BLANKOM®

Operating instructions

IP-ASI TRANSCODER
IP(GigE) ↔ ASI(TS)

ITB 100
Part N°: 9732.01

...setting Signals

Table of content

1. Basic installing and operating instructions

1.1 Safety instructions

- When assembling and commissioning the ITB 100 IP-ASI Transcoder and executing the settings, always follow the accompanying instructions exactly.

- The device is not to be assembled and brought into use by anybody who is not an authorised technician.

- When components are being installed in areas where reception is important, ensure that EMC regulations are observed.

- All assembly, installation and cable connection must take place when no electricity has been connected.

- The provisions of DIN EN 50083 must be observed at all times when working with the equipment. In particular, DIN EN 50083/1 regarding safety may on no account be ignored.

- The class of protection for the device is class II as per DIN EN 60065

1.2 Contact

If there are any questions or problems, help is available from

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1.3 General description of functions

This manual describes the use and functioning of the ITB 100 IP-ASI Transcoder (9732.01), a product of BLANKOM Antennentechnik GmbH. For an explanation of the abbreviations IP and ASI and other abbreviations below, see the glossary, Section 4.6.

The transcoder is one component of the *B-LINE* head end system and it can receive a data stream in the variety of ways: by Gigabit Ethernet (in which case it outputs the IP encapsulated transport streams at the ASI output ports) or by the reverse process, receiving the transport streams via the ASI input ports and sending them on as a data stream via Ethernet. There are two Ethernet interfaces in the device. Both come in the form of RJ45 sockets. The only Ethernet interface intended for the transport of MPEG data in accordance with ETSI TS 102034 is the port designated as streaming port. This one is in GbE format (Gigabit Ethernet). All IP data streams are unpacked in accordance with the protocol layers as they arrive and then forwarded to the output port which has been set.

The first thing that happens to data streams at the ASI inputs is a check on their correctness. The system then packs the TS (transport streams) to match the user's settings and sends on the data packet thus formed via the streaming port. It is possible for both procedures (send and receive) to run at once.

At each of the ASI ports, there is an output step and an input equalizer. An LED for each port shows the current status.

There is a CPU monitoring and regulating all the internal procedures. It is possible to arrange the settings either via a Web interface or via SNMP. The CPU has its own Ethernet interface, referred to as the control port, which permits alteration of the configuration at any time, even during normal operation.

The ITB 100 transcoder can, at any one time, stream or receive up to 6 transport streams and place them at the relevant ASI port. The process includes allocating a UDP port to a TS. It is also possible for each TS to have its own IP address. There is a choice between UDP and RTP; the streams can be transported by either or both methods to the various ports (Fig. 1).
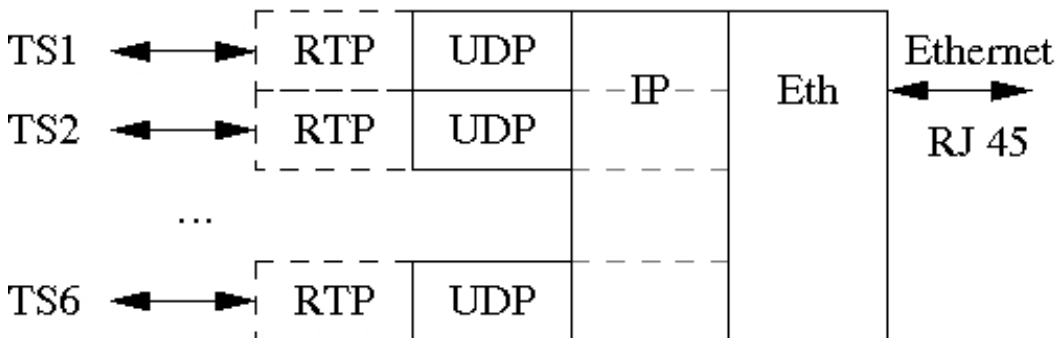

Fig.1: Transport stream processing at the protocol level

If the transport is by RTP, it can be given forward error correction in accordance with the pro-MPEG Code of Practice 3 rev. 2. How this works is shown in section 4.4.

1.4 Technical features and functions

The following are the technical features and/or functions of the ITB 100. For the technical data sheet, see section 4.1.

- Bi-directional IP ⇔ ASI converter
- Up to 6 ASI ports as per EN 50083-9
    • Individually configurable as either input or output
    • Configuration also possible during normal operation
    • Allocation of IP encapsulated transport streams (TS) to the output ports as needed

- RJ45 connector to the GbE network for the data stream (this is the streaming port)
    • DVB over IP to ETSI TS 102034 specifications
    • UDP (user datagram protocol)
    • RTP (real-time transport protocol)
    • Additional variable forward error correction as per SMPTE2022 (COP3R2)

- RJ45 -10/100 Mbit network connection for control tasks (this is the control port)

- ASI inputs
    • Individual data rates ranging from 1.3 to 139 Mbps.
    • Burst mode or continuous mode
    • Packet length 188/204 bytes

- ASI outputs
    • Data rates ranging from 1.3 to 139 Mbps
    • Burst mode
    • Constant / variable bitrate, switchable
    • Packet length 188 bytes

- Implemented servers (accessible via 10/100 Mbit control port)
    • http server(s) (controlled via Web interface)
    • SNMP server(s) (controlled via SNMP manager)
    • DHCP client (integrated into existing IP infrastructure)
    • NTP client for calibration of the internal Real Time Clock (RTC)

- Log-book

- Electricity supply voltage 100 to 240 V AC

- Assembly updatable from BLANKOM website

2. Position and explanation, functional elements
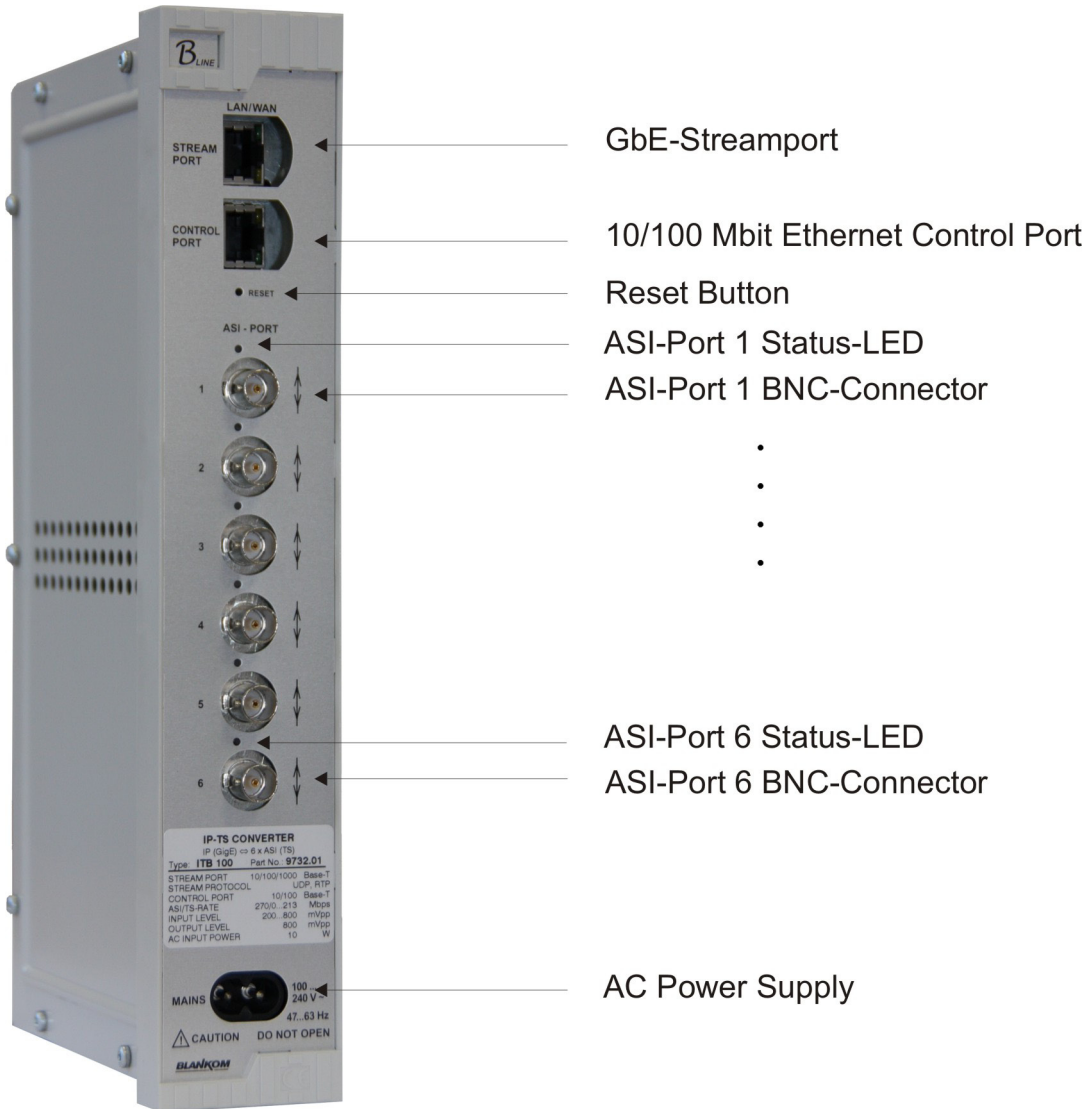
2.1 Front view

GbE-Streamport

10/100 Mbit Ethernet Control Port

Reset Button

ASI-Port 1 Status-LED

ASI-Port 1 BNC-Connector

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.
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.

ASI-Port 6 Status-LED

ASI-Port 6 BNC-Connector

AC Power Supply

Fig. 2: Front view ITB 100

2.2 Functional elements

2.2.1 GbE streaming port

Two LEDs integrated into the RJ45 socket display the operating status of the streaming port:

LED	Function/Action
yellow	"Data" LED; flashes while data are being exchanged
green	"GbE Connect" LED; only shows when the GbE cable connection is active (will not be illuminated if the connection rate is 10/100 Mbit).

Table 1: LED demonstration of streaming port status

2.2.2 10/100 Mbit control port

Two LEDs integrated into the RJ45 socket display the operating status of the control port:

LED	Function/Action
yellow	"Connect" LED; illuminated when the cable connection is active
green	"Data" LED; flashes while data are being exchanged

Table 2: LED demonstration of control port status

2.2.3 Reset button (sunk)

1. Press the button briefly (for 2 to 5 seconds) to reset the CPU
2. If the reset button is pressed for 5 to 10 seconds, a power-on reset of the device as a whole will follow (settings will be kept)
3. Pressing the reset button for more than 10 seconds will restore the settings present at delivery, all individual settings on the device are lost, except the current activation status of the ASI port (see also Section 3.3).

2.2.4 ASI-Ports (1...6)

The status of each ASI Port is shown by LEDs with two alternating colours:

LED status	Port status
yellow	Output
green	Input
off	Not activated

Table 3: LED demonstration of status at the ASI ports

2.2.5 AC Power supply (mains connection)

The mains connection is in the form of wide range input, 100 to 240 V~ / 47 to 63 Hz. Plugging the device into the mains puts it into operation. There is no separate mains switch on the device.

3. Operating instructions

3.1 Assembly and commissioning

All assembly and connection must take place when no electricity has been connected.

On no account may the safety notes (see Section 1.1) be ignored.

As soon as all the wiring has been done for the signal, the mains cable can be connected, and the device thus switched on.

The operating status is shown by the LEDs on the front panel (see Section 2).

3.2 Start-up behaviour

The device is initialised and put into operational mode as soon as it has been connected to the mains.
First the LEDs on the ASI ports will flash, then they will go out. After about 2 minutes they will come on to show the configuration that has been selected at the relevant ASI port. They will be either a steady yellow or a steady green light, depending whether the relevant activation has taken place.
The ITB 100 is now ready for use.

3.3 Factory settings

The following are the basic settings (factory settings) with which the transcoder is delivered:

Parameters	Set as	Notes
User name	admin	
Password	admin	
IP address, control port	192.168.1.1	
Gateway	192.168.1.254	
Subnet mask, control port	255.255.255.0	
DHCP	switched off	
DHCP Time-out	20 s	
IP address, streaming port	172.16.1.10	
Subnet mask, streaming port	255.255.255.0	

Parameters	Set as	Notes
activated ASI port	No. 1	
UDP port addresses 1 (to 6)	9200 (9210, 9220, 9230, 9240, 9250)	
Streaming direction	ASI GbE	ASI input
ASI polarity	normal	
FEC (parameter L)	off	
FEC (parameter D)	off	
SNMP server	activated	
SNMP manager IP	192.168.40.251	
NTP server	-	
NTP server IP	192.53.103.108	
Super server daemons	activated	

Table 4: Settings on delivery

3.4 Settings via the HTML interface

For configuration purposes, the HTML user interface must be opened using a computer connected to the ITB 100. How the user interface works is almost self-explanatory. Any special features of use will be explained in the following chapters.

3.4.1 Connection via the network to the Computer

System requirements:

- PC or laptop with 10/100 Mbit Ethernet interface
- Internet browser (e.g. Windows Internet Explorer), which accepts Java Script.

Making the connections:

The control port of the ITB 100 must be connected to the PC network using an Ethernet cable.
The IP address of the ITB 100 control port is 192.168.1.1 on delivery. 192.168.1.1
The address of the network connection at the computer must be adapted to the IP address of the ITB 100 control port (subnet mask: 255.255.255.0, IP address: 192.168.1.XXX).
Do not let XXX be exactly the same as the IP address of the ITB 100 control port.
When carrying out the very first configuration of a system containing several devices, it is necessary to insure that any ITB 100 devices are connected in succession to the network and are separately configured, as the IP addresses of all such devices are identical on delivery.

The IP address of the ITB 100 control port is entered onto the browser interface. When the link up has been successfully made, the device produces a pop-up log-in window:

Fig. 3: Log-in window

Access to the configuration menu is password protected.
When the transcoder is delivered, the access data are as follows:

Registration details	Valid string
User name	admin
Password	admin

Table 5: Access data on delivery

Please note:
If the password or the IP address is not known or no longer known, pushing in the reset button for more than 10 seconds will reset them to the factory settings (see Sections 2.2 and 3.3). Afterwards the device is back in its state as delivered, with the access data and factory settings described above (see Section 3.3).

Following successful login, the "welcome" screen of the ITB 100 appears.
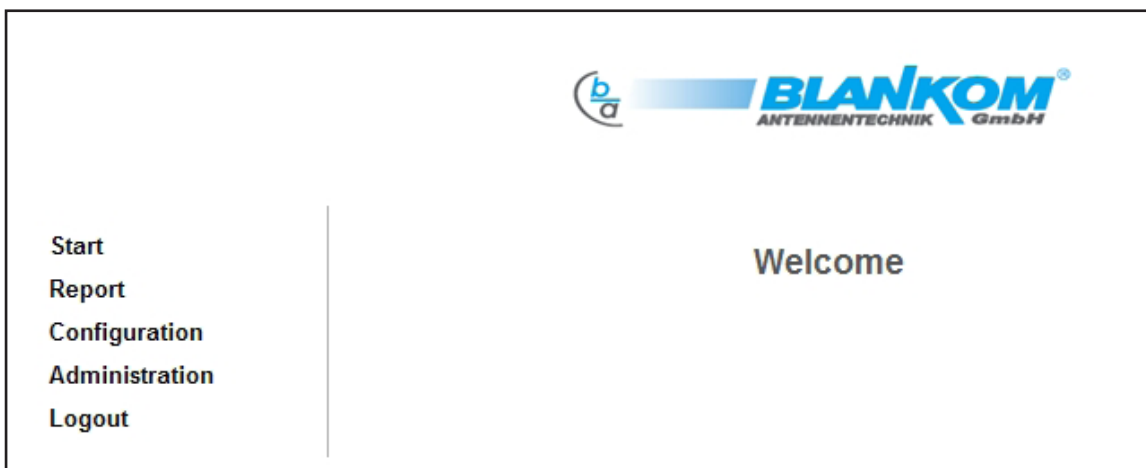
Fig. 4: ITB 100 "Welcome" page

The ITB 100 can be configured using the toolbar, and status information can be called up.

3.4.2 System Report

If the menu point "Report" in the toolbar on the screen menu is selected, a window will appear giving information on all the settings of the transcoder. An overview of the status of the individual ASI ports and the two Ethernet ports (including their MAC addresses) comes first.
The status of any software which has been implemented is also shown. For the current status of the software or the updateable software components the following entries are of importance:

- FPGA_ID_2: "IP-CPU/**Vx.yz**/DD.MM.YYYY/..." (FPGA software which is valid – if there is no entry under this item, the entry under FPGA_ID_1 is valid)
- System version: uClinux 2.6.19-uc1-**wxyz** # ...(current system and control software)

Fig. 5: System Report

3.4.3 Configuration

When the "Configuration" button is clicked, the following field containing choices appears:
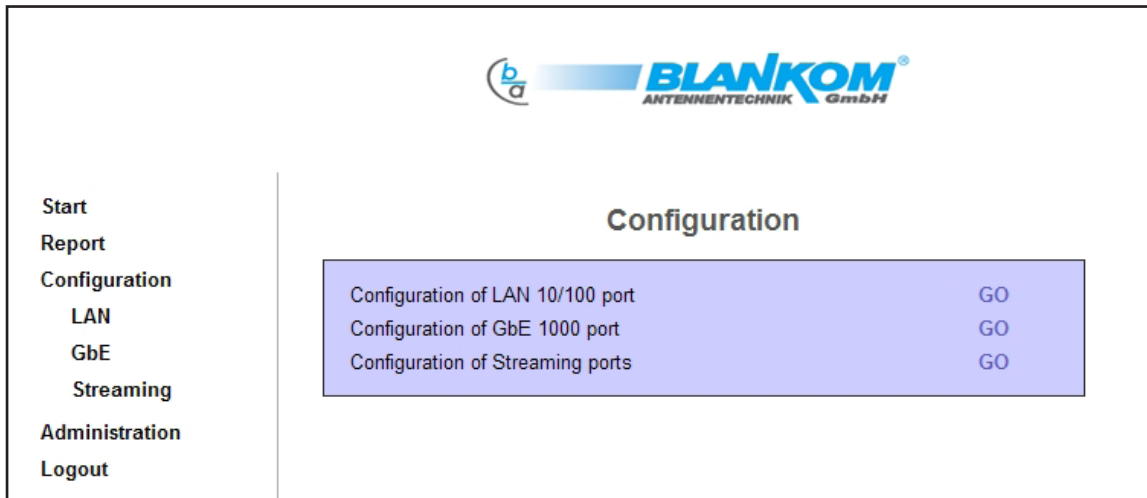

Fig. 6: Configuration choices

It is from this window that the configuration menus for the streaming port and the control port are accessed, or the menu for configuring the streaming itself. These 3 menus can, alternatively, be accessed via the "LAN" ,"GbE" or "Streaming" soft keys.

3.4.3.1 Control port (10/100 port)

To configure the control port, select "Configuration → LAN" in the system control menu or choose "Configuration of LAN 10/100 port" for configuration. The following configuration mask will appear:

Fig. 7: Control port configuration

IP Address, Gateway and Netmask have to match each other. In case of mismatch a reboot with factory defaults will be necessary. If DHCP is enabled and providing the network supports DHCP, automatic LAN IP configuration or automatic integration of the assembly into an existing network will ensue.
The DHCP time-out function determines the period (in seconds) after which an (unsuccessful) automatic configuration is cancelled and the preset IP address is used.
Reasonable use of DHCP, however, implies that the DHCP server will be accessed to elicit the IP address assigned to the control port for future access to the assembly.
If "DHCP" has not been enabled, the "LAN IP configuration" mask must be completed manually.

3.4.3.2 Streaming port (GbE 1000 port)

For the basic configuration of the streaming port, select "Configuration → GbE" in the system control menu or "Configuration of GbE 1000 port" in the configuration overview. The following configuration mask will appear:
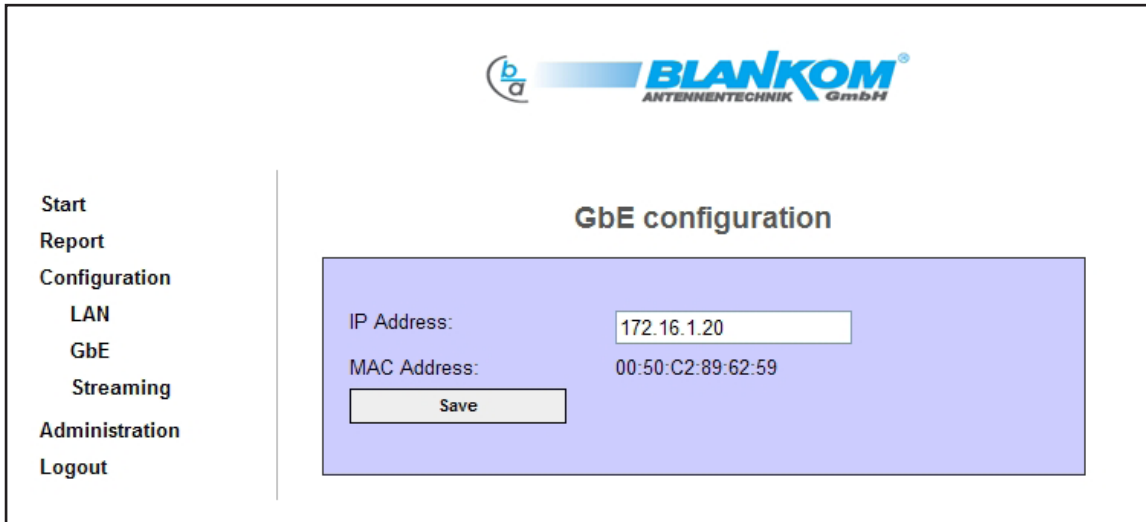

Fig. 8: Basic configuration of streaming port

The IP address already assigned here is to be considered as the host IP address. Additionally, an individual IP address can be assigned to each transport stream (see Section 3.4.3.3).

3.4.3.3 Streaming configuration (ASI – GbE or GbE – ASI)

To set the parameters for the streaming, select "Configuration → Streaming" in the main menu or „Configuration of Streaming ports" in the configuration overview. The configuration window shown in Fig. 9 will appear.
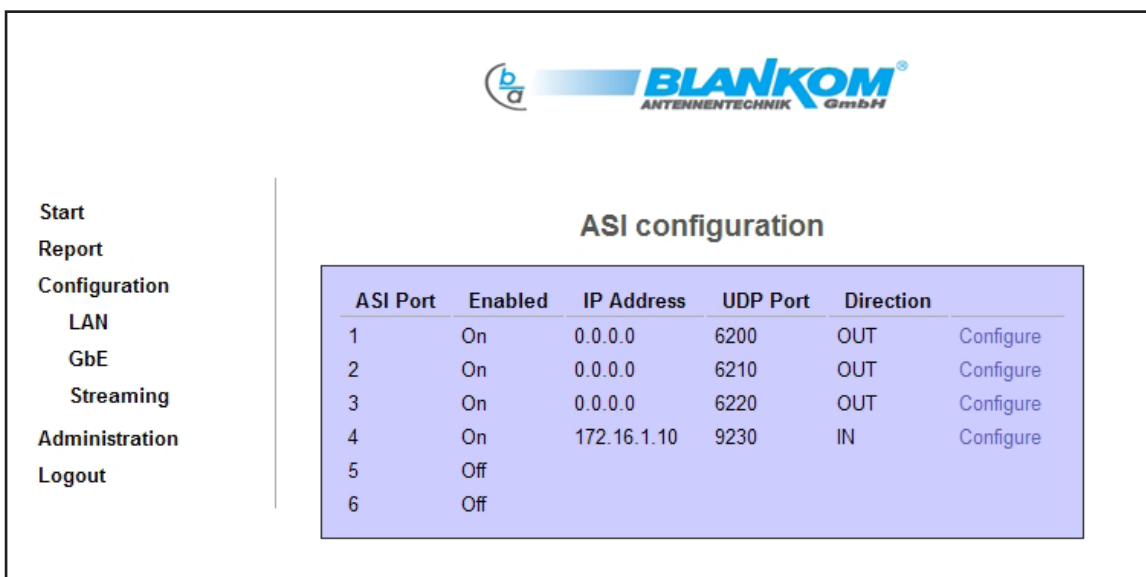

Fig. 9: Overview of streaming settings

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The options available make it possible to configure each ASI port and the related streaming settings separately. Abbreviated details of the configuration of each ASI port are also displayed.

3.4.3.3.1 Notes on selection of IP addresses and UDP ports

When selecting the **IP addresses,** and depending on the network structure at hand, especially if it is one of those which are not intended primarily to take streaming please observe the following.

For private use of networks the ICANN organisation has allocated the following IP address areas:

IP class	Number of possible networks	Number of possible hosts	Address range
A	1	approx. 16 million	10.0.0.0 – 10.255.255.255
B	16	65534	172.16.0.0 – 172.31.255.255
C	256	254	192.168.0.0 – 192.168.255.255

Table 5: Specified IP address areas for private network use

If direct connection to the Internet is required, application must be made to ICANN or one of its national sub-organisations for an appropriate IP address.

IANA is the administrating organisation for **UDP ports**, registering these because certain services such as FTP or http are allocated to fixed ports. UDP ports are divided into the following groups:

"well known" ports:	ranging from 0 to 1023
"registered" ports:	ranging from 1024 to 49151
dynamic or private ports:	ranging from 49152 to 65535

If streaming from the WWW is planned, BLANKOM's general recommendation is that the user ask the administrator immediately above, for example the responsible Internet service provider, about the port allocation.

Another point to observe is that if COP3R2 forward error correction is used, there must be a difference of at least 5 between the numbers given to the UDP ports (see Section 4.3).

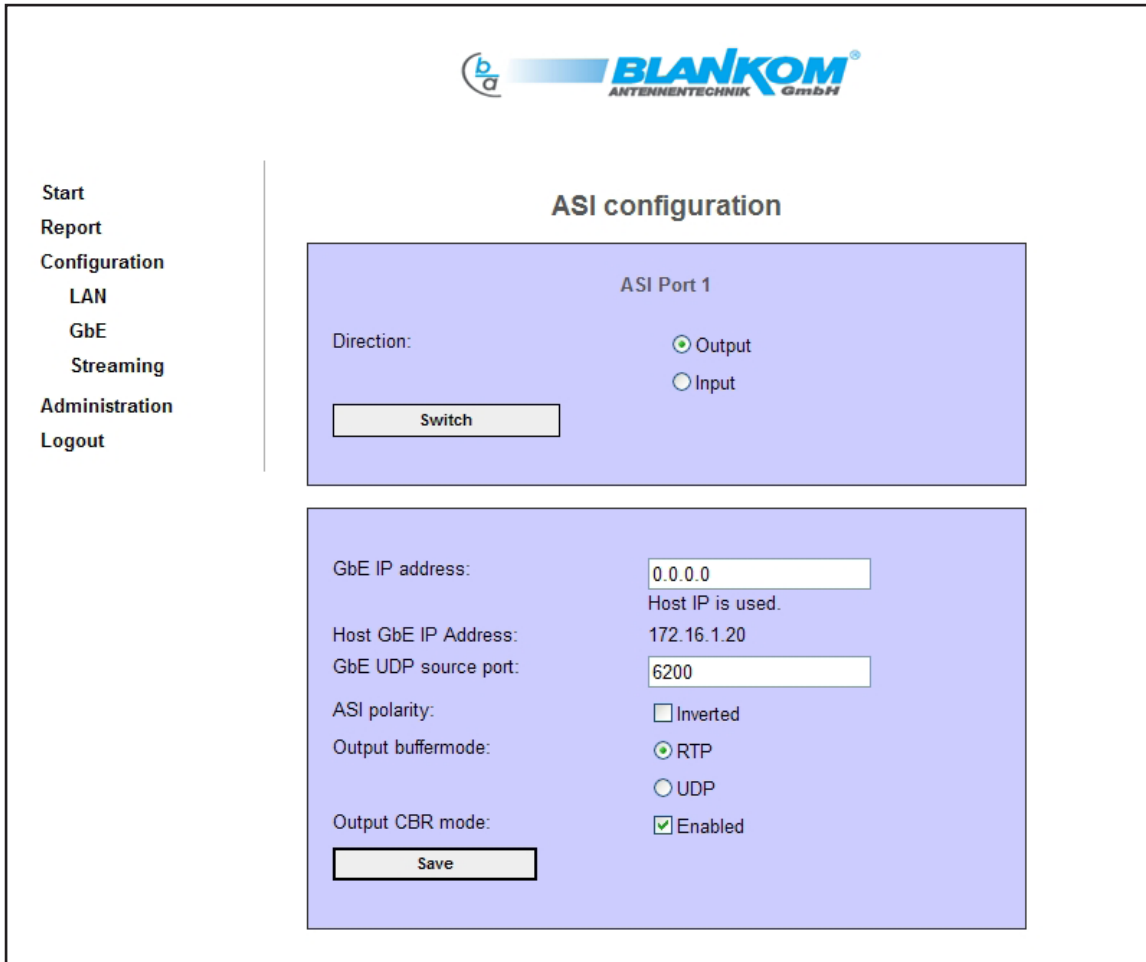## 3.4.3.3.2 GbE-ASI streaming configuration (ASI output)

Fig. 10: Configuration menu for GbE-ASI streaming

Explanation of the setting parameters:

Parameters	Notes
ASI port 1	
Direction	defines the direction of streaming: ASI = Output: GbE → ASI (ASI = Input: ASI → GbE)
Switch	allows direct reversal of the streaming direction and call-up of the related configuration menu
GbE IP configuration and/or adaptation (input)	
GbE IP address	IP address assigned to the relevant transport stream (TS) on transmitter side (destination IP). For each TS it can be selected individually. To use the host IP address of the device, enter 0.0.0.0 here.
GbE UDP source port	UDP port number assigned to the relevant TS on transmitter side (destination UDP port).

Parameters	Notes
Output buffer mode (Source data encapsulation)	Data transfer protocol which has been assigned to the relevant TS If COP3R2 forward error correction has been used on the transmitter side, "RTP" must be selected in order to enable the forward error correction in the receiver.
ASI port configuration (output)	
Polarity	Setting for the desired polarity of the ASI output signal (usually "normal")
Output CBR mode	If "CBR" is the setting, the incoming data will be broadcast fairly uniformly with the help of an internal regulation mechanism (this is called smoothing). This is what the standard setting should be. If "CBR" has not been set, the data will be transmitted immediately on reception. The result of this may, however, be very irregular surges of data at the ASI output port and reception problems in the ASI receivers (particularly in respect of buffering).
Save	Takes over the configuration and enables it

Table 6: Setting parameters for GbE ASI streaming (ASI output)
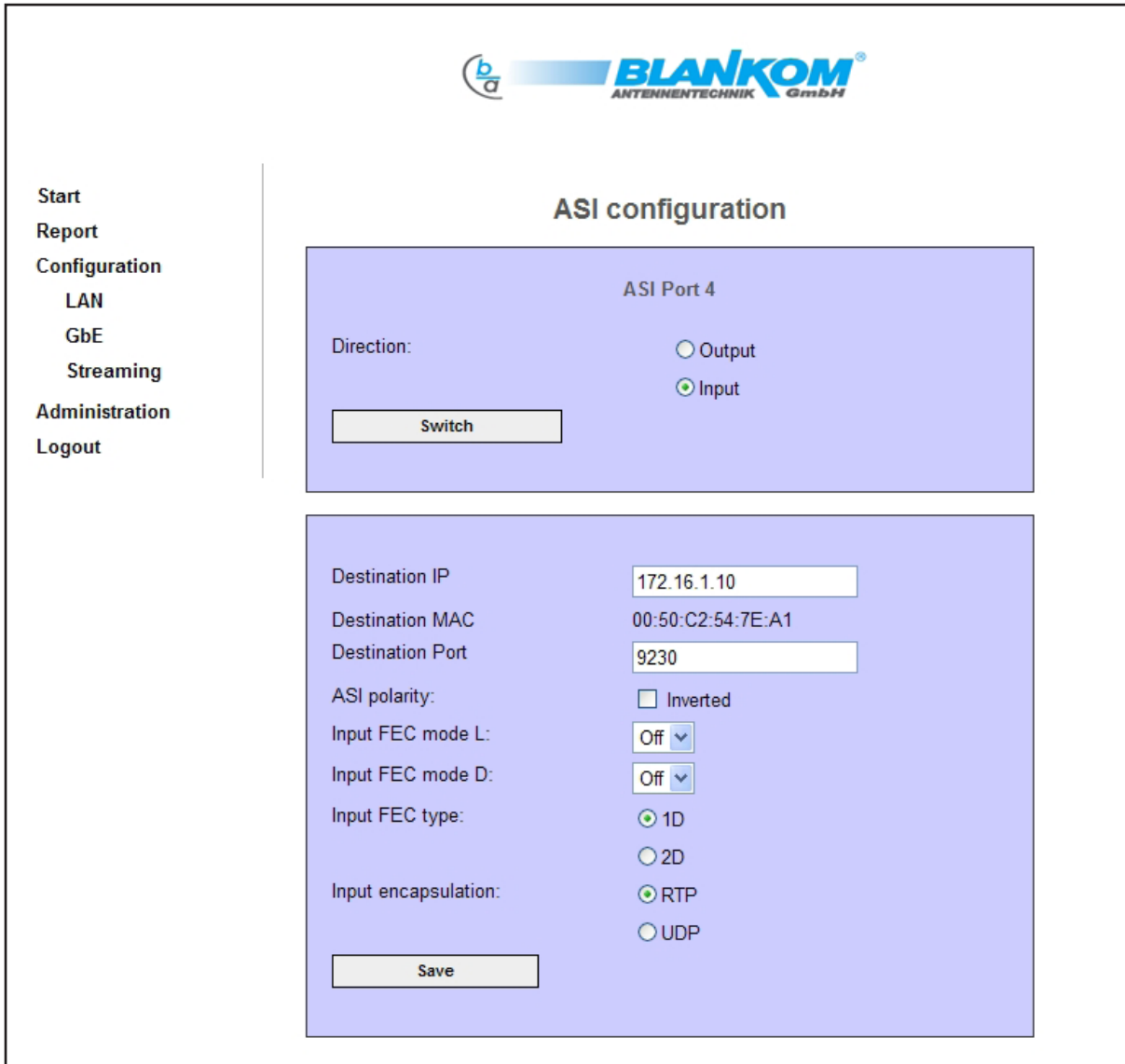
3.4.3.3.3 ASI-GbE streaming configuration (ASI input)

Fig. 11: Configuration menu of ASI-GbE streaming (at an ASI input)

Explanation of the setting parameters:

Parameters	Notes
ASI port 1	
Direction	defines the direction of streaming: ASI = Input: ASI → GbE (ASI = Output: GbE → ASI)
Switch	allows direct reversal of the streaming direction and call-up of the related configuration menu

Parameters	Notes
Streaming configuration (GbE port output)	
Destination IP	IP address of the GbE port on the destination device This can be either the same for each TS (e.g. the host IP of the receiver streaming port), or different for each. (This feature must be considered in conjunction with the similar entry under "GbE IP source address" in Section 10.)
Destination MAC	MAC address of the GbE port on the destination device (for information purposes)
Destination port	UDP port number of the ASI port on the destination device (This feature must be considered in conjunction with the similar entry under "UDP source port number" in Section 10.)
ASI polarity	Depending the polarity of the ASI source signal, the setting here is "normal" (as standard setting) or "inverted".
FEC parameters "L" and "D"	Both these parameters determine whether the FEC will be effective (see Section 4.3). If both parameters are set to "off", no FEC has been enabled.
Input FEC type	If „L" and „D" are not „Off" then choose „2D"; if „L" or „D" are not „Off" then choose „1D".
Input encapsulation	It is prerequisite to the use of FEC that "RTP" is set; otherwise "UDP" is adequate.
Save	Takes over the configuration and enables it

Table 7: Setting parameters for ASI –GbE streaming (at an ASI input)

The ITB100 is able to address multicast groups via IGMP ranging from 224.0.0.0 to 239.255.255.255. The MAC address will be adapted accordingly. All units in network should support IGMP.

3.4.3.3.4 Changing the direction of streaming (ASI port data transfer direction)

To change the direction of streaming, select the desired radio button in the "Direction" field of the configuration menu for the relevant ASI port. Then click the switch soft-key once.

This selection loads the relevant configuration menu (as described above).

The parameters for the ASI port and/or the streaming can now be set. Clicking the "Save" soft-key stores both the change of direction and the parameters belonging to the direction. The LED will come on at the same time, showing the right colour, at the ASI port which is currently operating (see Table 1).

3.4.4 Administration and service

The administration menu contains sub-menus for the general administration of this device. The sub-menus cover updates for the various software components, ASI port activation, changes of password, settings for the servers integrated in the device, log-files, and call-up of the Logfiles.
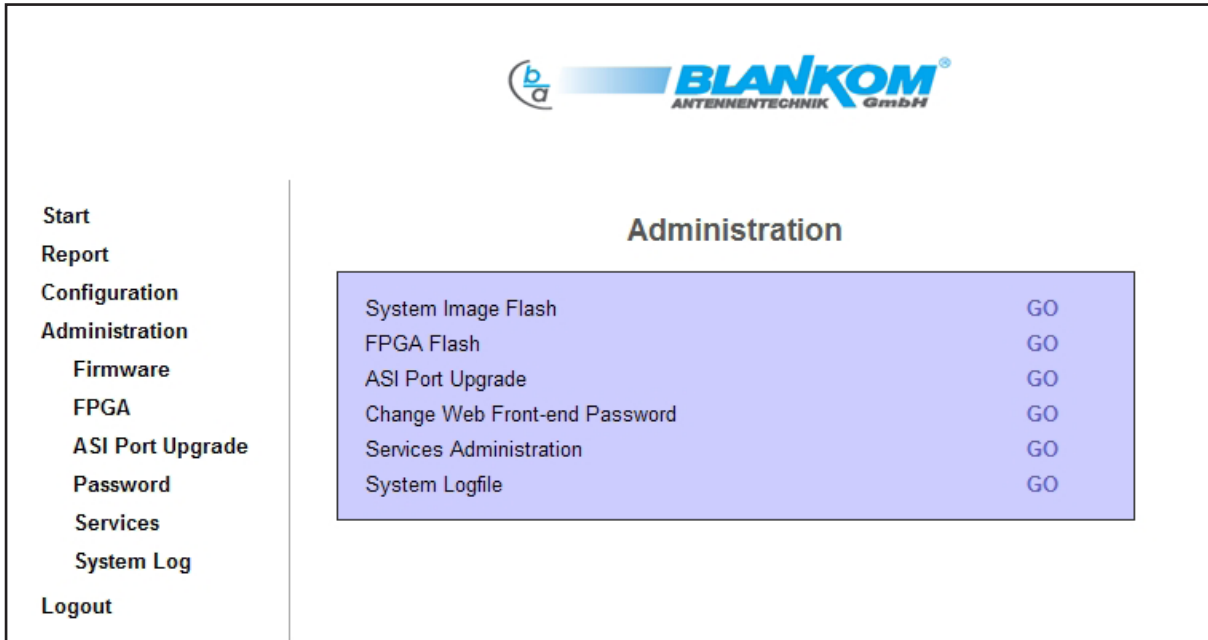

Fig. 12: Administration menu

3.4.4.1 Update

The ITB 100 contains several software components that can be updated.
The system report provides information on the status of the software currently in use in the device. This information is described above in Section 3.4.2.
It is possible to carry out an update either of the internal firmware (this file will be about 5 MB), the contents of which are system software, control software and the FPGA hardware (this is a 1 MB file). During the updating, none of the functions of the device will be affected.

The basic procedure is as follows:

First the software must be uploaded. Then the files are written to the memory (this is called "flashing"), and finally the command is given for reset of the device. All functionality is guaranteed for the ITB 100 even while the update is happening. The update will, however, fail to take effect unless the device is restarted. The restart will always be suggested by a reboot message at the end of a procedure.

3.4.4.1.1 Firmware update

The menu item which is used to update the control software is "Firmware".
If this item is called up, the following mask will appear.
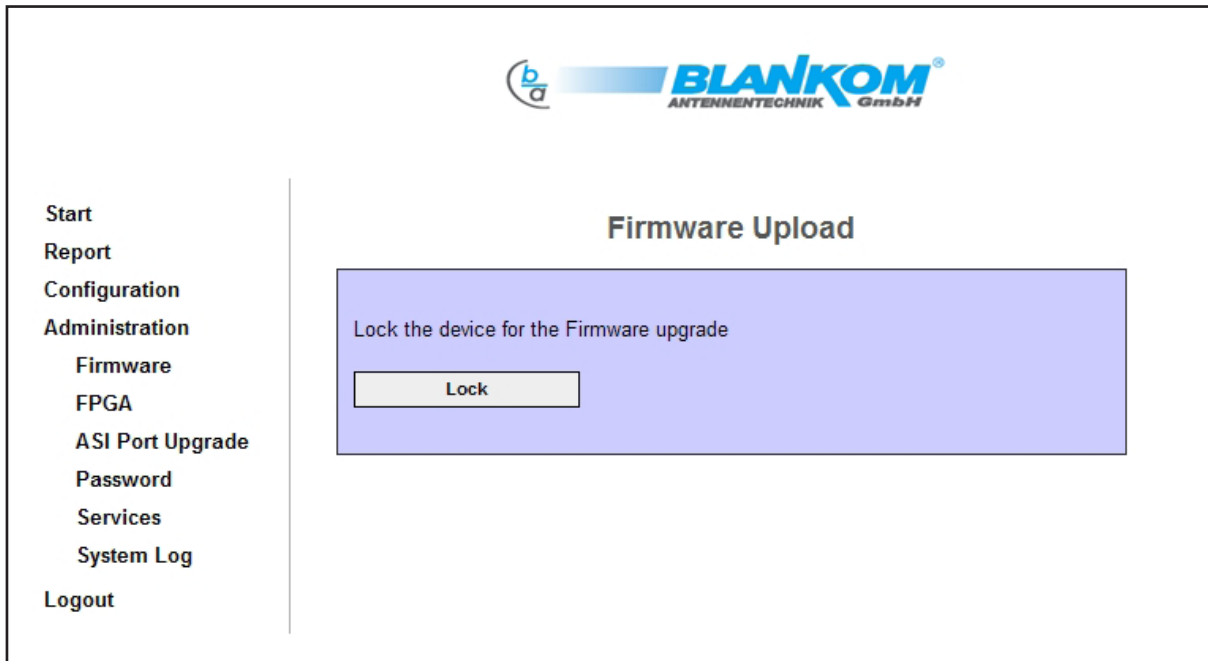
Fig. 13: Start mask for updating the control software

Confirming the lock ensures that the device will go into safe mode. After this, the mask shown as Figure 14 appears, enabling the new file to be selected.
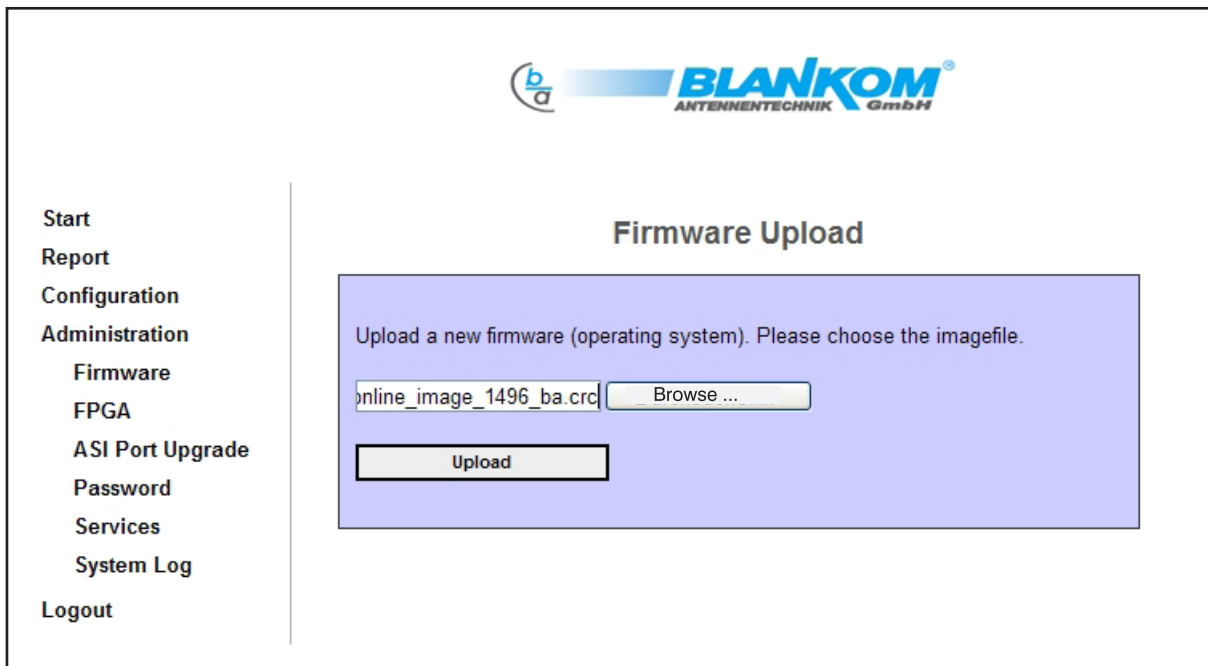

Fig. 14: Selection of the firmware file

Using the "Browse…" respectively "File searching" key, the relevant firmware file can be selected. However, the name of the file can also be typed into the text box directly together with its full path.
If the "Upload" button is clicked, the update will be transferred to the device.

As soon as the transfer has finished, the following information field will appear:
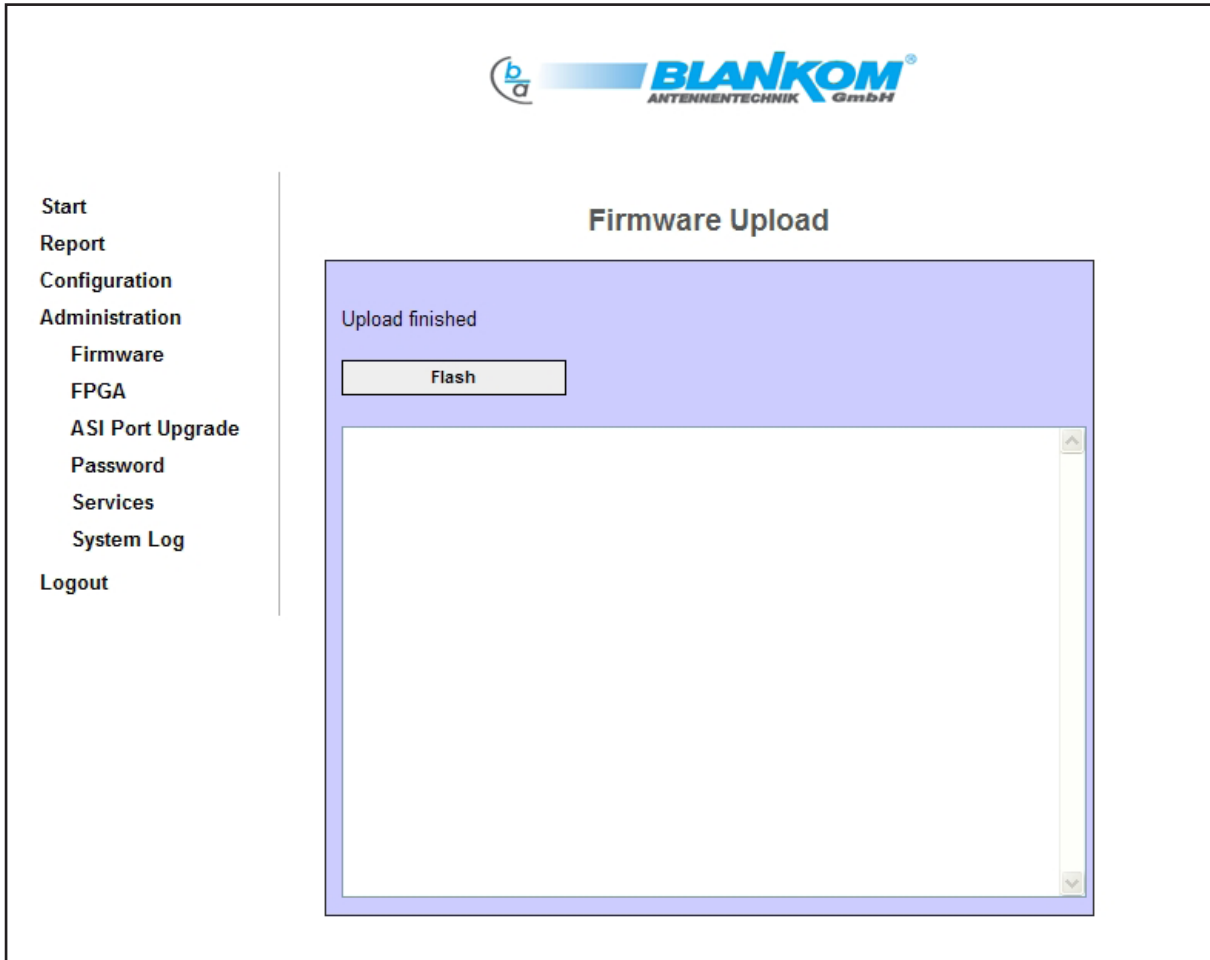
Fig. 15: Upload finished, "flash" as request for internal transfer of data

If the "Flash" button is clicked, the update will be written to the internal memory for fixed values. While this is happening, the following information will be shown:
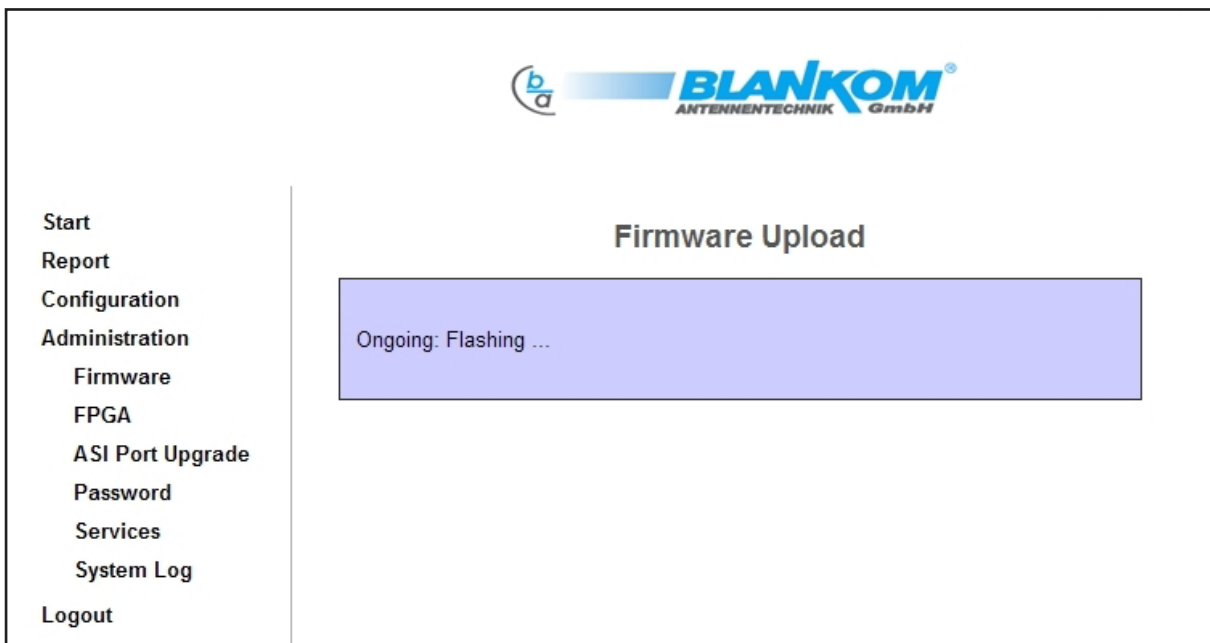
Fig. 16: Writing (flashing) the new firmware to the internal memory

When the flashing is successfully completed, the following steps are necessary to make the updates effective (see Figs. 17...20):
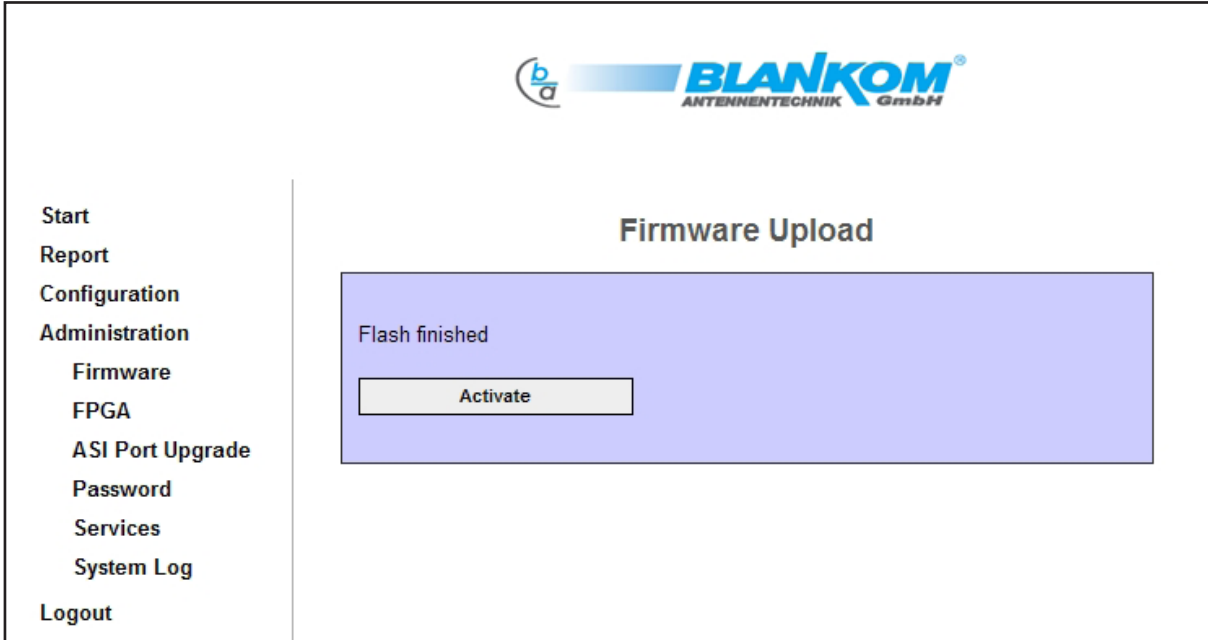
Fig. 17: Flashing complete; request enabling
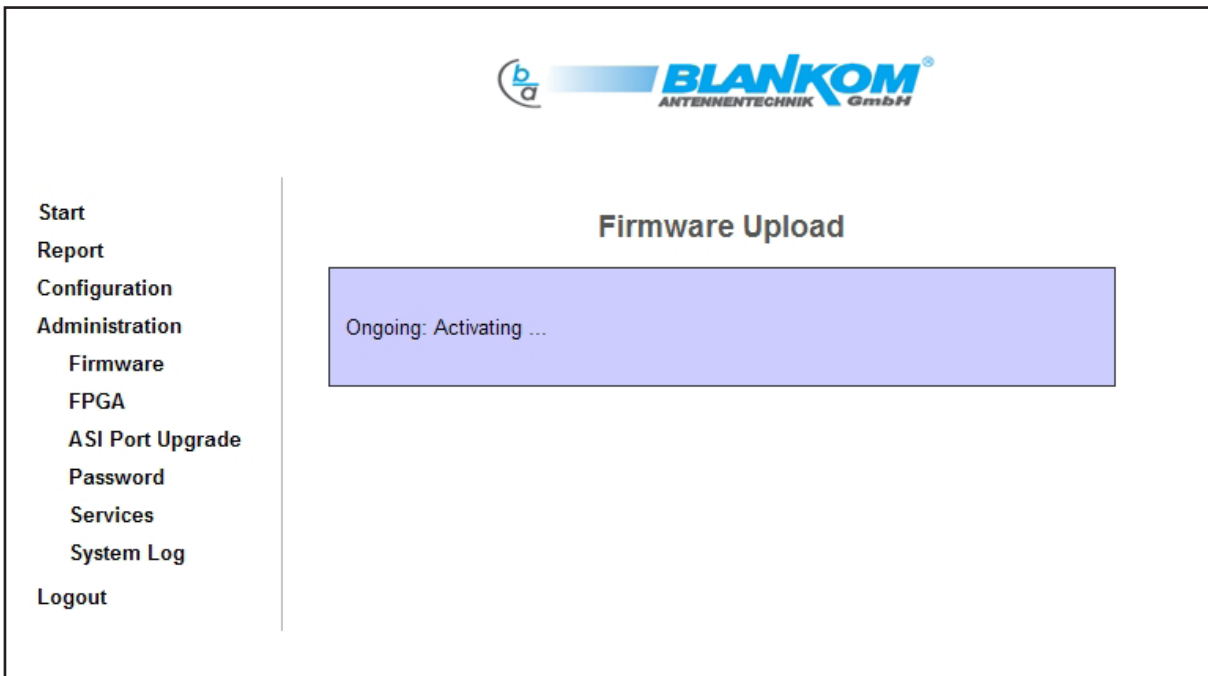
Fig. 18: Enabling (activating) the new firmware

Firmware Upload

Start
Report
Configuration
Administration
 Firmware
 FPGA
 ASI Port Upgrade
 Password
 Services
 System Log
Logout

Activation finished. Press the reboot button to restart the board.
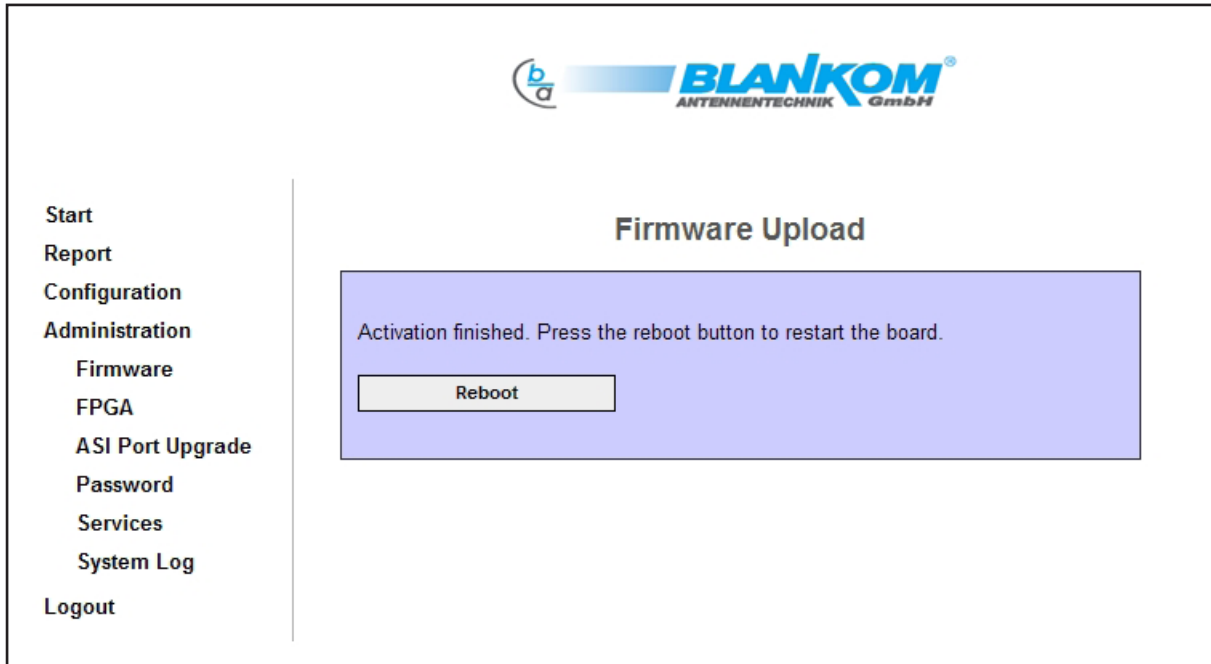
Reboot

Fig. 19: Request reboot in conclusion, to restart the device

Reset

Home
Report
Configuration
Administration
 Firmware
 FPGA
 ASI Port Upgrade
 Password
 Services
 System Log
Logout

Resetting board... Now, you should close your browser window.
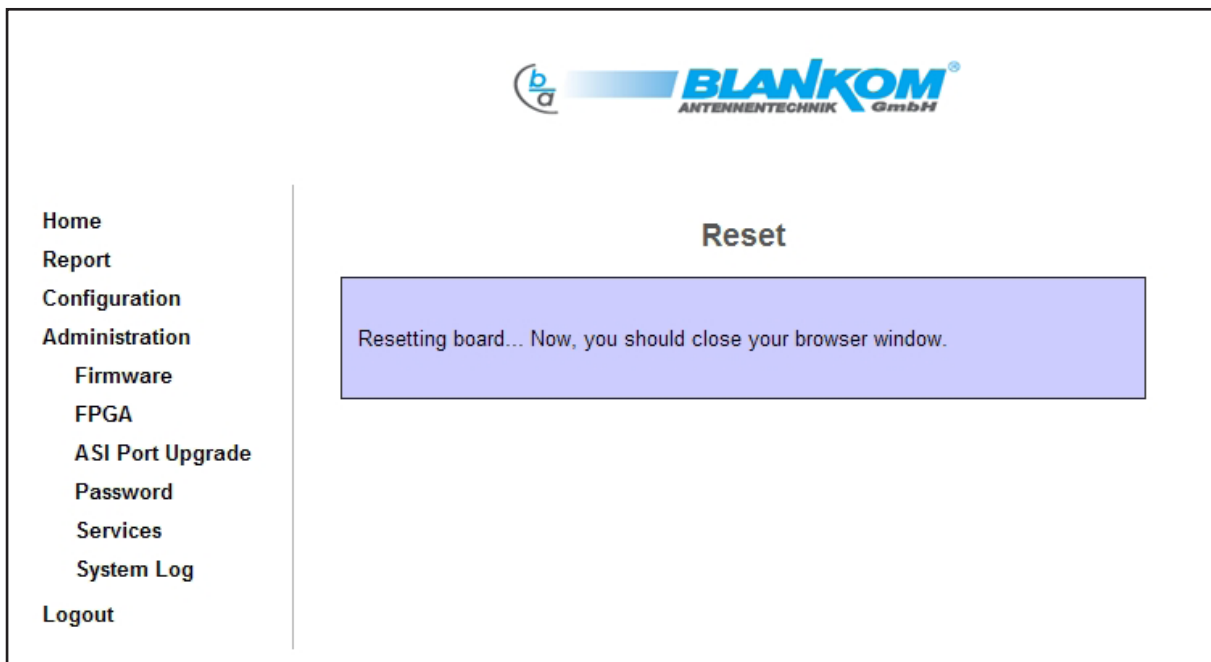
Fig. 20: Rebooting new firmware

3.4.4.1.2 Hardware update (FPGA)

The menu item which is used to update the hardware is "FPGA".
Here, again, a mask appears to enable the file to be selected:
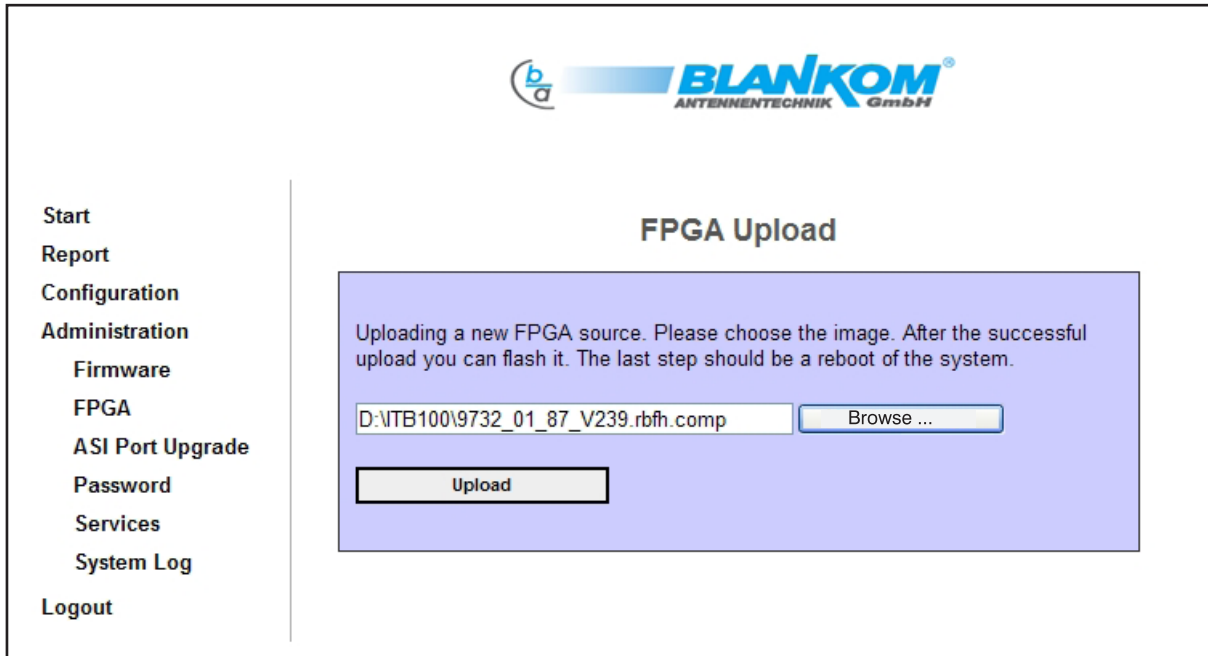
Fig. 21: Selection of file for FPGA update

When the relevant file has been selected, it will be uploaded and transferred to the internal memory on the hard drive.
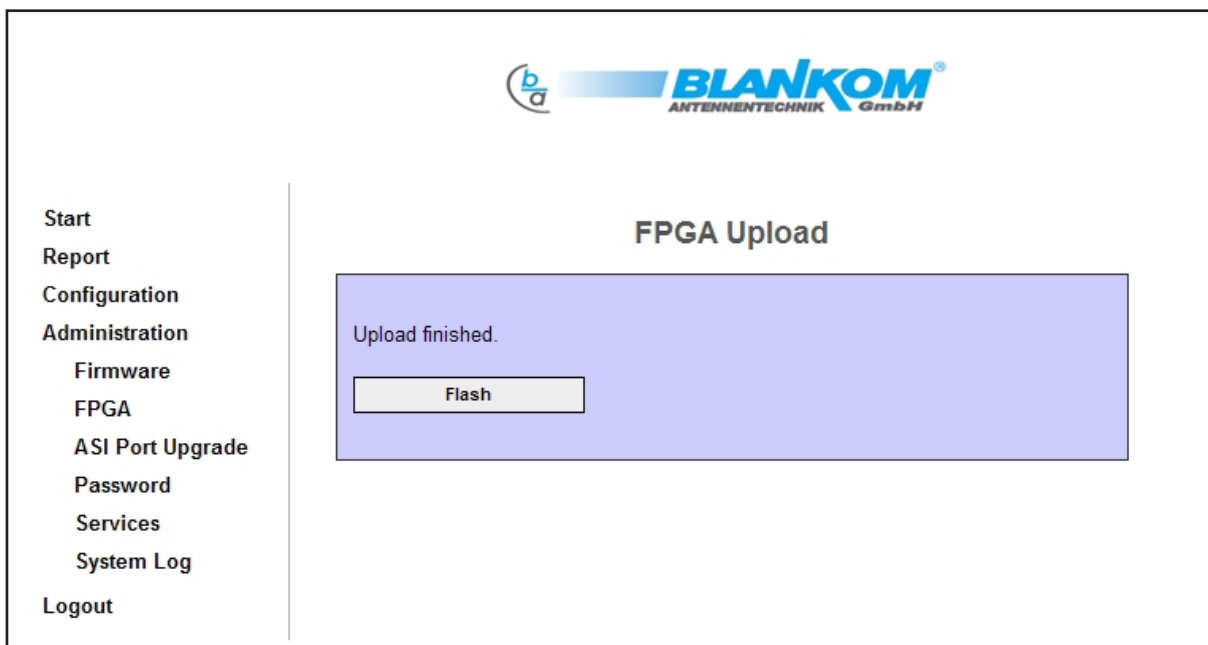
Fig. 22: Upload finished, "flash" as request for internal transfer of data

Once the files have been uploaded, the command to transfer them to the memory is required. The "Flash" button must be activated. The transfer (flashing) will take about 5 minutes.

Progress is shown in percentage terms and the information page (Fig. 23) is updated approximately every 10 seconds.

Fig. 23: Writing (flashing) the files to the memory

Once the flashing is complete, the system must be rebooted so that the change to the hardware takes effect.
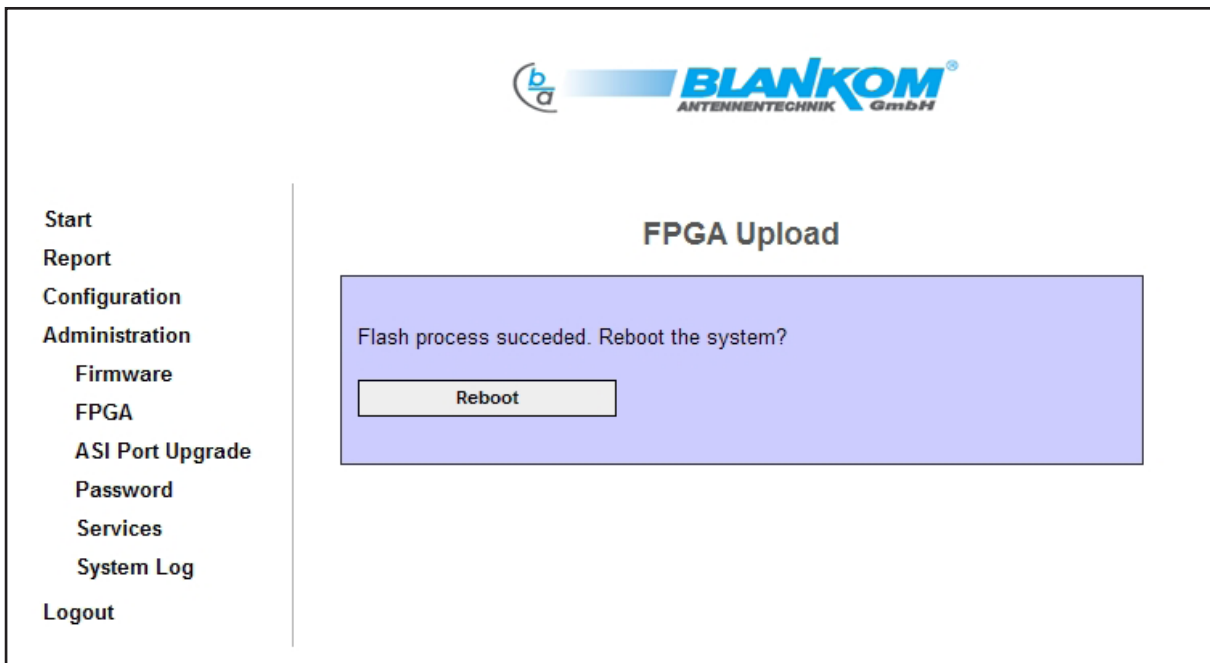
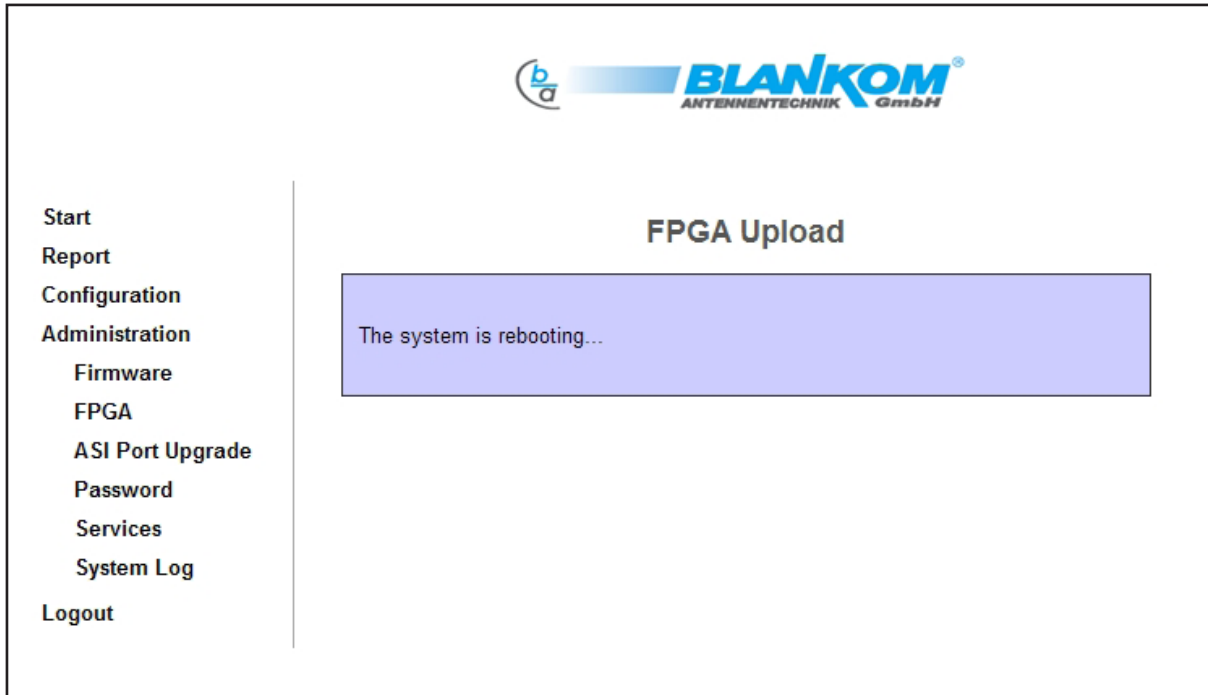Fig. 24: Flash procedure completed, request for reboot in conclusion

Fig. 25: Rebooting system

3.4.4.2 ASI port upgrade

If the software option CKB103 (catalogue item 9650.03) is purchased, it is possible to activate further ASI ports. CKB103 is a stand alone product extending the functions of the hardware by activating one more ASI port with each purchase.

The software option is always coupled to a particular device and is activated by a key for the purpose on that device. Transfer to other devices is not possible. The activation key cannot be generated without Update ID as well as Control Port MAC Address (MAC_ADDRESS_LAN, see Report) of the relevant device and the numbers of the ports it is desired to activate. The activation key can be sent or given by telephone, fax or email via the contact address given in Section 1.2.

By whatever method, the user will receive a certificate with the relevant details and the activation key. Actual activation then takes place via the "Administration → ASI port upgrade" menu on the device (see Section 3.4.4).
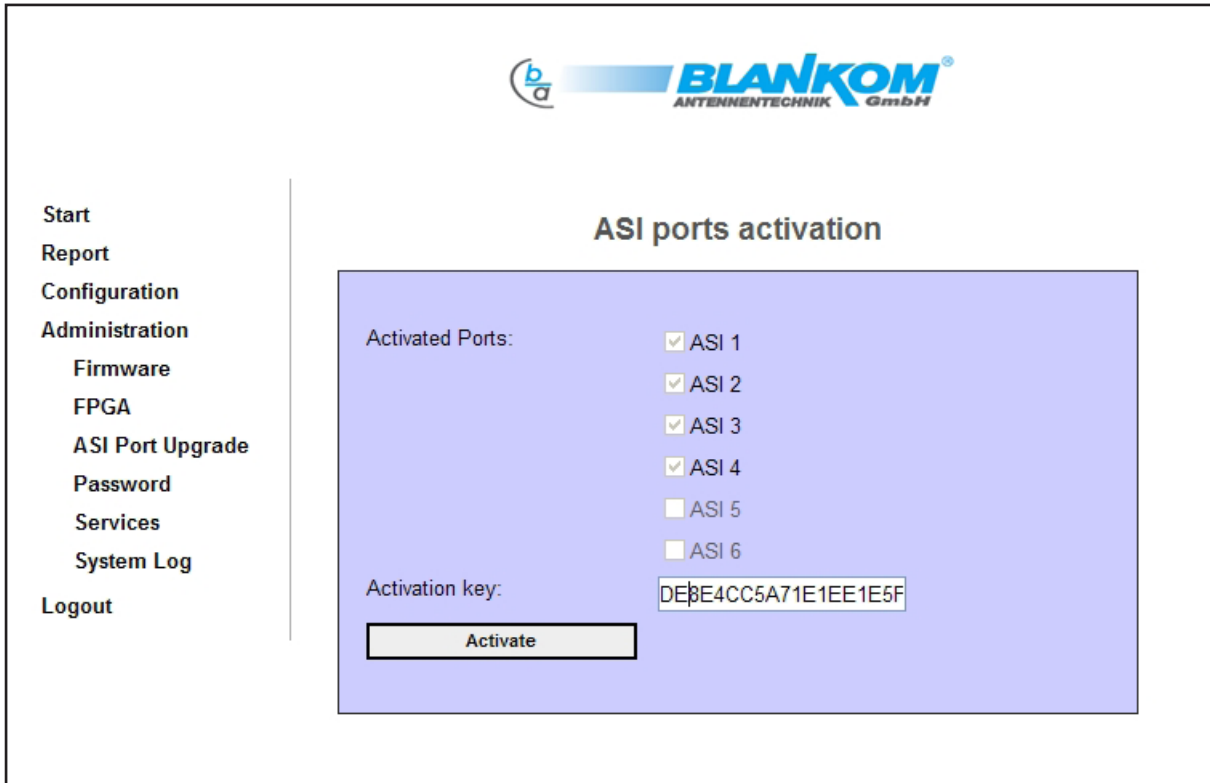
Fig: 26: Insert Key at device with 4 active ports

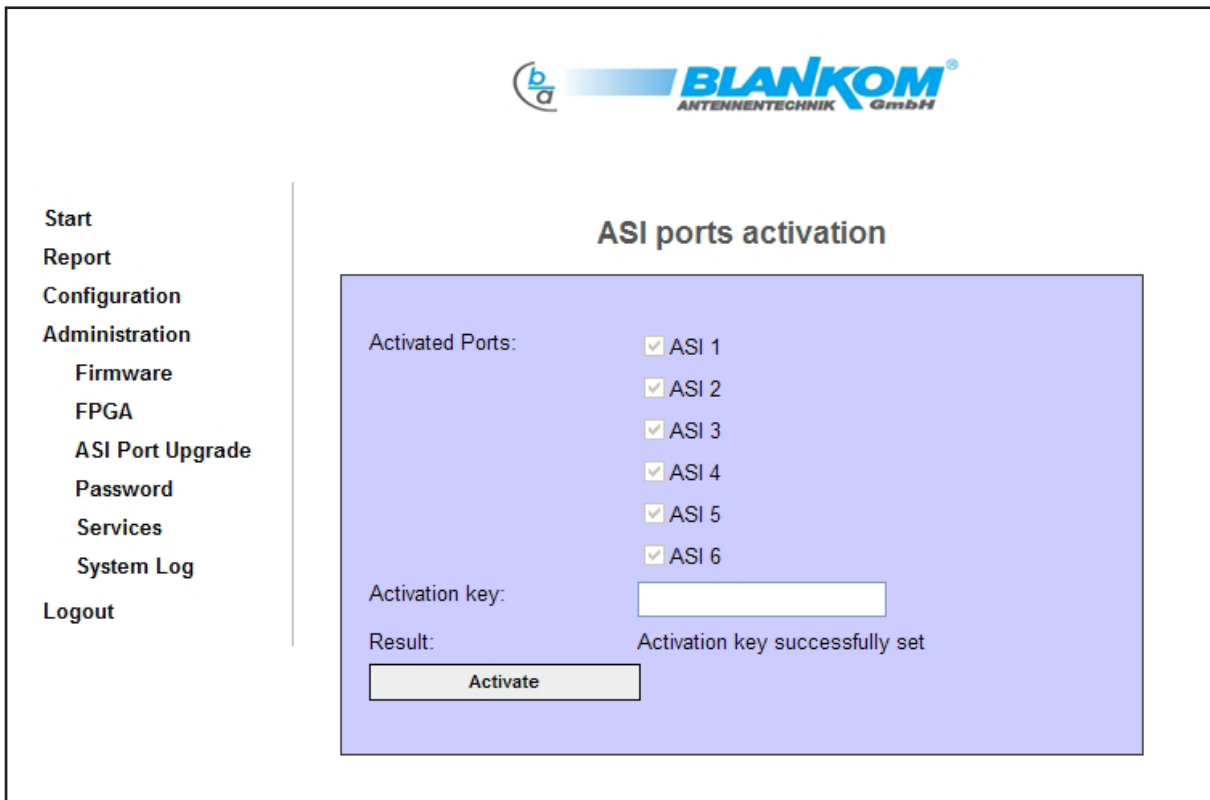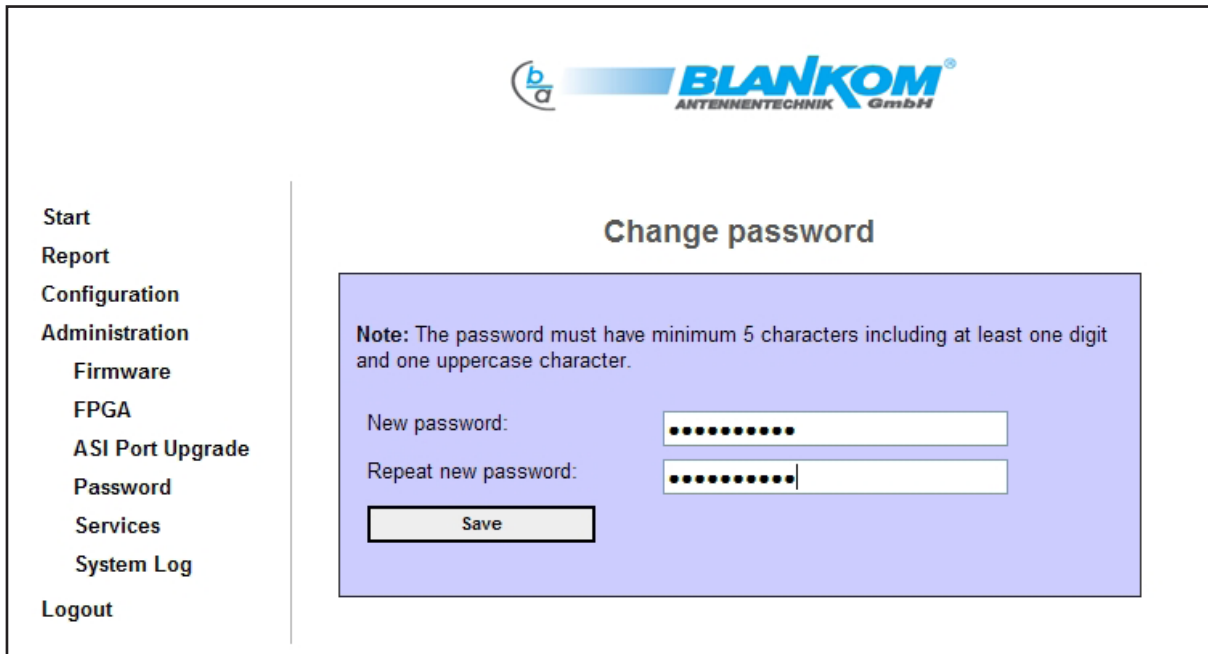"Please enter Activation key as shown in Fig.26 to activate ports."

Fig. 27: Validation of activation key

3.4.4.3 Changing the password for the device

Changes to the password are made by opening the menu item "Administration → Password". The following mask will appear:

Fig. 28: Changing the password

There are certain conventions for the password to comply with: 5 characters of which one must be a capital letter and one a digit. If these conventions are not adhered to, an error message will appear, for example:

Fig. 29: Error message (during change of password)

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BLINE CE

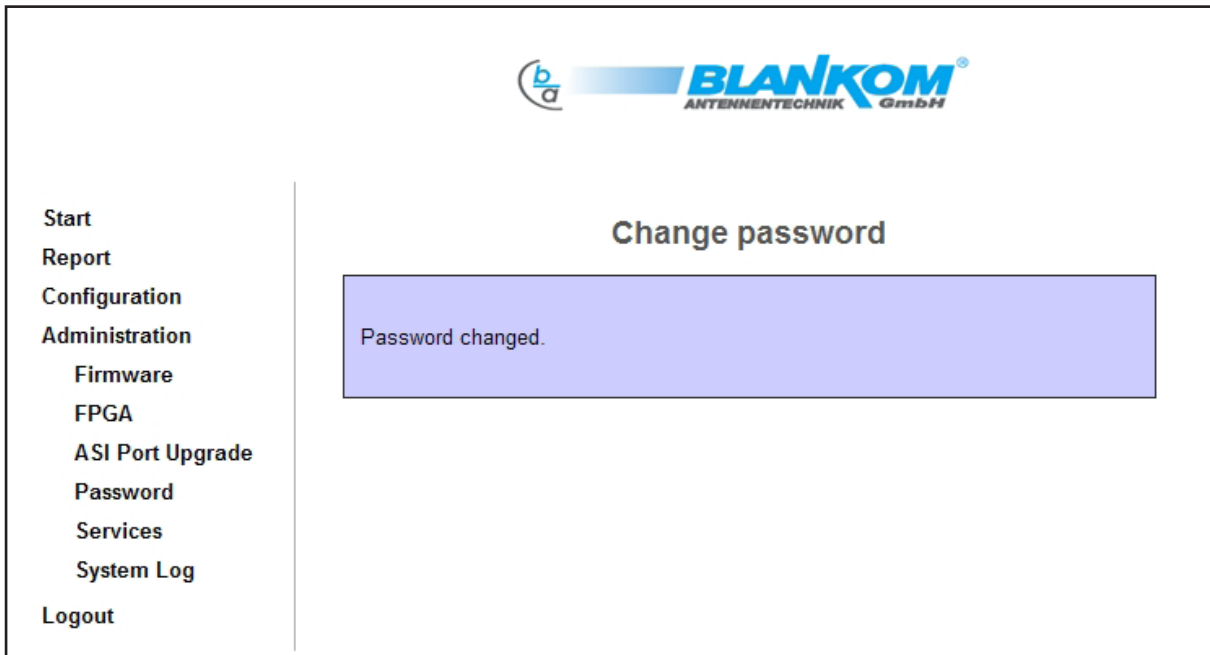If the change has been successful, the following message will appear:
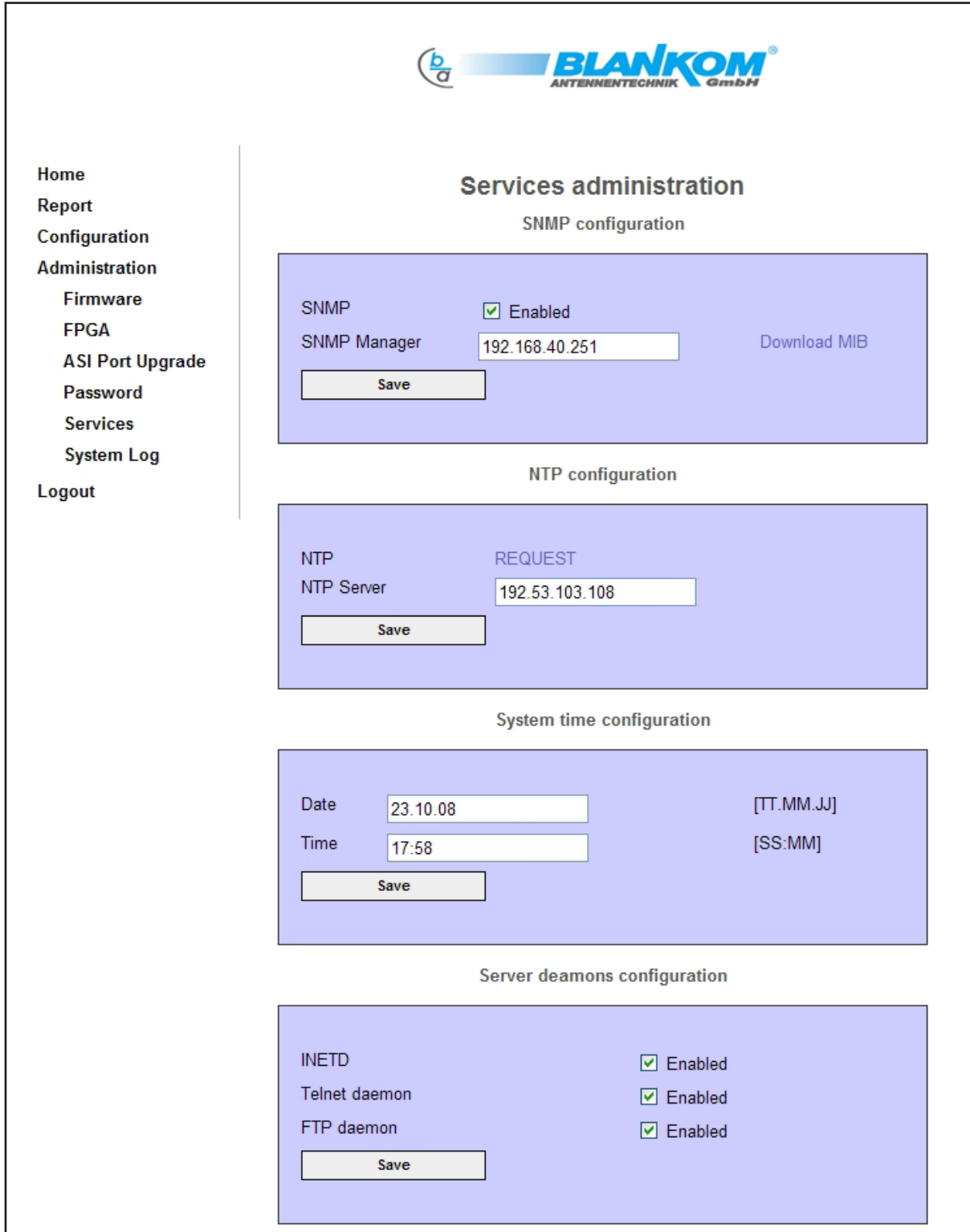

Fig. 30: Password changed correctly

The password is a common access restriction for all three interfaces web, telnet and ftp.

3.4.4.4 Server administration

The ITB 100 has a number of servers. They can be configured with the mask below after calling up the "Administration → Services" menu.

Fig. 31: Configuring servers

Parameters	Notes
SNMP configuration	
SNMP	By setting this as "enabled", the SNMP function is activated, i.e. there are traps producing messages in the case of certain events.
SNMP Manager	IP address of the SNMP manager where the traps are collected.
Download MIB	Button to enable MIB file to be downloaded
Save	For saving the configuration
NTP configuration	
NTP	Clicking on the "REQUEST" button makes the component attempt to synchronise with the current date and time set for the network at the IP address given below.
NTP server IP	IP address of the NTP server
Save	For saving the configuration
System time configuration	
Date Time	Date and time details for the network, either discovered automatically by means of NTP or typed in manually.
Save	For saving the configuration
Super server daemon configuration	
INETD Telnet daemon FTP daemon	These are auxiliary or background programs (e.g. programme start restrictions, rapid file transfer, service connection) They are not necessary for normal operation and should therefore be switched off.
Save	For saving the configuration

Table 8: Setting parameters for server configuration

3.4.4.5 Log file

Opening the menu item "Administration → System Log" brings up a log-file which presents a list of all changes made and their current status.
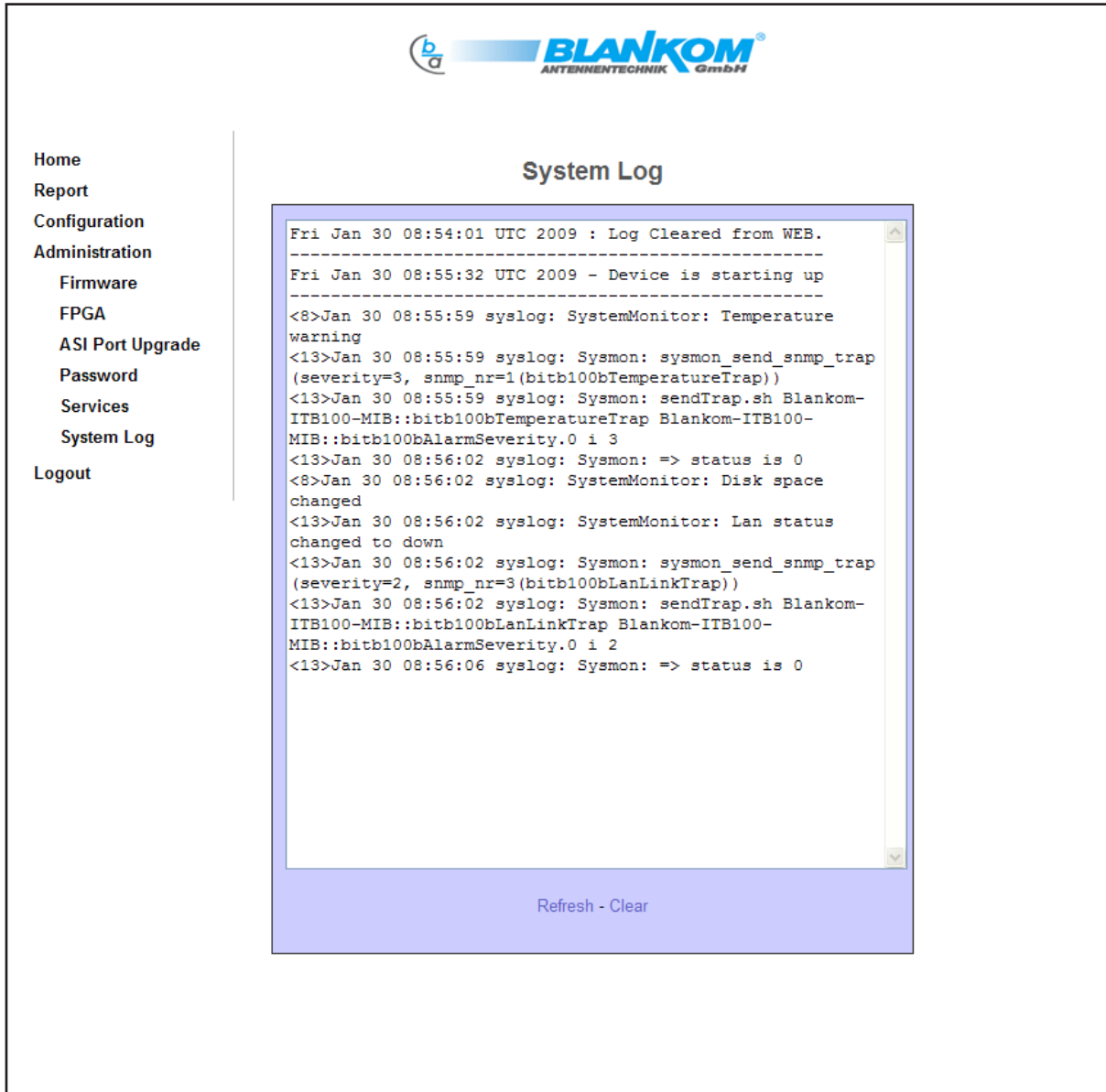

Fig. 32: Log file for the system

With the REFRESH and CLEAR buttons below the text window, the content of the log file can be updated or deleted, respectively.

4. Appendix

4.1 Technical data

ASI port

Signal processing	EN 50083-9
ASI data rate	270 Mbit/s
Plug connection	BNC socket
Impedance	75 Ω
Return loss	> 15 dB

Input port configuration

Level range	280... 880 mV$_{pp}$
ASI mode	burst, continuous (adapting of itself)
TS data rate	1.3 to 139 Mbit/s
	(the total rate of all input data together must not exceed 700 Mbps)
TS mode	188 / 204 byte (adapting of itself)

Output port configuration

ASI mode	burst
TS data rate	1.3 to 139 Mbit/s
TS mode	188
Output level	800 mV$_{pp}$ (+/- 10 %)

Streaming port

Network connection (LAN/WAN)	Ethernet, 10/100/1000 Base-T
Plug connection	RJ 45
Protocols	UDP, RTP
Additional error correction	pro-MPEG Code of Practice 3 rev. 2 (forward error correction)
Encapsulation	acc. ETSI TS 102034

Control port

Network connection (LAN/WAN)	Ethernet, 10/100 Base-T
Plug connection	RJ 45
Implemented servers	http server, SNMP server, DHCP client, NTP client

Elec. power:

Operating voltage	100 to 240 V ~ / 47 to 63 Hz
	100 to 353 V =
Power taken up	12 VA max.

Conditions for installation

Temperature range	-10 to +55°C
Relative humidity	$\leq$ 80 % (without condensation)
Orientation	vertical
Positioning	splash-proof and drip-proof

Miscellaneous

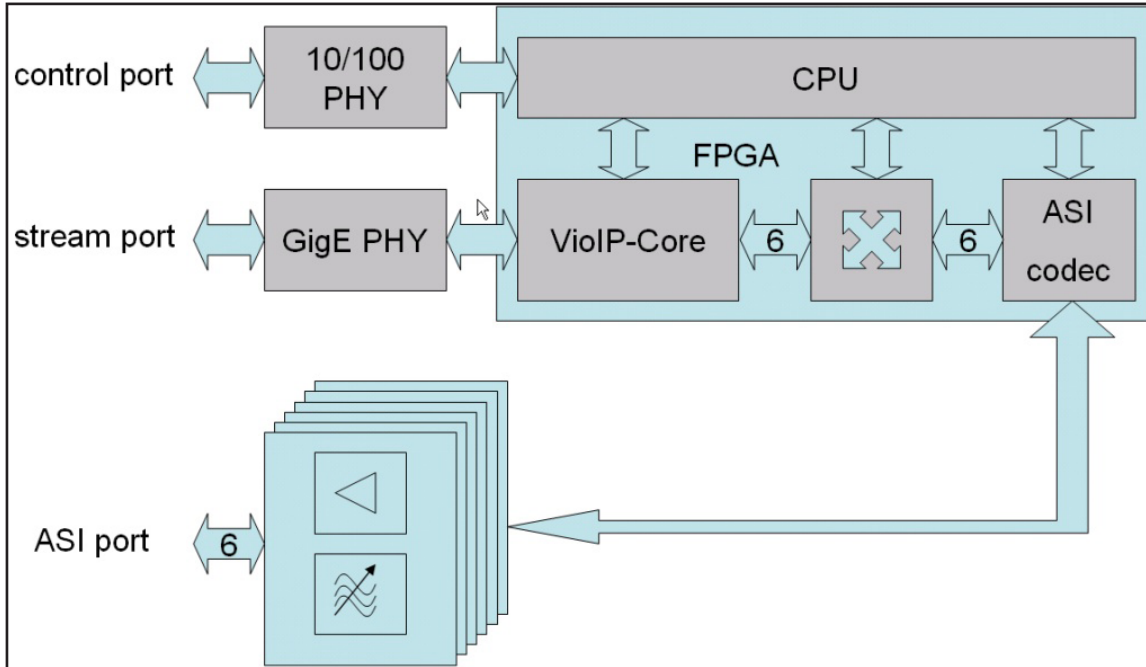|	
Dimensions (BxHxT)	
without 19" adapter	50 x 276 x 148 mm
with 19" adapter	50 x 301 x 148 mm
Weight	1,500 g

4.2 Block diagram

Fig. 33: ITB 100, circuit diagram

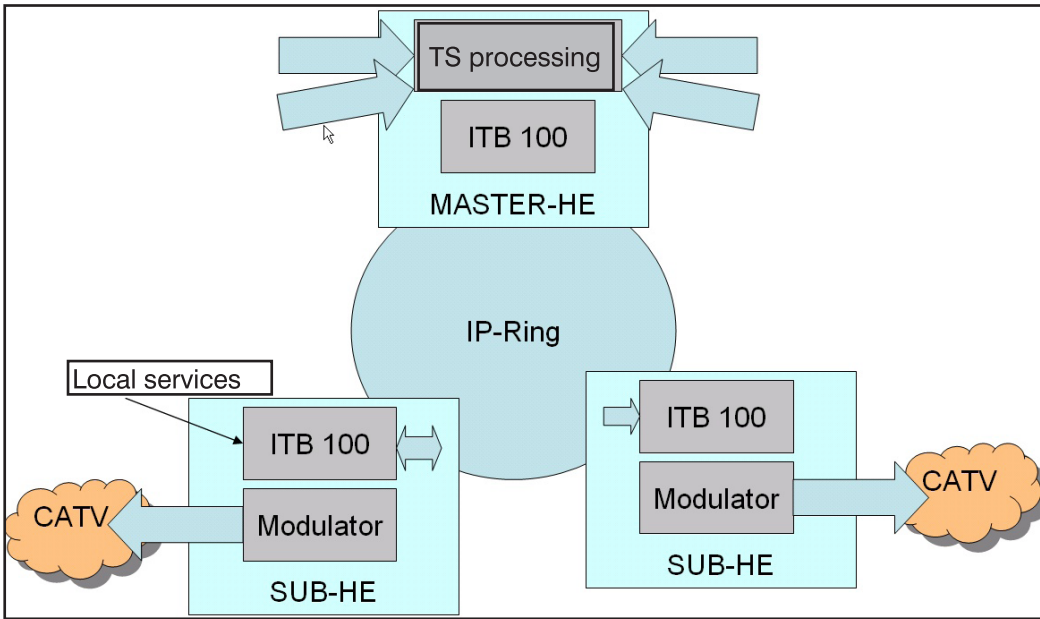## 4.3 Examples of use

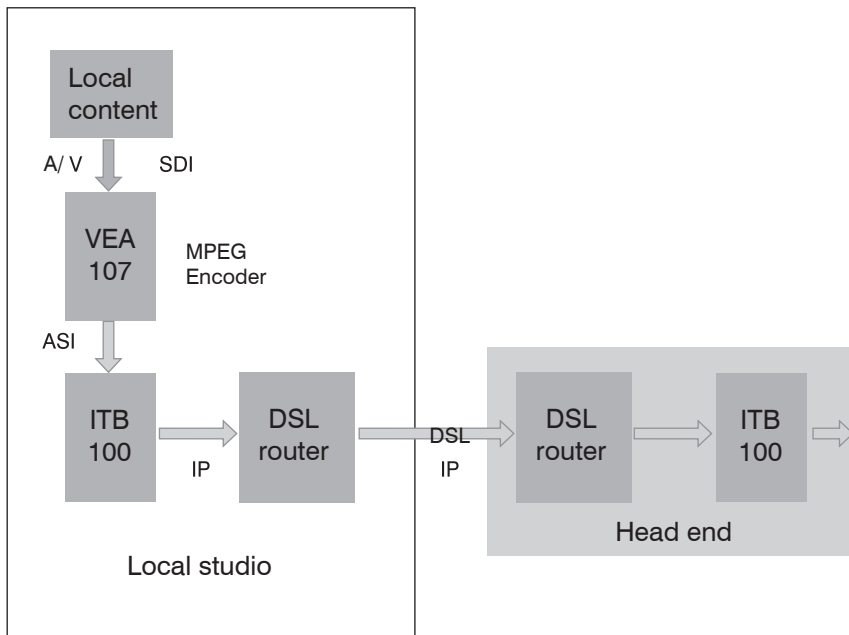Fig. 34: The concept of the master HE and sub-HE

Fig. 35: Playing MPEG data in from local services

4.4 Forward error correction

The forward error correction used, as under pro-MPEG code of practice 3 rev.2 (COP3R2), is defined in the document RFC2733. COP3R2 is currently being converted into an official standard (SMPTE 2022).

The principle is that additional redundant data packages are calculated (in the form of a two-dimensional data matrix with a maximum of 20 rows [D] and 20 columns [L] using an XOR algorithm) and are then embedded in the data stream (see Fig. 36). These data packages are then able to some extent to reconstitute any lost (but not faulty!) packages; the effectiveness increases the higher the number of columns and/or rows is selected (these are the FEC parameters L and D). FEC packages calculated from the rows (set as FEC parameter D) will correct burst errors; those calculated from columns (set as FEC parameter L) will also correct individual errors.

If only one of the parameters has been set, the term used for the FEC mode is "1D" (one dimension) and if both parameters are set the term is "2D" (two dimensions).

The higher the value selected for the parameters D and L, the more effective is the error correction. However, the delay is also greater, as is the necessary bandwidth (the bitrate).
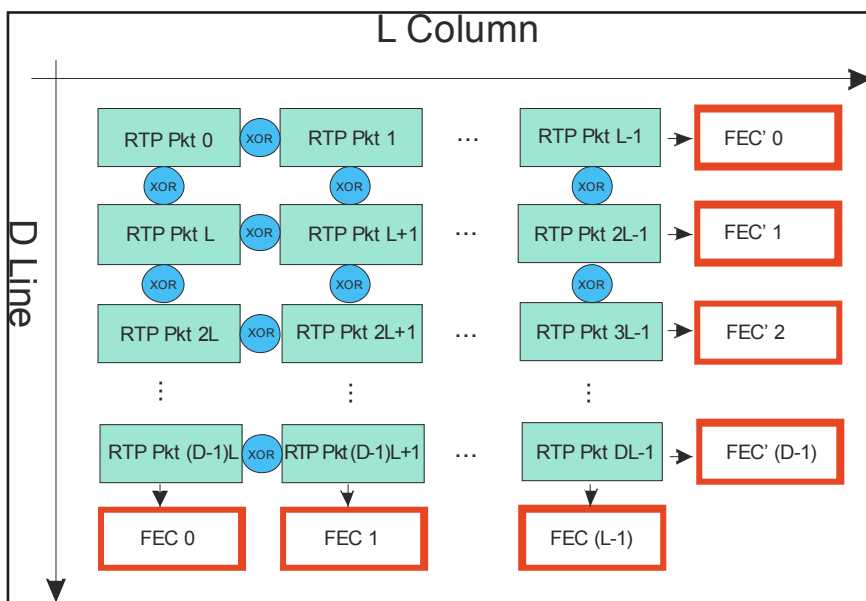

Fig. 36: Principle underlying the generation of additional FEC frames in the COP3R2

The FEC frames which are generated additionally in accordance with the selected matrix size are distributed across neighbouring ports but with a distance of 2 between those ports, so that when forward error correction is being applied between the UDP ports of two transport streams, a space of four ports must be left, i.e. only every fifth port may be used (see Fig. 37).
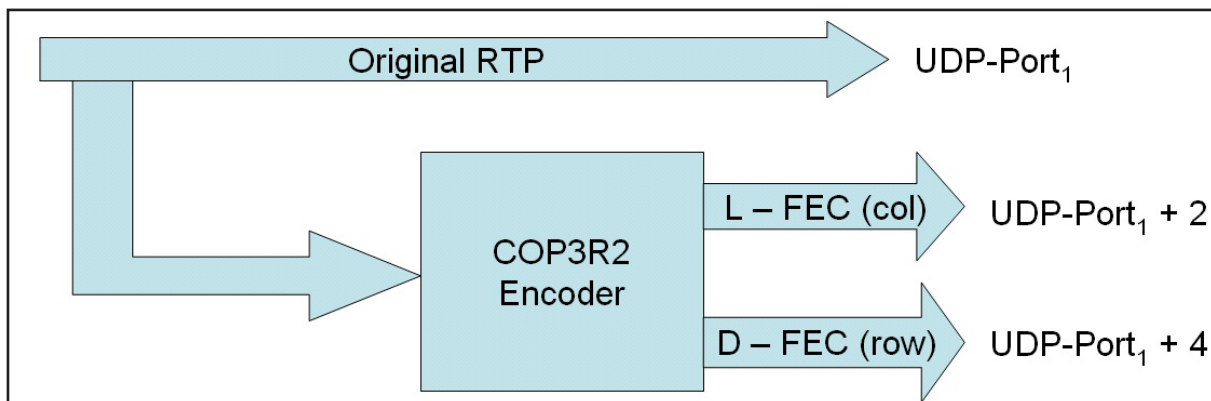

Fig. 37: Distribution of the data packages across the UDP ports in the case of FEC as per COP3R2

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4.5 SNMP management

4.5.1 Management Information Base (MIB)

The MIB is the reference point for all objects or parameters in any network requiring configuration. It is arranged as a tree. The BLANKOM path is shown as a section of the MIB tree in Figure 38. Each node in the MIB tree has a name and a number and can thus be referred to unequivocally in any list.
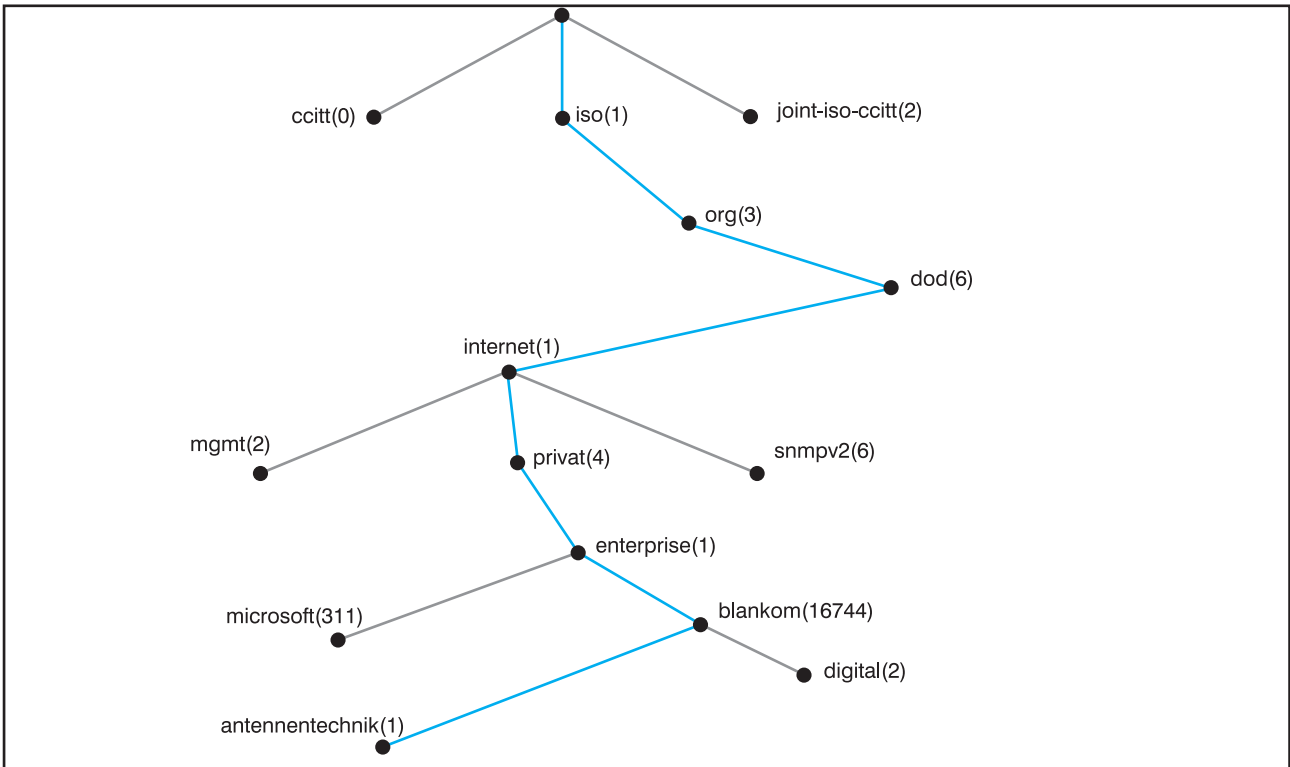

Fig. 38: Official position of the BLANKOM object identifier (OID) in the MIB tree

Its position in the MIB tree dictates the following script for the BLANKOM object identifier (OID) in the MIB tree:

iso.org.dod.internet.private.enterprise.blankom.antennentechnik
=1.3.6.1.4.1.16744.1

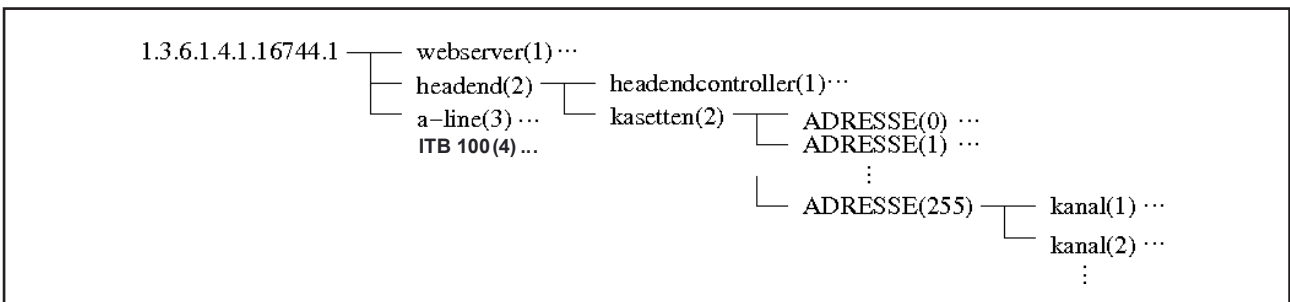Figure 39 shows the sequence for the rest of the OID as an example.

Fig. 39: General OID structure for BLANKOM head ends

4.5.2 Download of MIB / device management

The complete MIB for an ITB 100 can be downloaded by calling up the "Administration → Services" menu item under "SNMP configuration" and clicking the "Download MIB" button.
With the aid of an MIB browser, the relevant one can be decided upon and taken over to control the device via a network and/or an SNMP manager capable of SNMPv2c. Password for read and write community is "private".

Fig. 40: Extract of the OID structure of the ITB 100

Parameter set of ASI ports will be updated by setting the asi(1..6)Direction serving as "save" (see 3.4.3.3). All other OID will be updated immediately as long as a write permission exists.

4.5.3 Traps

A trap is generated when particular incidents occur within the device which are of relevance for the user. A typical example of traps is an alarm message, for example when temperature limits have been exceeded or there is signal loss.
Traps can be collected with special trap receiver software and then displayed. Table 10 shows a choice.

trap message	Cause	Notice
TemperatureTrap	Temperature greater than 50°C	Cool down ITB100
LanLinkTrap	LAN link broken / reconnected	Check LAN
GbeLinkTrap	GbE link broken / reconnected	Check GbE

Tab. 10: Choice of traps sent by ITB100

4.5.4 SNMP management software

The SNMP functions of the ITB 100 are primarily intended to assist integration into the management structures already existing. There are already mature software solutions in existence for network or SNMP management, and so BLANKOM does not accompany the device with SNMP management software.

There are usually tools for MIB loading and control and for trap reception (including evaluation, an example of which would be weighting on the basis of error priority or frequency) included in the SNMP management software; also for the setting of certain interactions, such as automatic administrator information.

Comprehensive information on how SNMP management software works is, however, beyond the bounds of this manual.
For this reason the reader is referred to other sources of information, such as that in [4].

4.6 Glossary

ASI	Asynchronuos Serial Interface
ARP	Address Resolution Protocol
CBR	Constant Bit Rate
COP3R2	pro-MPEG code of practice 3 rev. 2
DHCP	Dynamic Host Control Protocol
DNS	Domain Name System
DVB	Digital Video Broadcasting
ETSI	European Telecommunications Standards Institute
FEC	Forward Error Correction
FPGA	Field Programmable Gate Array
FTP	File Transfer Protocol
GbE	Gigabit Ethernet
HE	Head End
http	Hypertext Transfer Protocol
IANA	Internet Assigned Numbers Authority
ICANN	Internet Corporation for Assigned Names and Numbers
ICMP	Internet Control Message Protocol
IGMP	Internet Group Management Protocol
IP	Internet Protocol
MAC	Medium Access Control
MIB	Management Information Base
MPEG	Moving Pictures Expert Group
MPTS	Multi Program Transport Stream
NTP	Network Time Protocol
OID	Object Identifier
PHY	PHYsical (interface)
RTP	Realtime Transport Protocol
RFC	Request For Comments
SMPTE	Society of Motion Picture and Television Engineers
SNMP	Simple Network Management Protocol
SPTS	Single Program Transport Stream
Telnet	Communications tool
TS	Transport Stream
UDP	User Datagram Protocol
VBR	Variable Bit Rate
VoIP	Video over IP

4.7 Bibliography

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[2] ETSI TS 102034 V1.3.1 Digital Video Broadcasting (DVB);Transport of MPEG-2 TS Based DVB Services over IP Based Networks

[3] RFC Request for Comments (RFC): RFC Database; http://www.rfc-editor.org/rfc.html

[4] NetDecision Network Manager; http://www.netmechanica.com

[5] Comer, Douglas E., TCP/IP Konzepte, Protokolle und Architekturen, 1. Auflage Verlag: mitp, ISBN: 3-8266-0995-6

[6] Internet Assigned Numbers Authority (IANA); http://www.iana.org/assignments/port-numbers

[7] Internet Corporation for Assigned Names and Numbers (ICANN); http://www.icann.org

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[9] Stevens, W. Richard, TCP/IP. Der Klassiker. Protokollanalyse. Aufgaben und Lösungen; Huethig, ISBN: 978-3778540367

[10] WIRESHARK, Network protocol analyzer; http://www.wireshark.org

[11] VLC, Cross platform media Player; http://www.videolan.org/vlc/

[12] SMPTE, Society of Motion Picture and Television Engineers; http://www.smpte.org

4.8 History

Version no.	Date	Modification	Carried out by
1.00	10.03.2008	Original document	Kirchner, Häußer, Poch
1.01	08.04.2008	Alterations of technical data (Return loss)	Kirchner, Häußer, Poch
1.02	30.06.2008	Corrected and extended version	Kirchner, Fiedler, Bähring
1.03	31.07.2008	Corrected Version	Fiedler, Bähring, Wuckel
1.04	30.01.2009	Extended Version	Fiedler, Rudolph

Changes due to technical progress possible