EMCtools

Fiber optic RS-232 transceiver
Microbox

EMCtools
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1. Introduction

Functional tests e.g. in test-labs often require insulated RS-232 bus installations to control and monitor the device under test. For this purpose special Fiber Optic RS-232 transceivers are available. They allow data transmission of RS-232 signals via fiber optic cables and can be used during susceptibility tests at high field strength levels.
Our EMCtools Microbox has been designed for emission and susceptibility tests. Using multilayer technology and sophisticated circuit design full RS-232 compatibility and the ability to perform tests at electromagnetic field levels of 270 V/m and above could be achieved. The handy plastic housing allows tests with limited test space and a minimum of impact on the field.
The EMCtools Microbox uses standard multimode fiber optic cables and allows direct connection to the electric bus via SUB-D female connectors.

2. *EMCtools* Microbox RS-232

The Microbox is built into a handy, rugged plastic housing (65x66x27mm).
Power is supplied externally e.g. by using an external battery or power-supply.

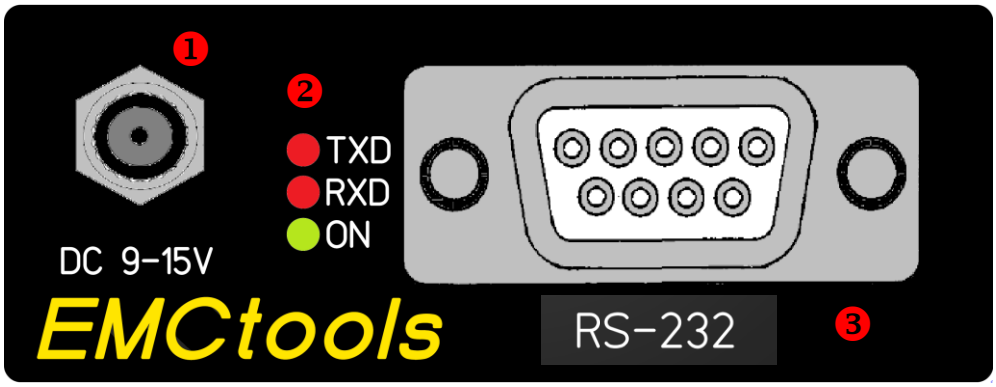


Fig. 1: Front Panel Microbox RS-232

No. in Fig. 1:	Description
1	Power supply (DC Power Jack 5.5/2.1mm)
2	Control-LEDs: Green: Power on/off status and supply voltage LED off when supply voltage less than 7V Red: RXD and TXD (receive and transmit data)
3	9-pin Sub-D connector for bus-connection

An illuminated green LED (Fig.1 – No.2) indicates the operating status of the Microbox.

A first red LED (Fig.1 – No.2) indicates the status „RXD“ (= receive-data).
It indicates that fiber optic data are received.

A second red LEDs (Fig.1 – No.2) indicates the status of „TXD“ (= transmit-data).
It indicates the transmission of fiber optic data.

The 9-pin Sub-D connector (Fig.1 – No.3) is used to connect the Microbox to the electrical RS-232-bus. See chapter 4 for pinning details.

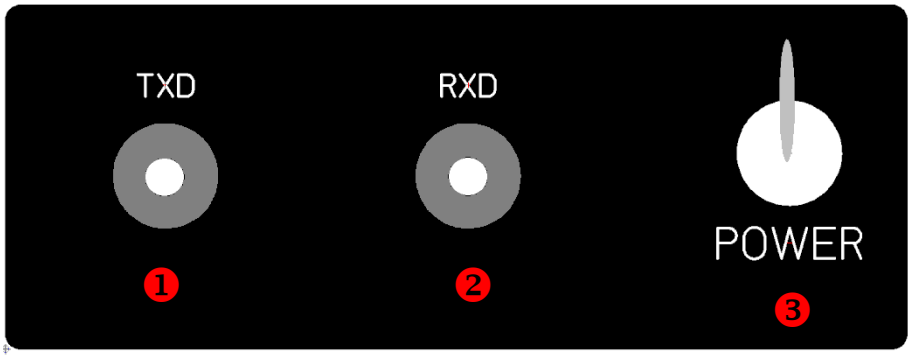


Fig.2: Rear panel

No. in Fig.2:	Description
1	Fiber optic connector TXD (Transmitter)
2	Fiber optic connector RXD (Receiver)
3	Power on/off toggle switch

On the rear panel you can find the F-SMA connectors „TXD“ and „RXD“ for the fiber optic data transmission (Fig.2 – No.1 and 2) . Here the fiber optic cables are connected.
The „TXD“ (= transmit-data) labeled connector is the transmitter and the „RXD“ (= receive-data) labeled connector is the receiver of the fiber optic data transmission.

The Microbox is put into and is taken out of operation by using the toggle switch (Fig.2 – No.3).

3. Setup of *EMCtools* Microbox RS-232

The setup for operating a fiber optic data transmission for RS-232 using the Microbox is easy:

1. Connect two transceivers with a duplex fiber optic cable:
   - connect Microbox No.1 „TXD“ with Microbox No.2 „RXD“
   - connect Microbox No.1 „RXD“ with Microbox No.2 „TXD“
2. Connect the electrical RS-232-bus cables with attached cable ferrites to the Sub-D connectors of both Microboxes (see chapter 4 for Sub-D pinning)
3. Set the Microbox RS-232 bus options (see chapter 5)
4. Plug in the power cables with attached cable ferrites acc. Photo 1 and connect power
5. Switch on both Microboxes

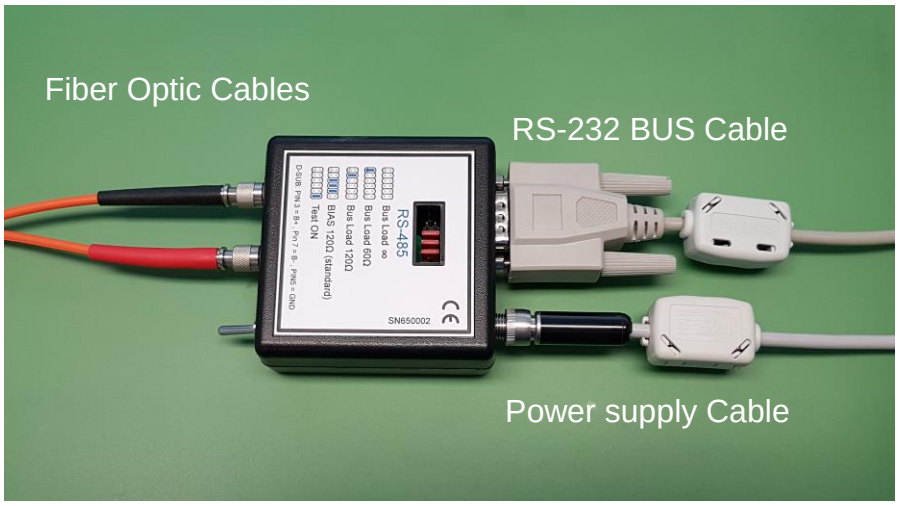
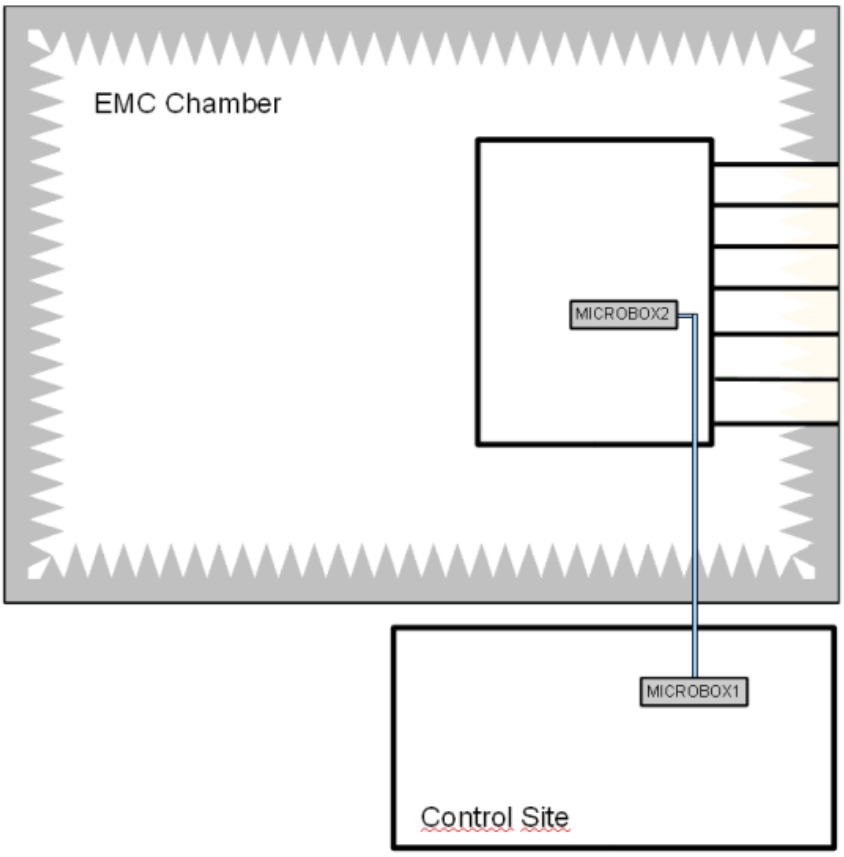


Photo 1: Microbox Setup



One *EMCtools* Microbox RS-232 is put into the test environment.

It is connected to a second Microbox RS-232 at the control site using a duplex fiber optic cable

Fig.3: Microbox Setup in and outside EMC chamber

RS-232 defines signals connecting between a *DTE* (*Data Terminal Equipment*) such as a personal computer or a computer terminal, and a *DCE* (*Data Communication Equipment*), such as a modem or a RS-232 controllable device (e.g. Digital Volt Meter etc.):

- DTE devices like personal computers use a male D-SUB connector
- DCE devices like Modems use a female D-SUB connector

The ***EMCtools*** Microbox RS-232 Set replaces a standard RS-232 9-pin D-SUB cable with a female connector on one side and a male connector on the other side.
It consists of 2 different transceivers Mod.-No.:551 and Mod.-No.:552:

- Mod.-No.:551 uses a male D-SUB connector and represents the DTE
- Mod.-No.:552 uses a female D-SUB connector and represents the DCE

Mod.-No.: 551	**DTE**
Sub-D (male) Pin #	**Description**
1	n.c.
2	RX
3	TX
4	n.c.
5	GND
6	n.c.
7	n.c.
8	n.c.
9	n.c.

Mod.-No.: 552	**DCE**
Sub-D (female) Pin #	**Description**
1	n.c.
2	TX
3	RX
4	n.c.
5	GND
6	n.c.
7	n.c.
8	n.c.
9	n.c.

Please note:

Use 1:1 RS-232 cables. These cables have a male connector on one end of the cable and a female connector on the other end of the cable. All pins are connected to the equivalent pin on the other end of the cable:

Sub-D (male) Pin #		Sub-D (female) Pin #
1	→	1
2	→	2
3	→	3
4	→	4
5	→	5
6	→	6
7	→	7
8	→	8
9	→	9

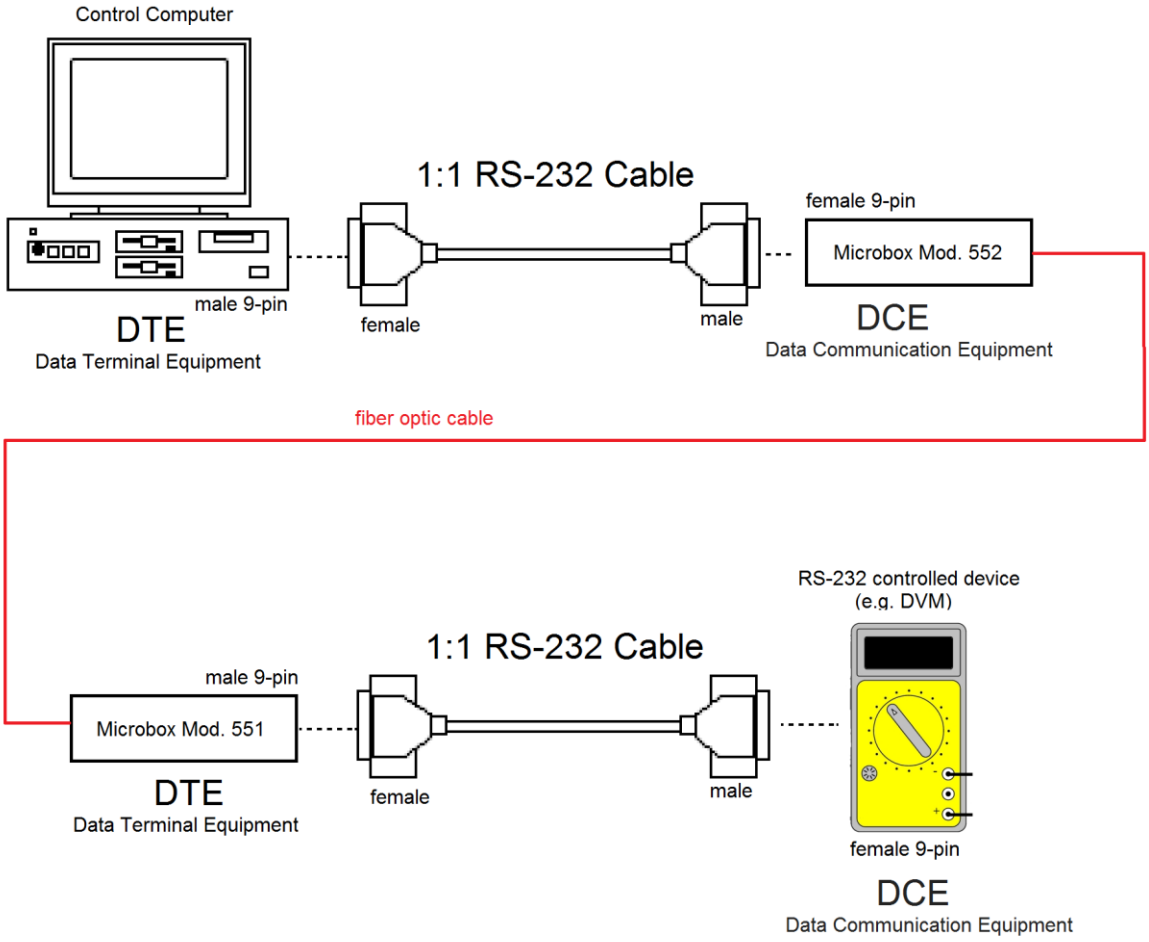


Fig.4: Cable connection for RS-232

5. Setting the Jumper options of the *EMCtools* Microbox RS-232

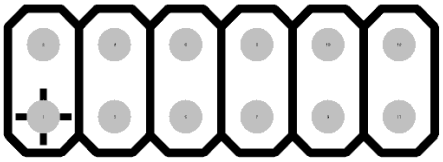
Photo 2: Microbox with Jumpers

Three different capacitive bus loads can be set separately for RX and TX for the RS-232 bus by setting jumpers. These jumpers can easily be accessed through a hole in the Microbox RS-232 housing top. Please not that higher capacitive bus loads reduce noise emission but also reduce max. bus speed.

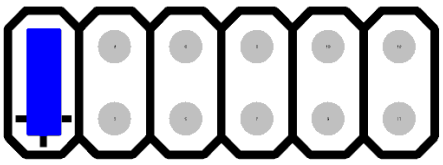
To check the fiber optic connection without a bus signal the „Test“-jumper may be used. The TXD-LED of the Microbox with the jumper set then transmits permanently and the RXD-Signal LED on the other end of the optical cable can be checked. During this test the control-LED RXD of the second Microbox should be permanently on. Remove the „Test“-jumper for proper bus operation.

RS-232 bus physical layer is described in TIA-232-F.

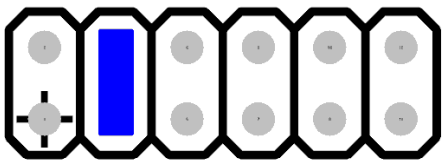
A printed label on the Microbox housing shows jumper setting options.
The “Test”-Jumper may be set at any time independent of the other jumper setting.



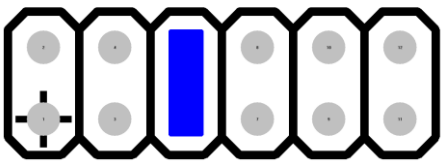
No capacitive bus load



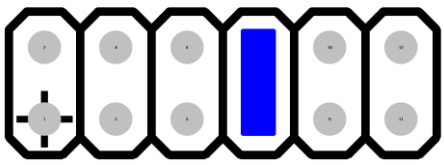
RX capacitive bus load 470pF



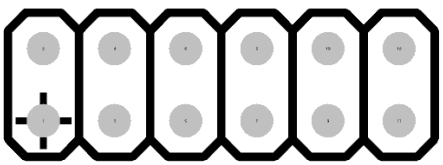
RX capacitive bus load 1nF



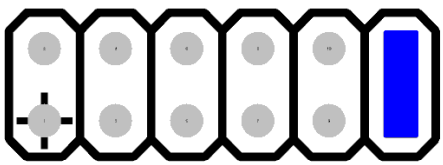
TX capacitive bus load 470pF



TX capacitive bus load 1nF



Test off



Test on

6. ESD Protection:

Microbox RS-485 is protected against electrostatic discharge in lab use.

This built in protection is not sufficient if you intend to perform ESD tests.
Here an additional ESD protection is needed.
Please contact EMCtools for details.

7. Delivered devices of the system and accessories:

Microbox RS-485-Set:

1 pcs EMCtools Microbox RS-232 Mod.-No.:551
1 pcs EMCtools Microbox RS-232 Mod.-No.:552
1 pcs printed manual
2 pcs power supply cable (1m) with cable ferrite (DC-plug: Switchcraft S761K)
2 pcs cable ferrite for the bus-line (Ferrite: Würth Part-No: 74271142)

8. Available accessories:

a) rechargeable Battery Box for EMCtools Microbox (Mod. 350)
- to be used inside the EMC chamber
- to be used for ESD-Tests in combination with *EMCtools* ESD-Protector

b) Plug-In wall supply for EMCtools Microbox (Mod. 165 or Mod.167)
- to be used outside the EMC chamber

9. Technical data *EMCtools* Microbox RS-232:

Microbox RS-232:

Max. Bitrate:	> 128 kBit/s depending on bus load
Power-Supply:	9 – 15V DC (7V min)
	max. 50mA (depending on DC output current)
	DC Power Jack 2.1mm, center pin positive, reverse polarity protected
Fiber optic:	F-SMA, duplex 50/125µm or 62.5/125µm
BUS-connector:	9-pin Sub-D (female)
BUS-termination:	**capacitive busload** RX and TX: 0pF / 470pF / 1000pF
Temperature range:	operating: -40 – 85°C (-40 – 185° F)
	storage: -40 – 85°C (-40 – 185° F)
Housing Size:	66 x 65 x 27 mm (66 x 85 x 27 mm incl. connector jack / switch)
Weight:	85 g

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CE

Declaration of Conformity

Hereby we declare, that our product is compliant with the CE directives and standards listed below.

Product:	***EMCtools* Microbox**
Model:	RS-232 Bus
Directives:	2004/108/EG (EMC)
Standards:	DIN EN 61326-1 (2006) DIN EN 61000-4-3 (2008) DIN EN 61000-4-2 (2009) DIN EN 55022 (2008)
Tested Setup:	Typical setup for fiber optic conversion of bus, locally supplied by battery.

Ostrach, July 27nd 2019

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