measured is correct.

4.6 Service

Settings

The following settings can be changed in the Service menu.

- Language (German/English)
- Loop resistance (50 to 200 Ω/km)
- Baud rate (9600 baud to 12 Mbaud)
- Contrast ($\uparrow\downarrow$)

Default values

If you want to reset all values to their status on delivery, keep **both cursor** keys pressed for approx. three seconds after turning on the device.

Displays

The Service menu gives you the following information.

- Firmware version
- Battery capacity

Hardware test

This tests the internal hardware.

Calibration

Calibration is not necessary when the standard type-A PROFIBUS cable is used.
The accuracy of distance and reflection measurement is achieved by calibration with 2 test cables of different known lengths.
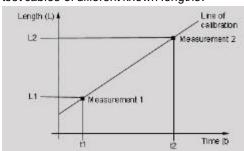

Fig. 6   Principle of calibration

5 Maintenance and Trouble-
   Shooting

5.1 Charging Status of the Battery

The charging status of the battery is indicated
for approximately 3 seconds during startup.
This display then disappears.
The charging status can also be indicated via
the service menu during operation.
If the battery goes dead during operation, the
charging status begins to flash.

5.2 Changing the Battery

⚠ **Attention!** When changing the battery (2),
make absolutely sure that the battery con-
nector (1) with the red cable (light-colored ca-
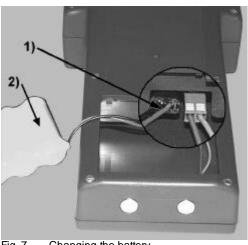ble) is inserted to the right.

Fig. 7   Changing the battery

5.3 Self-Tests

The BT 200 performs self-tests automatically and on request (hardware test).

- Internal RS 485 driver test
  The test is performed each time the station and branch test is called.

- RAM test
  A cyclic RAM test is performed.

- Flash EPROM test
  A cyclic EPROM test is performed.

- RS 485 driver test

The individual tests (e.g., RAM test, flash EPROM test and display key test) can also be selected from specialist mode via the HW test service menu.

If an error is detected during the self-test, you must proceed as shown in the **error correction table**.

5.4 Error Correction Table

Fault during startup

Display	Fault	Reason	Effect	Correction
None	No display after switch-on	Battery dead	Hardware does not start up.	Charge battery or install new battery.
If possible: "internal error" message	After switch-on, "internal error" message appears.	RAM/ EPROM error diplay/ keyboard defective	No measuring possible	Replace BT 200.

Fault during operation

Display	Fault	Reason	Effect	Correction
Battery display flashes before.	Device goes off.	Battery is dead.	No measuring possible	Charge battery/ install new one.
None	Device goes off.	Time with no user activity was exceeded.	None	Press ON button.
Internal driver defect	Internal driver is defective.	HW defect	No station/branch test possible	Replace BT 200.

6 Accessories and Replacement Parts

The following components can be ordered under their MLFB number.

Designation/Picture	MLFB Number
Test connector	6EP8106-0AC20
Charging shell w. power pack for: 230 V AC 110 V AC	6GT2003-1AA00 6EP8106-0HB01
Battery with connection cable	6EP8106-HA01
Test cable 9-pin sub D on 9-pin sub D (1 to 1)	6EP8106-OHC01

7 Technical Data

General	
Dimensions	210 * 100 * 55 mm²
Weight	400 g
Battery capacity	≥ 720 mAh
Life	≥ 8 h
Voltage supply	NiCd, 4.8 V battery
Display	LCD, 2 * 16 characters
Baud rate	9600 Bd to 12 MBd
Protection class	IP 30
Measuring accuracy	Length measurement (+/-3m)
Environmental Requirements	
Operating temperature	+ 5°C to +45°C
Storage temperature	-20°C to +60°C
Relative humidity	Maximal 95% / 24°C Middle 75% / 17°C (without condensation)
Air pressure operation storage	795 to 1080 hPa 660 to 1080 hPa
EMC guidelines	
CE labelling	DIN EN 61326-1: 1998 EN 50 081-1 EN 50 082-2
Physical Requirements	
Vibration during operation	IEC 1131-2
Shock stress during operation	IEC 1131-2
Free fall	IEC 1131-2/68-2-32

Abbreviations

Bd	Baud (1 Bd = 1 character (bit/second)
BT	Physical bus test device
CP	Communications processor
EMC	Electromagnetic compatibility
MBd	1 MBd = 10^6 baud
NiCd	Nickel cadmium
NN	Miles above sea level
OP	Operator panel
PG	Programmer
RTS	Request to send

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