Bercut-ETL
Ethernet/Gigabit Ethernet loopback

Operating manual
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Metrotek

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1. General description

Ethernet/Gigabit Ethernet loopback device **Bercut-ETL** is intended for loopback performing at the physical, data link, network and transport layers of the OSI model in IP/Ethernet networks.

Incoming traffic is being retransmitted backward with possibility of source and destination MAC/IP addresses and TCP/UDP port numbers swapping.

To switch between loopback layers **L** button is used. The device allows to perform loopback control via OAM protocol and remote control via TELNET protocol.

2. Supply kit

Table 2.1. Supply kit

Item	**Quantity**
Device **Bercut-ETL**	1
Power supply unit with connecting cable	1
PC connecting cable	1
Changeable nozzle	4

3. Overview

3.1 Appearance

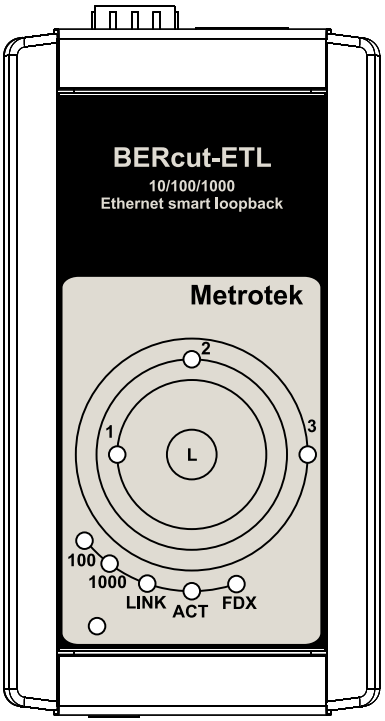

Figure 3.1. Appearance of **Bercut-ETL**

LEDs

LEDs are located on the front panel of **Bercut-ETL**. They show loopback layer, Ethernet links and power supply unit connection state.

Loopback layer indicators

- **1** — layer 1 loopback;

- **2** — layer 2 loopback;
- **3** — layer 3 loopback;
- **1+3** — layer 4 loopback.

For more details see section 4.
Link speed indicators

Table 3.1. Speed LEDs

Speed	**LED**	**LEDs color**
10 Mbit/s	*100* and *1000*	green
100 Mbit/s	*100*	green
1000 Mbit/s	*1000*	green

State LEDs
LINK — link state:

- green — connection at physical layer is established;
- off — no connection.

ACT — data reception/transmission state:

- green — data is being received/transmitted at the moment;
- off — no data is being received or transmitted at the moment.

FDX — Ethernet interface state:

- green — full-duplex connection is established;
- off — half-duplex connection is established.

Power — external power supply (indicator is located in the left bottom corner of front panel):

- green — power supply unit is plugged in;
- red — device malfunction.

L — the button for loopback mode control. To switch between layers 1, 2, 3, 4 or turn loopback off, press this button as many time as needed.

3.2 External connectors

Location of external connectors on the top and bottom panel is shown on the figure 3.2.

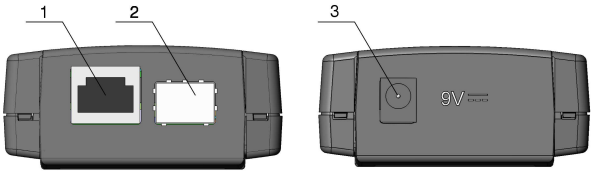

Figure 3.2. External connectors disposition

Tester connectors and equipment to be connected are described in the table 3.2.

Table 3.2. Connectors description

Designation	Description	Connected equipment
port A[1]	RJ-45 connector to connect to the tested network or equipment	Ethernet cable
	SFP-module connector	SFP-module
9 V	External power unit connector	Power supply unit

3.3 Setting-up procedures

1. For device energy supply 9 V power unit is used.
2. The device is ready to work after all LEDs flash once for 1 second and LINK indicator color has changed to green.
3. To perform analysis connect **Bercut-ETL** to the tested network.
4. To turn the device off disconnect the power supply unit.

[1]Port A contains 2 connectors — RJ-45 and SFP. During the test only one connector of the port is used.

3.4 Restore device settings

1. Disconnect the device from the power supply unit.
2. Press and hold the button of a loop's level choice **L**.
3. Connect the device to the power supply unit and wait until the power supply indicator will start blinking. This means the beginning of the firmware backup recovery process.
4. Release the button of a loop's level choice **L**.
5. The recovery process takes a few minutes. After the recovery process, all LEDs will flash and the device will reboot and then start to work in standard mode.

3.5 Reset settings to default

1. Connect the device to the power supply unit.
2. Press and hold the button of a loop's level choice about 20 seconds, until the three LEDs light up for one second. The settings will be reset to the default settings.

4. Loopback

Bercut-ETL is intended for loopback performing. Incoming traffic is being retransmitted backward with possibility of source and destination MAC/IP addresses and TCP/UDP port numbers swapping.

Network testing with the Loopback function can be performed at the four OSI layers, jumbo frames are supported (up to 9600 byte).

- At the **Physical layer (L1)** all the incoming traffic (including error frames) is being retransmitted backward without changing.

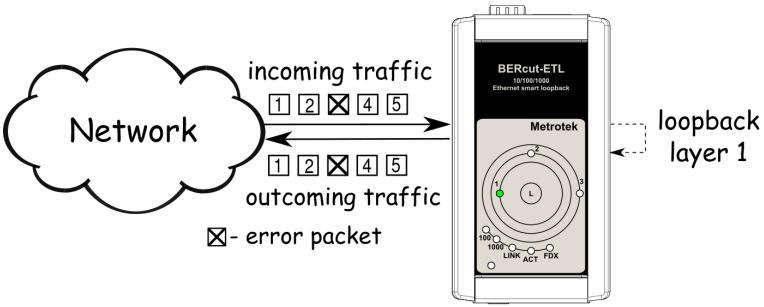

Figure 4.1. Loopback at the physical layer

All the connection schemes use the following notation:

  - MAC Src — source MAC address;
  - MAC Dst — MAC address of **Bercut-ETL**;
  - IP Src — source IP address;
  - IP Dst — destination IP address.
  - TCP/UDP Dst — destination TCP/UDP port number;
  - TCP/UDP Src — source TCP/UDP port number.

- At the **Data link layer (L2)**, the incoming traffic (without error frames) is being retransmitted backward with swapping destination and source MAC addresses.

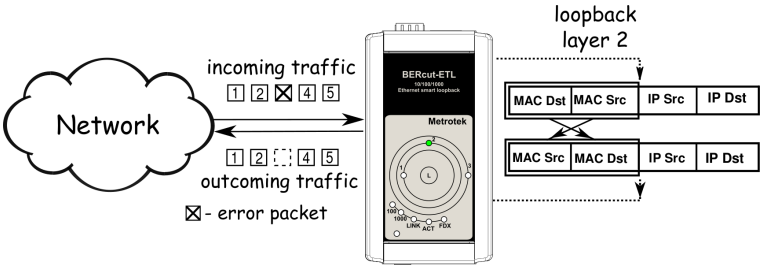

Figure 4.2. Loopback at the data link layer

Note: *if a frames destination MAC address is not equal to the MAC address of* ***Bercut-ETL****, the frame will not be retransmitted.*

Note: *frames with equal destination and source MAC address are not retransmitted at the data link, network and transport layers.*

- At the **Network layer (L3)** the incoming traffic (without error packets) is being retransmitted backward with source and destination IP and MAC addresses swapping.

  Note: *the frame will be retransmitted only if a frames destination MAC address is equal to the MAC address of* ***Bercut-ETL****.*

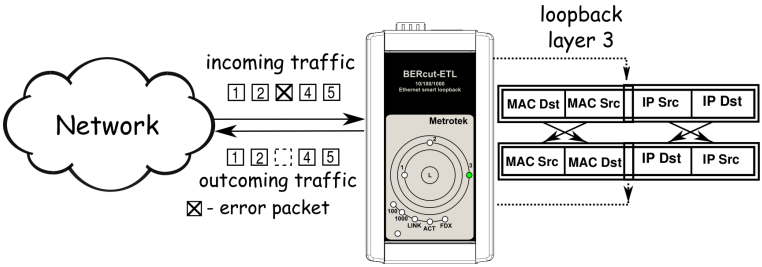

Figure 4.3. Loopback at the network layer

- At the **Transport layer (L4)** the incoming traffic (without error packets) is being retransmitted backward with source and destination IP and MAC addresses swapping and source and destination TCP/UDP addresses swapping.

  Note: *the frame will be retransmitted only if a frames destination MAC address is equal to the MAC address of* ***Bercut-ETL****.*

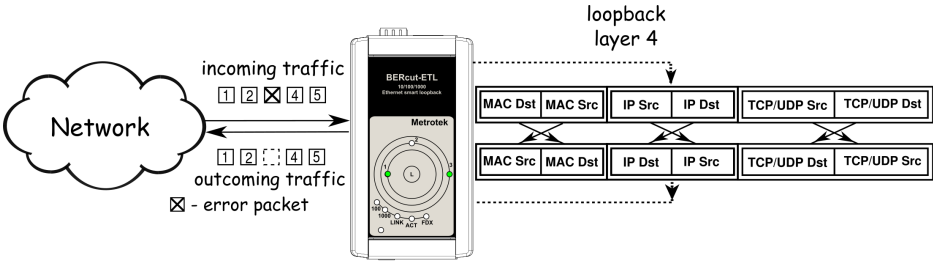

Figure 4.4. Loopback at the transport layer

4.1 Loopback adjustment

Connect **Bercut-ETL** to the Ethernet network and select Loopback layer by pressing **L** button. Additional parameters (IP address, MAC address, etc.) are being adjusted in the remote management mode (see section 5).

5. Remote management

5.1 Remote control via Telnet potocol

Telnet (Telecommunication Network) is a network protocol used for access to the remote network device. This network protocol allows the user of the personal computer to cooperate with the device on the other end of connection. By means of the commands presented in the table 5.1 and 5.2, it is possible to configure device and view current settings.

To manage **Bercut-ETL** over Telnet protocol connect to the device through the Ethernet interface or directly.

Default IP address of the loopback device is 192.168.1.1.

Username — *admin*, default password — *admin*.

Table 5.1. Remote management commands; show mode

Command	Information shown in the console or action performed
show version	software versions
show link	the state of the interface
show ip address	interface IP address
show ip netmask	interface subnet mask
show ip gateway	gateway IP address
show gbe speed	interface speed
show gbe autonegotiation	interface autonegotiation state
show gbe mac	interface MAC address
show oam mode	OAM mode: off/passive
show oam discovery	state of OAM discovery process
show tftp	state of a TFTP server: on/off
show vlan mode	vlan state: on/off
show vlan id	vlan identifier
show vlan priority	vlan priority
reboot	reboot device
configure	switch to configuration mode
exit	finish session
help	list of available commands

Table 5.2. Remote management commands (Telnet); configuration mode

Command	Operation
ip address	set interface IP address
ip netmask	set interface subnet mask
ip gateway	set gateway IP address
gbe mac	set interface MAC address
gbe speed	set interface speed: 10/100/1000/automatic
gbe autonegotiation	set autonegotiation mode: on/off
oam	set OAM mode: off/passive
vlan mode	set vlan mode: on/off
vlan id	set vlan identifier (a number in the 0–4095 range)
vlan priority	set vlan priority (a number in the 0–7 range)
tftp	enable or disable TFTP server: on/off
password	change admin's password
save	save settings; settings will be applied after device reboot
reboot	reboot device
exit	leave configuration mode
help	list of accessible commands

Note: *configuration mode commands become effective after* ***save*** *and* ***reboot*** *commands.*

5.2 OAM

OAM (Operations, Administration, and Maintenance) is a protocol of the link state monitoring. The protocol operates at the Data Link Layer of OSI model. To transmit data between two Ethernet-devices, OAM protocol data units (OAMPDU) are used.

An important feature of the OAM protocol is providing the ability to use Loopback mode for the remote end. Both devices should support the IEEE 802.3ah standard.

Bercut-ETL and remote device should be connected directly.

The traffic (without error frames) is being retransmitted backward without swapping destination and source MAC addresses

Possible OAM states are described below.

- **Passive** — passive mode. In passive mode, **Bercut-ETL** can only response to Ethernet OAM commands from the remote device, but cannot initiate the Loopback mode.
- **Off** — OAM is disabled.

5.3 ET discovery

ET discovery function allows to switch off loopback mode or to change loopback level (L2, L3 or L4) on **Bercut-ETL** using Bercut-ET.

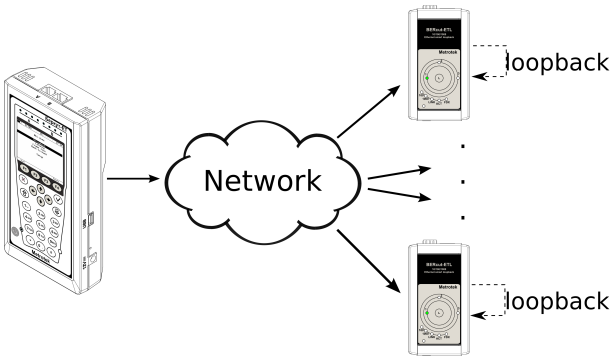

Figure 5.1. Connection diagram

In accordance with connection diagram it is possible to switch loopback mode on for several devices **Bercut-ETL** in series. The devices may be in the same or in the different subnets.

> ***Note:*** *the loopback mode on the* ***Bercut-ETL*** *devices may be switched off or switched on.*

> ***Note:*** *for data transmission UDP protocol is used. Destination port number is 32792. Source port number is 32793.*

5.4 Upgrading software versions

The last versions of the software for the **Bercut-ETL** are accessible on the Internet:

```
http://www.metrotek.spb.ru/files/b3etl/release
```

Note: *it is necessary to connect the device to the power unit before upgrading versions of the software.*

5.4.1 Device preparing for upgrading software versions

To upgrade software versions TFTP protocol is used.
If you use ***Unix operating system***:

1. Connect **Bercut-ETL** to network.
2. Establish connection with the device over Telnet protocol, enter user name (admin) and password (admin).
3. To enable TFTP server, enter in console terminal in **configure mode**:

```
tftp on
```

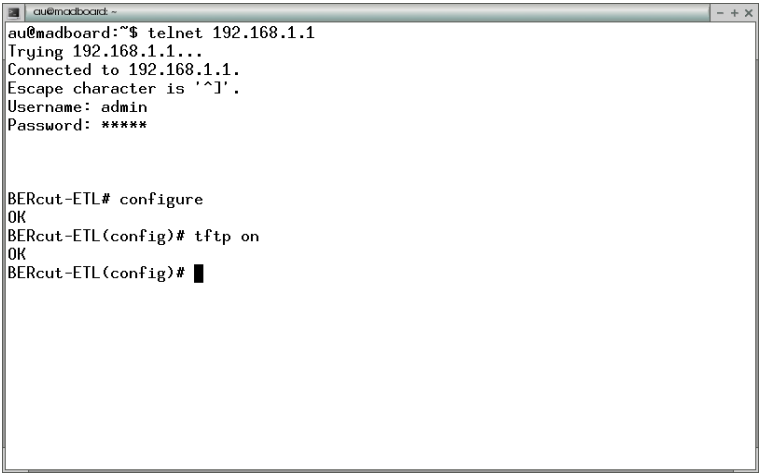

Figure 5.2. Upgrading software versions

When you prepare the device to software upgrading in ***Windows operating system*** it is necessary to enter in the command line mode and perform the same actions as for Unix operating system.

5.4.2 PC setup for device software upgrading

If you use ***Unix operating system***:

1. To set TFTP client to work in binary mode on PC, that is connected to the same network as device, enter in console terminal:

   ```
   mode binary
   ```

2. To connect to the device by means of TFTP client, enter in console terminal:

   ```
   connect IP-address_of_device
   ```

3. To upload software package file with the new version of software, enter in console terminal:

   ```
   put path-to-file/etl_X.X.X.bin
   ```

   Note: *instead of* ***etl_X.X.X.bin*** *inscription it is necessary to enter corresponding file name.*

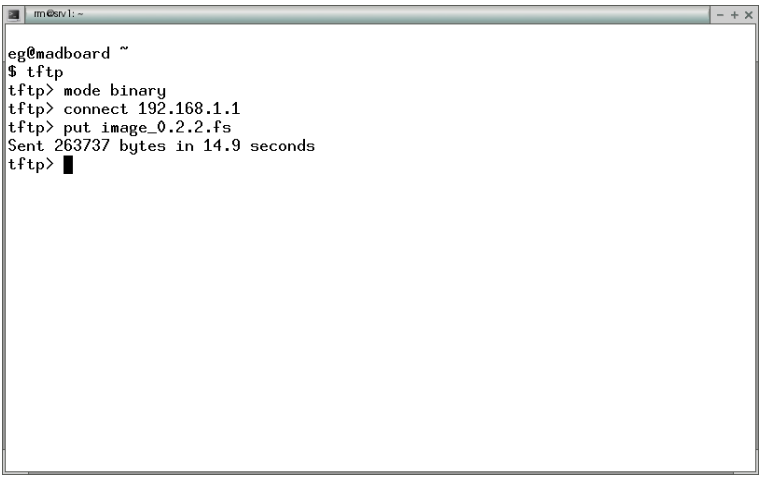

Figure 5.3. Upgrading software versions (Unix)

When you perform device software upgrading in ***Windows operating system*** enter in console terminal:

```
tftp.exe -i IP-address_of_device put C:\work\etl_X.X.X.bin
```

Note: *instead of* ***etl_X.X.X.bin*** *inscription it is necessary to enter corresponding file name.*

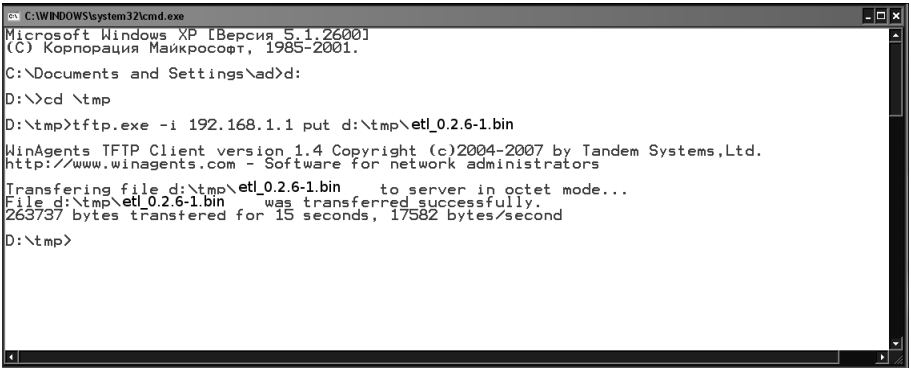

Figure 5.4. Upgrading software versions (Windows)

After a short while a message about command performance will appear in console terminal.

When the software package file is uploaded **Bercut-ETL** will automatically reboot.

Notes

- *If current and new versions of the software are very much different, settings are restored to default.*

6. Troubleshooting

Table 6.1. Troubleshooting

Failure symptom	Possible reason	Repair method
Connection is lost. LINK indicator does not light up	Incorrect cable connection	Check cable connection state
	Two active connections (RJ-45 and SFP) at the same time	Use only one of the device connectors
No telnet connection	Loopback mode is on	Switch off Loopback mode by means of OAM protocol, ET discovery function or by pressing **L** button