



User Manual v 1.0

beronet GmbH
Friedrichstr. 231
D-10969 Berlin
Tel.: +49-(0)30-259389-0
Fax: +49-(0)30-259389-19
www.beronet.com
E-Mail: info@beronet.com

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Editor: beroNet GmbH
Friedrichstraße 231
10969 Berlin

Infoline: +49-(0)30-259389-0
Fax: +49-(0)30-259389-19
E-Mail: support@beronet.com
Internet: www.beronet.com

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1. First steps

1.1. Delivery content

1x **bero*fos** device
1x power card

1.2. Safety information

The **bero*fos** has been developed as IT-equipment and should be used in this field.

Make sure that the equipment you want to access does not exceed the maximum switching capacity. You can find the maximum switching capacity under "Technical data".

1.3. Connection

Remove the **bero*fos** out of the package and assemble it into the rack. The assembly brackets and the **bero*fos** are matched for 19" racks.

You can also use the device without a rack. Please make sure that there is a fixation for the **bero*fos** at its destination. The delivered power card assures the current supply. Connect **bero*fos** by using of a standard network cable with the LAN-port of your network.

1.4. Initiation

Switching-on **bero*fos** occurs by pressing the on/off button on the front of the device. If everything is connected correctly the device will start up. In the regular operating status you will hear a small BEEP and the ports A-D will blink green and red.

2. Configuration

The bero*fos is accessible over several ways. One way is over the web interface. The other way is over our software *Library bntools*. The library bntools are freely downloadable from our website:

<http://www.beroNet.com/downloads/berofos>

More information about bntools see chapter 4ff.

A valid IP-address from your network is essential for configuration of bero*fos. The following chapter will show you several ways to do this.

2.1. Detection or setting the IP-address manually

There are different options to detect the IP-address of **bero*fos** in your network:

- automatic configuration via DHCP
- standard IP-address in factory status
- detection of the equipment with the *bntools*

2.1.1. Automatic configuration via DHCP

In factory default the **bero*fos** is in DHCP mode. That means it searches for a DHCP-server in the network and requests an IP-address. Please check the logs of your DHCP-Server to see which IP-address has been assigned from your DHCP-server for the **bero*fos**.

2.1.2. Standard IP-address (factory default)

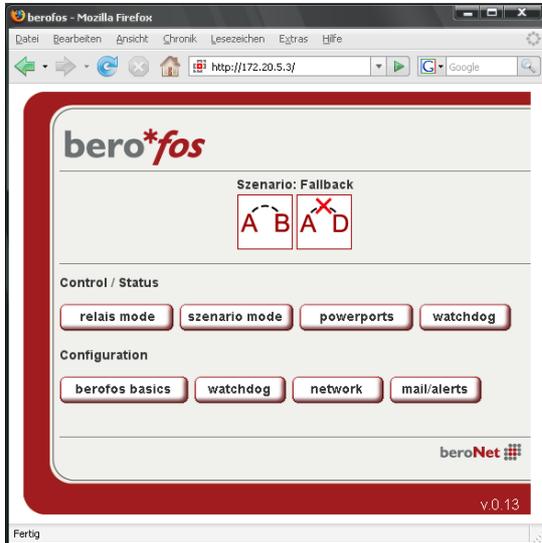
In factory default the **bero*fos** is in DHCP mode. If there is no DHCP-server in your network the **bero*fos** will keep its default IP-address *192.168.0.2* with the subnet *255.255.255.0*.

2.1.3. Detection of the equipment with the *bntools*

For detection of bero*fos in your network you will need the command line program *bntools*. More information about installing und using of *bntools* see chapter 4.4

2.2. The web interface

You can access the web interface of the **berofos** by entering the IP-address in the address bar of your web browser.



pict. 1

After that you will see the main page of **berofos** (pict. 1).

In the upper field you can see the current state of the relays as well as the operating scenario. In our case the operating scenario is set to fallback, the relay state of ports A-B are "connected" and the ports A-D are "disconnected".

In the section "Control/Status" you can set the relay state, change the operating scenario, set the state of the power ports and change the watchdog parameters.

In the section "Configuration" you can set the start-up parameters, the watchdog parameters as well as the configuration of the network and main settings.

2.2.1. Relay mode

In the section "Relay-Mode" (pict. 2) you can check and set the current relay state as well as in the operating scenario.



pict. 2

In pict.2 you can see that the current operating scenario is fallback. The relays of port A-D are "connected" and the ports A-B are "disconnected". This working state is displayed through LED's on the front of the device. In this case all 4 LED's of port A and all 4 of port D should glow green (connected) and the LED's of port B and C should glow red (disconnected).

Using the button "switch: A-D" the relay state would change to "A-B connected and A-D disconnected".

2.2.2. Operating scenario



pict. 3

Using „Scenario Config“ you can configure the operating scenario of **bero*fos**. You can choose between the fallback or bypass scenario. More information about these scenarios see chapter 3.

2.2.3. Powerports



pict. 4

By selecting the menu item “Powerports” the power ports on the backside of bero*fos will be switched on/off.

In this case power port 1 is switched off; power port 2 is switched on. You can change their state using “on” or “off” buttons. The working state of the power ports will be displayed through green or red LED’s on the front of the device.

2.2.4. Watchdog



pict. 5

By selecting the menu item “Watchdog” you activate or deactivate watchdog. Furthermore you can check the current state of watchdog.

By selecting the button “refresh” you can see the remaining seconds until watchdog is generating a failover. This is very practical to check and test your applications.

2.2.5. bero*fos defaults

By selecting menu item “bero*fos” (pict.6) you can determine the default states of bero*fos at starting-up.



pict. 6

The working states of the relay and of the power ports are adjustable. Please note that the working state of the relay is depending on the operating scenario.

It is recommendable to set the relays on mode 1 because this is also the state when the device has no power. Depending of the operating scenario the state of the relays are as follows:

Mode 0:

Failover: A-B connected

Bypass: A-B, C-D connected

Mode 1:

Failover and Bypass A-D connected

2.2.6. Watchdog config

By selecting menu item “Watchdog Config” the watchdog parameters are accessible (see pict.7)



pict. 7

The default state of watchdog is adjustable at starting-up. These adjust if watchdog should be activated or deactivated after switching-on the device.

Using the “Watchdog Intervall” you can set the time period in seconds which the watchdog is waiting before it generates a failover in case of receiving no heartbeat. The point Audio Failover can additionally generate an Audio signal in case of a failover. A failover is also signalled via a red LED on the front of the device.

2.2.7. Network Config



pict. 8

You can set the following parameters:

- **DHCP**: If it is activated an IP-address will be requested after every switch-on.
- **Hostname**: Sets the network name.
- **IP-Configuration**: You can change IP-address, net mask, gateway and DNS, if you don't want to request these configurations automatically via DHCP.
- **HTTP port**: You can set the port of the internal web server. Any value between 1 and 65534 (standard: port 80) is valid.

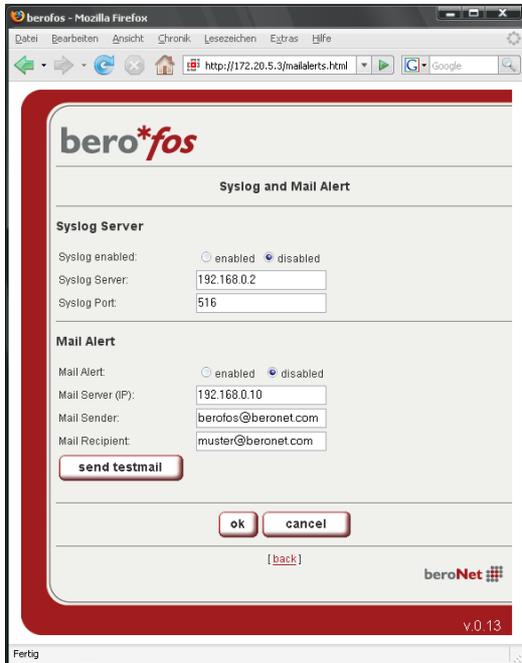
This port number would be added to the address of **berofos** using a colon, e.g. <http://192.168.0.2:1720/>

- **Password**: If requested you can activate a password access. In this case you have to set an admin-password (max. 15

marks).

2.2.8. Mail / Alerts

By selecting menu item “Mail / Alerts” you can configure the parameters of the Syslog-server and the mail-configurations (see pict.9).



pict. 9

If needed the **berofos** could inform you about important state changes as well as failovers. This information will be send via Syslog to your selected IP-address/Port. See Chapter Syslog in appendix for more details.

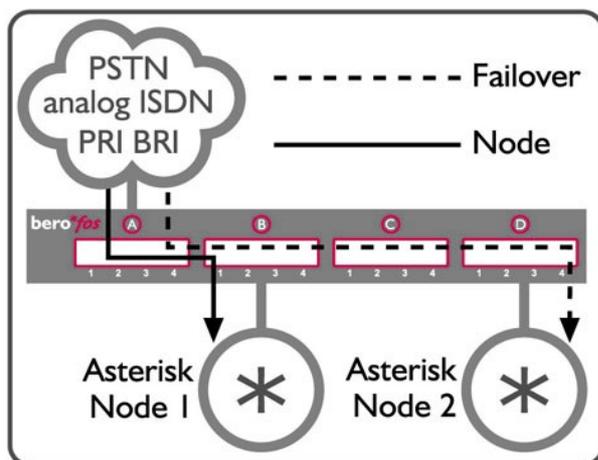
Additionally you can choose if you want to be informed via email in case of a failover. The proper settings can be set here.

3. Application scenarios

berofos is usable in two different operating scenarios (fallback or bypass). In both scenarios it is possible to switch the port modes either manually or automatically. A port mode is defined by which ports are connected and which are unplugged. The default mode in every scenario (even if **berofos** fails itself by unplugging power), the ports „A“ and „D“ are connected (indicated with „A-D“). Both scenarios will be described in the following chapters.

3.1. The failover scenario

The failover scenario is the capability to switch over to a redundant or secondary standby PBX upon a failure of the primary active PBX to minimize downtimes (see pict.10).



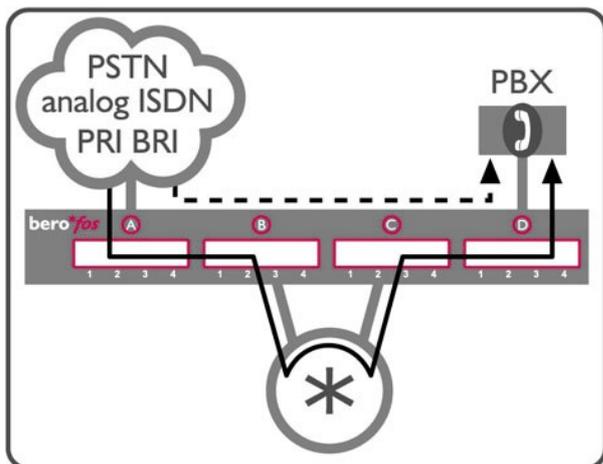
pict. 10

In case of a failover the PSTN ports can be switched from the primary Node to the redundant secondary Node. In this scenario (see pict. 10) the equipments are named primary Node and secondary Node. The primary Node is sending a heartbeat either to **berofos** or to the secondary Node. As long as there is a "heartbeat" from the primary Node to the second Node (or **berofos** itself), the secondary Node will not initiate its systems. The secondary Node will immediately take over all ports as soon as it detects an alteration in the "heartbeat" of the primary Node.

This scenario is not only usable in case of a failure. You could also use this scenario for maintenance reasons by deactivating and activating the proper Node.

3.2. The bypass scenario

The bypass scenario describes a possibility where you can place a new PBX (i.e. Asterisk-Server) in front of an already existing PBX. In case of a failover the existing PBX will be connected transparently to the PSTN ports (see pict.11).



pict. 11

In this scenario the Asterisk server is sending a Heartbeat to the **bero*fos**. As long as there is a "heartbeat" from the Asterisk server to the **bero*fos** the PBX will be connected to the Asterisk-server. In case the **bero*fos** detects an alteration in the "heartbeat" the old PBX will be connected to the PSTN ports directly. This scenario is also not only usable in case of a failure. You could use this scenario for

maintenance reasons of the Asterisk server. The described scenario is only an example how to use the **bero*fos** together with an Asterisk. You can also use the **bero*fos** in any similar situations.

3.3. The hardware watchdog

The hardware watchdog is a software daemon running on the **bero*fos** itself and awaits a heartbeat in a configurable timeout period. When the **bero*fos** will not receive this heartbeat by an external server (for example by Asterisk) within the preconfigured timeout it will automatically switch to the default mode of the running scenario („A-D“). Additionally **bero*fos** could send an e-mail, could send a Syslog event, start an audio signal (if configured) and go into the failure mode. The failure mode will be indicated via the „Fail“LED on the front panel.

You could generate the heartbeat either by using the *bntools* (for more information see chapter 4.5.) or generate it yourself and send it via socket to **bero*fos**. To send a valid heartbeat you have to send the following "magic packet" per UDP to **bero*fos**:

Type = UDP
Destination Port: 50123

4. bntools

The command line program *bntools* includes tools to control bero*fos as well as an Asterisk resource module *res_bnfos*. *bntools* is downloadable from our website:

<http://www.beronet.com> .

4.1. General information about bntools

As aforementioned you can use the *bntools* to control bero*fos. Using *bntools* you can set and change any parameter of **bero*fos** like kicking the watchdog or changing network parameters.

Before describing *bntools* we want to take the chance to show you some hints which makes working with bero*fos easier. **bero*fos** has two operating modes – the flash mode and the operational mode. Using the device in flash mode you can reset bero*fos or update the firmware. Using the device in the operational mode you can start the watchdog or kick it for instance. Please note that some commands are only available during the flash mode and other commands only during the operational mode.

To control **bero*fos** with *bntools* you will always need the IP-address of the device as well as the MAC-address. With the scan command you can detect bero*fos on the network. With the parameter *-x* you can store the result automatically in a file.

bnfos -scan -x will detect all **bero*fos** units in your network and additionally save the results under *"/etc/bnfos.conf"*.

For all further instructions you can use the values stored in the file so you don't have to type them again and again. To do this use the parameter *-f* like in the following example

bnfos - -show -f fos1 will use the parameters of the first detected device which have been stored with *bnfos -scan -x*

More information can be found typing *bnfos --help* or in the reference section of instructions.

4.2. Installation of *bntools*

4.2.1. Installation of *bntools* using Windows

Please download the software package under <http://www.beronet.com/downloads/docs/berofos/tools/windows/bnfos.rar> and unpack the archive in your target directory. Start the program using the command line.

4.2.2. Installation of *bntools* using LINUX

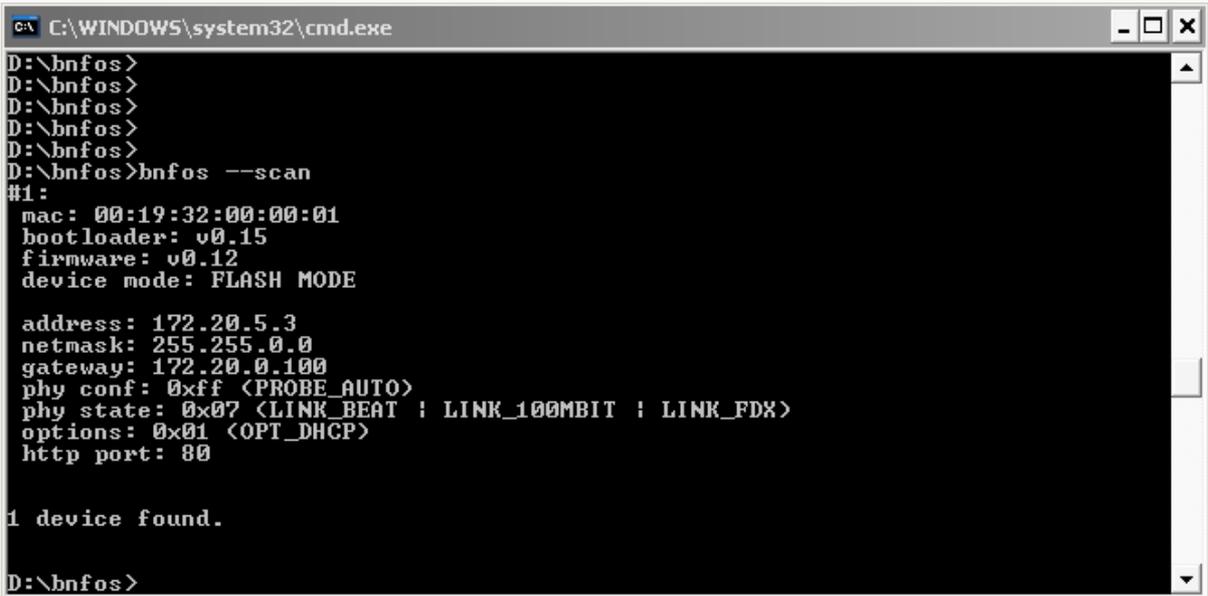
Please download the tar.gz archive under

„<http://www.beronet.com/downloads/docs/berofos/tools/linux/bntools.tar.gz>“

and compile it with *make* and *make install*. If you use **bero*fos** with an Asterisk you will be able to install the resource module with *make res_bnfos*.

4.3. Detection of **bero*fos** in your network

You have the possibility to detect any **bero*fos** in your network using *bntools* even if the device has no IP-address. To do this you have to type *bnfos -scan*.



```
C:\WINDOWS\system32\cmd.exe
D:\bnfos>
D:\bnfos>
D:\bnfos>
D:\bnfos>
D:\bnfos>
D:\bnfos>bnfos --scan
#1:
  mac: 00:19:32:00:00:01
  bootloader: v0.15
  firmware: v0.12
  device mode: FLASH MODE

  address: 172.20.5.3
  netmask: 255.255.0.0
  gateway: 172.20.0.100
  phy conf: 0xff <PROBE_AUTO>
  phy state: 0x07 <LINK_BEAT ! LINK_100MBIT ! LINK_FDX>
  options: 0x01 <OPT_DHCP>
  http port: 80

1 device found.
D:\bnfos>
```

pict. 14

If your **bero*fos** is correctly installed in your network you will get similar results as shown in picture 14. Please notice that **bero*fos** can only be detected over Ethernet. **bero*fos** can not be detected in WLAN environments and networks that are currently routed.

4.4. Setting network configurations

For setting the network parameters bring the device in the flash mode. For this press the black key (right side of the PW LED's) while switching on the bero*fos. If the device is in flash mode the red LED's of port D will blink. Detect the equipment with `bnfos -scan -x` in your network and set the network configuration as follows:

```
„bnfos -netconf -f fos1 -i 172.20.23.23 -n 255.255.0.0 -g 172.20.0.1 -d 0“
```

As alternative without the `-f` option.

```
„bnfos -netconf -m 00:19:32:00:00:58 -i 172.20.23.23 -n 255.255.0.0 -g 172.20.0.1 -d 0“
```

```
C:\>
C:\>
C:\>bnfos --netconf -f fos1 -i 172.20.23.23 -n 255.255.0.0 -g 172.20.0.1 -d 0
Loading config for: fos1
Setting network configuration succeeded!

C:\>bnfos --scan
#1:
mac: 00:19:32:00:00:58
bootloader: v2.0
firmware: v0.13
device mode: OPERATIONAL

address: 172.20.23.23
netmask: 255.255.0.0
gateway: 172.20.0.1
phy conf: 0xff <PROBE_AUTO>
phy state: 0x07 <LINK_BEAT | LINK_100MBIT | LINK_FDX>
options: 0x00
http port: 80

1 device found.
```

pict. 15

The new network parameters will be activated after a restart of the device (see pict.15).

4.5. Kick the heartbeat

With the parameter `-kick` in the `bntools` you can send a heartbeat to the bero*fos:

```
bnfos -kick -m 00:19:32:00:00:58
```

With the parameters `-c -b -w 5` you can periodically send a Heartbeat every 5 sec (`-w 5`) to the bero*fos while the `bntools` starts as daemon (`-c`) in the background (`-b`).

```
“bnfos -kick -f fos1 -c -b-w 5”
```

More information about this see reference of instructions.

4.6. Firmware upgrade

Before making a firmware upgrade set the device into the flash mode. Use the following command in *bntools* to update the firmware:

```
"bnfos -flash firmwarexy.bin -f fos1".
```

Once this process is finished and **bero*fos** has been restarted you could use the device with the new firmware. For more information just download the "deviceupgrade.pdf" in the download section of our website www.beronet.com.

5. Attachement

5.1. Reference of instructions *bnf tools*

Usage: bnfos <MODE> ...

operation modes:

```
--scan [-h <host>] [-c] [-w <time>] [-t <sec>] [-s] [-x] scan the network for devices
--netconf { -m <mac> [-h <host>] | -f <id> } [-i <ip>] [-n <netmask>] [-g <gateway>] [-e <phy>] [-d
<status>] [-a <status>] [-p <port>] [-t <sec>] [-s] configure network parameters (flash mode only)
--ping { -m <mac> [-h <host>] | -f <id> } [-c] [-w <time>] [-t <sec>] [-s] send ping request
--kick { -m <mac> [-h <host>] | -f <id> } [-c] [-b] [-w <time>] [-t <sec>] [-s] kick watchdog timer
--reset { -m <mac> [-h <host>] | -f <id> } [-s] reset to default values (also deletes firmware)
--flash <file> { -m <mac> -h <host> | -f <id> } [-t <sec>] [-s] upload firmware (flash mode only)
--set <key>=<value> { -h <host> | -f <id> } [-p <port>] [-u <usrpwd>] [-t <sec>] [-s] set configuration
value
--get <key> { -h <host> | -f <id> } [-p <port>] [-u <usrpwd>] [-c] [-w <time>] [-t <sec>] [-s] show single
configuration or status value
--show { -h <host> | -f <id> } [-p <port>] [-u <usrpwd>] [-c] [-w <time>] [-t <sec>] [-s] shows configuration
and status
```

arguments:

| | |
|--------------|--|
| -m <mac> | mac address of the device (notation: XX:XX:XX:XX:XX:XX) |
| -h <host> | hostname or ip address of the device (default: 255.255.255.255) |
| -p <port> | http port (default: 80) |
| -u <usrpwd> | authentication data (notation: <username>:<password>) |
| -c | continuous operation |
| -b | fork to background (implies -s) |
| -w <time> | wait 'time' seconds between continuous operations (default: 2) |
| -t <sec> | timeout in seconds (default: 3) |
| -s | enable syslog output |
| -x | write scan results to /etc/bnfos.conf |
| -f <id> | load mac and/or ip address from /etc/bnfos.conf |
| | |
| -i <ip> | configure ip address (default: 0.0.0.0) |
| -n <netmask> | configure netmask address |
| -g <gateway> | configure gateway address (default: 0.0.0.0) |
| -e <phy> | configure ethernet phy configuration (values: 0=auto; 1=10mbit; 2=100mbit; default: 0) |
| -d <status> | configure enable dhcp (1=on; 0=off; default: 1) |
| -a <status> | configure enable http auth (1=on; 0=off; default: 0) |
| -p <port> | configure http port (default: 80) |

valid '--set' <key>=<value> pairs / '--get' keys:

| | |
|-----------------|---|
| scenario={0 1} | scenario (0=fallback; 1=bypass) |
| mode={0 1} | relais mode (0=A--D; 1=A--B or A--B,C--D) |
| modedef={0 1} | default relais mode (0=A--D; 1=A--B or A--B,C--D) |
| power1={0 1} | state of powerport 1 (0=off; 1=on) |
| power1def={0 1} | default state of powerport 1 (0=off; 1=on) |

| | |
|----------------------|--|
| power2={0 1} | state of powerport 2 (0=off; 1=on) |
| power2def={0 1} | default state of powerport 2 (0=off; 1=on) |
| hostname=<dn> | device hostname |
| address=<ip> | ip address |
| netmask=<nm> | netmask address |
| gateway=<gw> | gateway address |
| dns=<dns> | dns server address |
| dhcp={0 1} | query dhcp server (0=off; 1=on) |
| port={1..65535} | http listen port |
| pwd={0 1} | http password protection (0=off; 1=on) |
| apwd=<apwd> | admin password (only --set) |
| smtpserv=<mhost> | smtp server |
| smtpfrom=<mfrom> | smtp sender address |
| smtppto=<mto> | smtp destination address |
| smtpptest=<XXXXX> | trigger testmail (only --set) |
| syslog={0 1} | syslog logging (0=off; 1=on) |
| slgip=<loghost> | syslog server ip |
| slgpt={1..65535} | syslog server port |
| wdog={0 1} | watchdog enable (0=off; 1=on) |
| wdogdef={0 1} | default watchdog enable (0=off; 1=on) |
| wdogstate=<wstate> | watchdog state (0=off; 1=on; 2=failure) |
| wdogitime={1..65535} | watchdog intervall time |
| wdogaudio={0 1} | watchdog audio alarm (0=off; 1=on) |
| wdogmail={0 1} | watchdog alarm mails (0=off; 1=on) |
| wdogrtime=<wretv> | watchdog remaining time to failure |

5.2. Syslog Output

Powerup:

berofos:00: Powerup

Relay States:

berofos:10: Relay Mode changed: A-D

berofos:11: Relay Mode changed: A-B

berofos:12: Relay Mode changed: A-B,C-D

Szenarios:

berofos:20: Szenario changed: Fallback

berofos:21: Szenario changed: Bypass

PowerPorts

berofos:30: PW1 Mode changed: on

berofos:31: PW1 Mode changed: off

berofos:32: PW2 Mode changed: on

berofos:33: PW2 Mode changed: off

Watchdog:

berofos:40: Wdog swithed: on

berofos:41: Wdog swithed: off

berofos:42: Wdog swithed: Failover (timeout)

berofos:43: Wdog swithed: Failover (sticky)