BLANKOM®

Professional Headend Solutions

Operating instructions

SAT-AUDIO Transmodulator

2 x DVB-S (QPSK) → 6 x FM

Contents

STR 821

Part Nº: 9085.01

...Setting Signals

1. Safety and operating instructions

When assembling, starting-up and adjusting the modules, it is necessary to consider the system specific references in the manual instruction!

The modules may only be installed and started up by authorized technical personnel!

When assembling the modules into the receiving points, the adherence of the EMC regulations is to be secured!

The assembly and wiring have to be done without voltage!

All active modules may only be operated with the Headend Controller HCB x00 or Bus Extender BEB x00!

The main voltage and the operating voltage of the modules working by DC have to be in complience to the operating parameters described in the technical data.

With all work the defaults of the DIN EN 50083 have to be considered! Especially the safetyrelevant execution of the DIN EN 60728-11 [3] is necessary!

2. Device variants

STR 821 9085.01 2 x DVB-S(QPSK) → 6 x FM [87,5 ... 108 MHz]

Minimum software requirements for HCB x00:

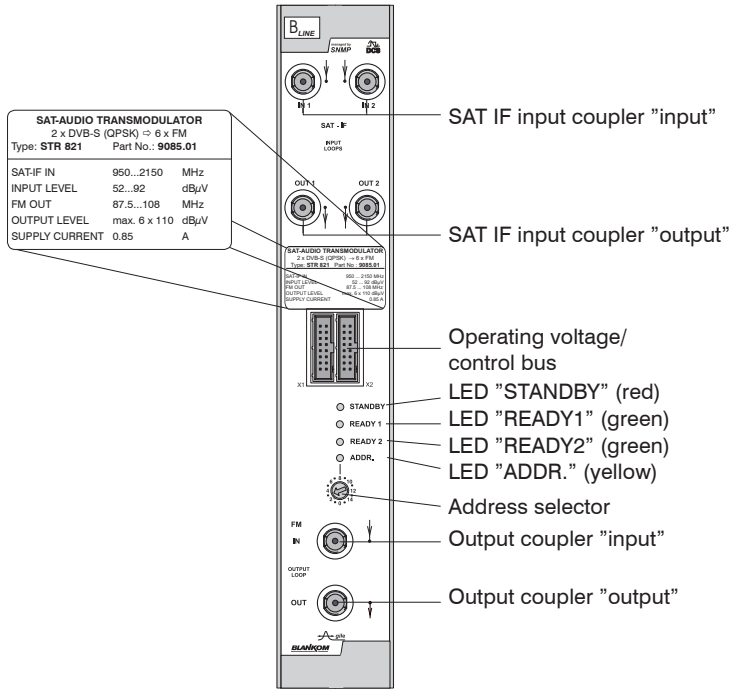
9650.03:	version 2.34*
9650.04/.05:	version 3.19*
9652.01:	version 3.23*

*) updates: www.blankom.de

3. General

The SAT-Audio transmodulator STR 821 is a module of the head end system B-LINE, which is conceived as a complete system for middle sized networks. The STR 821 makes it possible to produce up to 6 radio programmes coded as MPEG2 from two DVB-S transport streams in the FM range.
All the components are programmed via a central control unit and will function independently thereafter. The status of the modules are displayed via LED's (see chapter 7 „Meaning of the status LED`s on front panel “).

4. Front view



SAT IF input coupler ”input”

SAT IF input coupler ”output”

Operating voltage/
control bus

LED ”STANDBY” (red)

LED ”READY1” (green)

LED ”READY2” (green)

LED ”ADDR.” (yellow)

Address selector

Output coupler ”input”

Output coupler ”output”

gile

DCS

managed by
SNMP

5. Functional description

The transport streams (TS) passed on by the input section are processed on entering the system. The SI data are extracted and sent on to the control system so that the services to be decoded can be displayed and selected. At the same time, the audio streams to be decoded are filtered out of the transport streams, as are the RDS data, and these are passed to the DSP. The DSP decodes the MPEG data streams which it receives. The RDS data received from the TS processing stage and are sent on, together with the decoded MPEG data streams, to the FPGA of the modulator. 6 complete FM modulators for VHF are implemented in the FPGA. The audio signals are subjected to 19-kHz filtering in these. Next comes the stereo processing: the audio signals are added or subtracted and are modulated to match the 38-kHz carrier; to the audio signal a 19-kHz pilot tone and the RDS data are added. The MPX signal produced in this way is then modulated by FM. The FM signals are combined and passed through a D/A converter. They are then available either via a directional coupler or, simply, direct at the component output port. Each FM channel produced can be configured individually and independently of the others. The 12-V-LNC-remote power supply is switchable for both SAT-inputs at the same time (see chapter 8.3).

6. Adjustments

6.1 Adjustment with the Headend Controller

- Adjustment of the addresses at the Bus Extender BEB x00 and at the modules
- Activation of the programming mode on each module by selecting the line (BEB x00) and the module position (01... 15) at the Headend Controller(HCB x00)
  → yellow LED illuminates until the beginning of the parameter adjustment
- Adjustment of the STR 821 parameters (see chapter 9)
  → green LED is switched on
- After the programming the STR 821 will be automatically switched into the operating mode
  → yellow LED flashes shortly/ green LED is switched on

6.2 Adjustment with the PC/ laptop

- Prerequisite for the remote programming is an “online-connection” according the IP standard and an ethernet connection at the PC/ laptop
- Adjustment of the line/ position addresses at the Bus Extender BEB x00 as well as at the modules
- At the Headend Controller HCB x00 input IP address (e.g. 192.168.001.001)
- For “direct connection” between a PC and HCB x00 use crossover cable (RJ 45)
- For connection over a HUB use a normal straight throught patch cable
- Start-up HTML browser and put in IP address as target address
- If connected correctly the web interface will be opened on the pc and a blue LED (LINK) at the HCB x00 will be lit up.
- All adjustments of the modules are specified on the web interface.

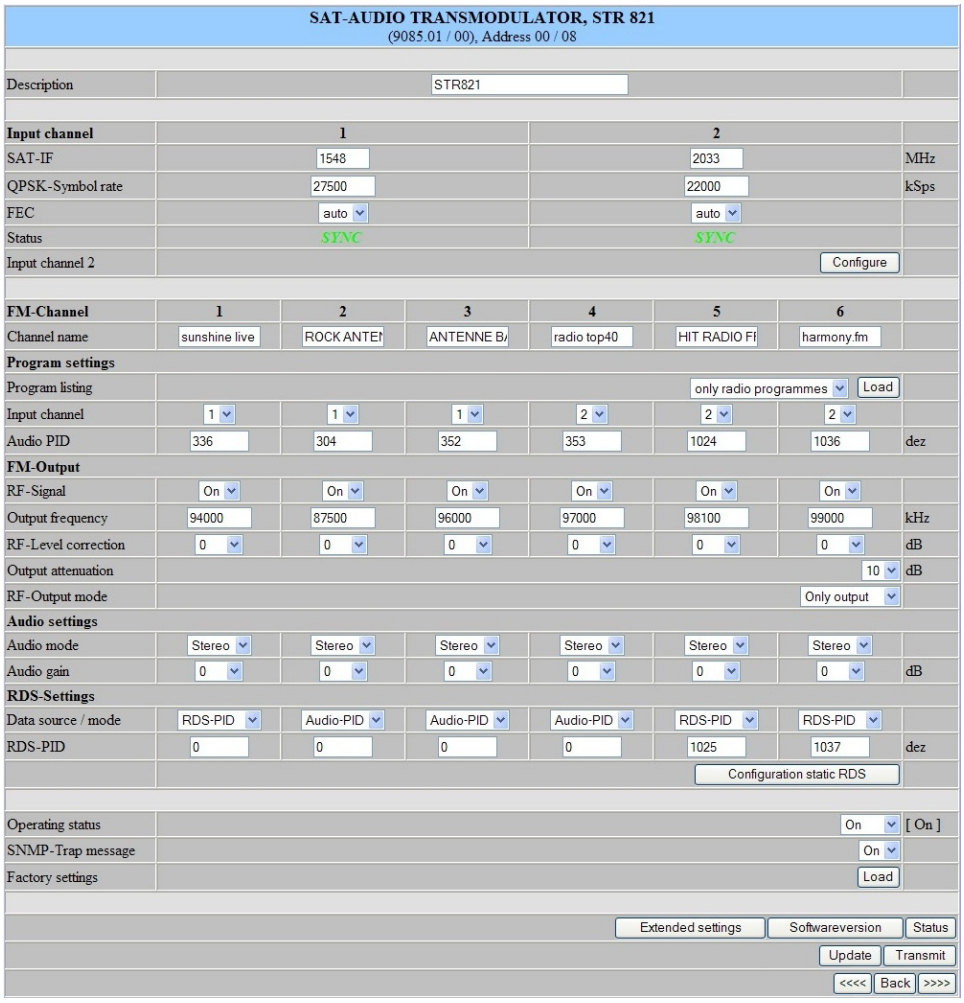
The manual instructions of the Headend Controller HCB x00 and the Bus Extender BEB x00 have to be considered!

7. Meaning of the status LED`s on front panel

Designation (Colour)	Status	Meaning of display
STANDBY (red)	permanently on	Module is in standby
	flashing	Module faulty (hardware)
READY 1 (green)	permanently on	Module working (SAT input 1), everything ok
	flashing	Error warnings depending on signal: - Tuner without sync (e.g. when there is no input signal) - at least one of the adjusted Audio-PID`s can not be decoded
READY 2 (green)	permanently on	Module working, (SAT input 2), everything ok
	flashing	Error warnings depending on signal: - Tuner without sync (e.g. when there is no input signal) - at least one of the adjusted Audio-PID`s can not be decoded
	off	SAT input channel 2 off
ADDR (yellow)	illuminated/ flashing	remote control connection/ data being exchanged

8. Programming by web server*

8.1 Main menu



Description Module name, editable (max. 30 characters)

Input channel displays the respective SAT channel (1 or 2)
SAT-IF adjustment range: 950 … 2150 MHz
QPSK-Symbol rate adjustment range: 1000 … 45000 kSps
FEC selection: auto, 1/2, 2/3, 3/4, 5/6, 7/8
Status displays whether **SYNC**hronization or **noSYNC**hronization with input
Input channel 2 configuration button for SAT input channel 2 (see menu 5)

* For further details see the HCB manual

FM-Channel	displays the adjustments of the FM output channel (1..6)
Channel name	programme name of the respective FM channel, editable (max 25 characters)
Program settings	
Program listing	loading of the list with available programmes with pre-selection: all programmes or only radio-programmes (see menu 2)
Input channel	selection: 1/ 2
Audio PID	Audio PID of the programme, adjustment range: 0 … 16383
FM-Output	
RF-Signal	selection: On/ Off
Output frequency	adjustment range: 87500 ... 108000 kHz
RF Level correction	adjustment range: +3 …-3 dB in 0.5-dB steps (per channel)
Output attenuation	adjustment range: 0 … 31 dB in 1-dB steps (module)
RF-Output mode	selection: loop/ only output
Audio settings	
Audio mode	selection: Mono/ Mono1/ Mono2/ Stereo/ Auto
Audio gain	adjustment range: +6 ... -10 dB in 0.5-dB steps
RDS-Settings	
Data source/ mode	selection: RDS-PID/ Audio-PID/ Static/ Off
RDS-PID	adjustment range: 0 … 16383

Routing to the adjustment menu: configuration static RDS (see menu 6)

Operating status	selection: On/ Off/ reset
SNMP-Trap messages	selection: On/ Off, if SNMP option in HCB x00 enabled, otherwise „locked“ displays
Factory settings	setting the default values (see menu 4)

Routing to the respective adjustment menus:

Extended settings	see menu 3
Status	see menu 7
Software versions	see menu 8

8.2 Load programme list (menu 2)

SAT-AUDIO TRANSMODULATOR, STR 821
(9085.01 / 00), Address 00 / 08

Input channel 1		FM-Output channel						Program info			
Audio ID	Program name	1	2	3	4	5	6	Service	Language	RDS	CA
304	ROCK ANTENNE	○	◉	○	○	○	○	Radio	DEU	*	
320	ERF Radio	○	○	○	○	○	○	Radio	DEU		
336	sunshine live	◉	○	○	○	○	○	Radio	DEU		
352	ANTENNE BAYERN	○	○	◉	○	○	○	Radio	DEU	*	
528	2255 Gewinnradio	○	○	○	○	○	○	Radio	DEU		
Input channel 2		**FM-Output channel**						**Program info**			
Audio ID	Program name	1	2	3	4	5	6	Service	Language	RDS	CA
702	Inselradio	○	○	○	○	○	○	Radio	---		
353	radio top40	○	○	○	◉	○	○	Radio	DEU	*	
354	ffn digital	○	○	○	○	○	○	Radio	UND		
355	Radio Paloma	○	○	○	○	○	○	Radio	UND		
356	WRN Deutsch	○	○	○	○	○	○	Radio	DEU		
357	PEPPERMINT fm	○	○	○	○	○	○	Radio	UND		
358	ffn Comedy	○	○	○	○	○	○	Radio	UND		
359	Radio Gloria	○	○	○	○	○	○	Radio	---		
1024	HIT RADIO FFH	○	○	○	○	◉	○	Radio	DEU		
1030	planet radio	○	○	○	○	○	○	Radio	DEU		
1036	harmony.fm	○	○	○	○	○	◉	Radio	DEU		
363	Radio Regenbogen	○	○	○	○	○	○	Radio	UND		
Disable program		**FM-Output channel**						**Programm Info**			
Audio ID	Program name	1	2	3	4	5	6	Service	Language	RDS	CA
0	empty	○	○	○	○	○	○				

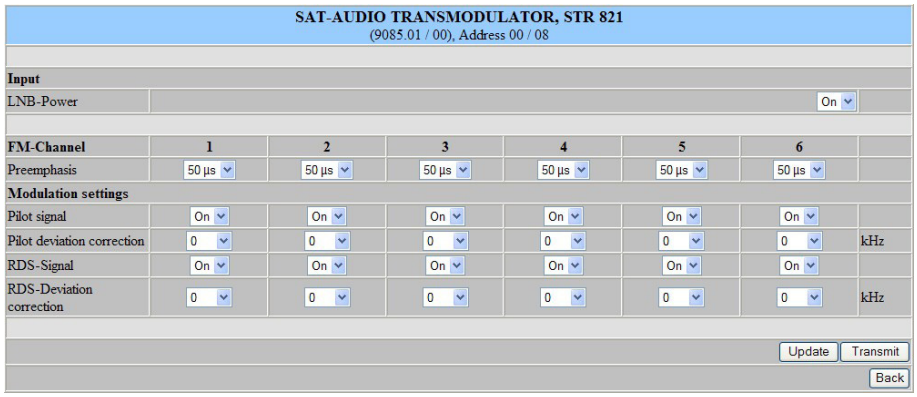
☑ Use program name for static RDS

Update Transmit

Back

In this menu, all of the input stream contained services are listed. Depending on the preselection only radio-services or all services appear. For every of the 6 FM channels a service can be choosen. The assumption/ settings of the services occurs by pressing the “Transmit” button.

8.3 Extended settings (menu 3)



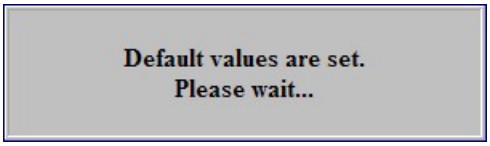
Input
LNB-Power — selection: On/ Off (for both channels)

FM-Channel — displays the adjustments of the FM-channels (1...6)
Preemphasis — selection: 50 µs/ 75 µs/ Off

Modulation settings
Pilot Signal — selection: On/ Off
Pilot deviation correction — adjustment range: +2 ... -2 kHz in 0.1-kHz-steps
RDS-Signal — selection: On/ Off
RDS-Deviation correction — adjustment range: +2 ... -2 kHz in 0.1-kHz-steps

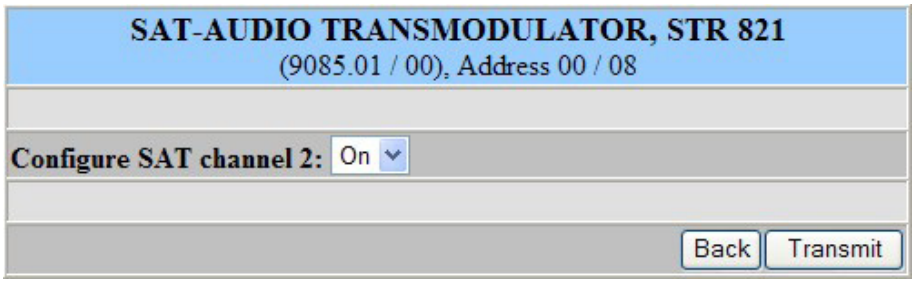
8.4 Factory settings (menu 4)

When this menu item is requested, at first a security query whether it really set all parameters to the factory default settings pops up.



Affirming the query, all settings stored in the EEPROM will be deleted and replaced by the default settings. The module will go back to these default values. Once the setting process is over, there will be an automatic return to the main menu. It takes about one minute.

8.5 Configuration of SAT Input channel 2 (menu 5)



In this menu the SAT input channel 2 can be set on or off.

8.6 Configuration of static RDS (menu 6)

SAT-AUDIO TRANSMODULATOR, STR 821
(9085.01 / 00), Address 00 / 08

Configuration static RDS

FM-Channel	1	2	3	4	5	6	
Output frequency	94000	87500	96000	97000	98100	99000	kHz
Audio PID	336	304	352	353	1024	1036	dez
PI-Code	D102	D302	D168	D409	D722	D314	hex
PS-Name	sunshine	ROCK ANT	ANTENNE	sunshine	HIT RADI	harmony.	
Radio text							
PTY-Code	POP M	POP M	POP M	POP M	POP M	POP M	
EON	Off	Off	Off	Off	Off	Off	
M/S-Code	Music	Music	Music	Music	Music	Music	
DI-Code	1	1	1	1	1	1	dez
TP-Signal	On	On	On	On	On	On	
TA-Signal	Off	Off	Off	Off	Off	Off	
CT-Signal	On	On	On	On	On	On	
UTC-Time	09:52:01 23.11.2009						
Local time offset	+1						h
CEST-Correction	On						

Update Transmit

Back

FM-Channel	displays the settings for the FM output channel(s) (1 to 6)
Output frequency	displays the frequencies set for the FM channel (in kHz)
Audio PID	shows the audio PID of the selected service
PI-Code	adjustment range: 0000 … FFFF (hexadecimally)*
PS-Name	8 characters of the name of the transmitted programme or service
Radio text	max. 64 characters, which can be transmitted statically
PTY-Code	selection of the programme type
EON	selection: On/ Off
M/S-Code	selection: music/ language
DI-Code	decoder identification control code, entered decimally. Default setting: 1 (stereo)
TP-Signal	selection: On/ Off
TA-Signal	selection: On/ Off
CT-Signal	selection: On/ Off
UTC-Time	displays the UTC time transmitted in the RDS
Local Time offset	relection + 12 ... - 12 h input of the offset between local and UTC time
CEST-Correction	enable/ disable automatic CEST correction

* The current list of PI codes for German radio broadcasters can be found on the following website:
www.irt.de./de/themengebiete/digitaler-hoerfunk/radio-daten-system-rds.html

8.7 Device status (menu 7)

SAT-AUDIO TRANSMODULATOR, STR 821
(9085.01 / 00), Address 00 / 08

Input channel	1	2	
Status	SYNC	SYNC	
Input frequency offset	1.456 MHz	1.211 MHz	
Signal reserve	7.4 dB	6.0 dB	
BER	< 1 E-6	< 1 E-6	
TS-ID	7	1113	

FM-Channel	1	2	3	4	5	6	
Output frequency	94000	87500	96000	97000	98100	99000	kHz
Audio status	Layer2 48kHz 192 kbps Frame0= 576 CRC 1 Emph 0 stereo	Layer2 48kHz 192 kbps Frame0= 576 CRC 0 Emph 0 stereo	Layer2 48kHz 256 kbps Frame0= 768 CRC 0 Emph 0 stereo	Layer2 48kHz 192 kbps Frame0= 576 CRC 1 Emph 0 stereo	Layer2 48kHz 256 kbps Frame0= 768 CRC 0 Emph 0 stereo	Layer2 48kHz 256 kbps Frame0= 768 CRC 0 Emph 0 stereo	
dynamically RDS data							
PI-Code	---	D319	D318	DAFA	---	---	
PS-Name	---	ROCK ANT	ANTENNE	*TOP_40*	bis 12 C	harmony	
Radio text	---	Die ROCK ANTENNE - 100 Prozent Rock nonstop	jetzt auf ANTENNE BAYERN: Midnight Oil - Beds are burning	normal ist anders	HITRADIO FFH - Hessens bester MusikMix -	harmony.fm Hoerertelefon 06101-985000	

Information		
Error memory	empty	
Temperature	105 °F	
Device number	0000000	
Device index	00	

Update Back

Input channel	displays the respective SAT channel (1 or 2)
Status	status of synchronization
Input frequency offset	tolerance of the pre-setted input frequency (in MHz)
Signal reserve	displays in dB
BER	displays the bit error ratio
TS-ID	displays the TS-ID
FM-Channel	displays the details for the FM output channel(s) (1 to 6)
Output frequency	displays in kHz
Audio status	audio status informations
dynamically RDS data	
PI-Code	displays the sender's PI code as contained in the data stream
PS-Name	displays the service name as contained in the data stream
Radio text	displays the radio text as contained in the data stream
Information	
Error memory	displays the errors arising in internal communication between the controllers
Temperature	temperature of the front circuit board
Device number	displays the device number
Device index	displays the device index

8.8 Software overview (menu 8)

SAT-AUDIO TRANSMODULATOR, STR 821
(9085.01 / 00), Address 00 / 08

Version	
AP-Controller	9085.01-81.01 Steuercontroller Anschluß-LP V1.04 06.05.2009 JR
TS-Manager	9085.01-88.03 TS_Aufbereitung V1.03f 22.01.09 SS
UKW-Bootcontroller	9085.01-88.01 UKW-FPGA download Ctrl(1) V1.02 17.10.08 JR
UKW-Modulator-FPGA	9085.01-87.01 6x UKW modulator V1.01 25.08.2008 PK
RDS-Encoder	9085.01-90.01 RDS-Encoder V1.04 05.05.2009 JR
MPEG-Decoder	9085.01-88.02 MPEG-Decoder V0.01 23.05.2008 SS

Update Back

Name of device, item number, address in head end

Software versions
displays the software versions for the controllers as follows:

Controller of the front circuit board

Transport stream manager

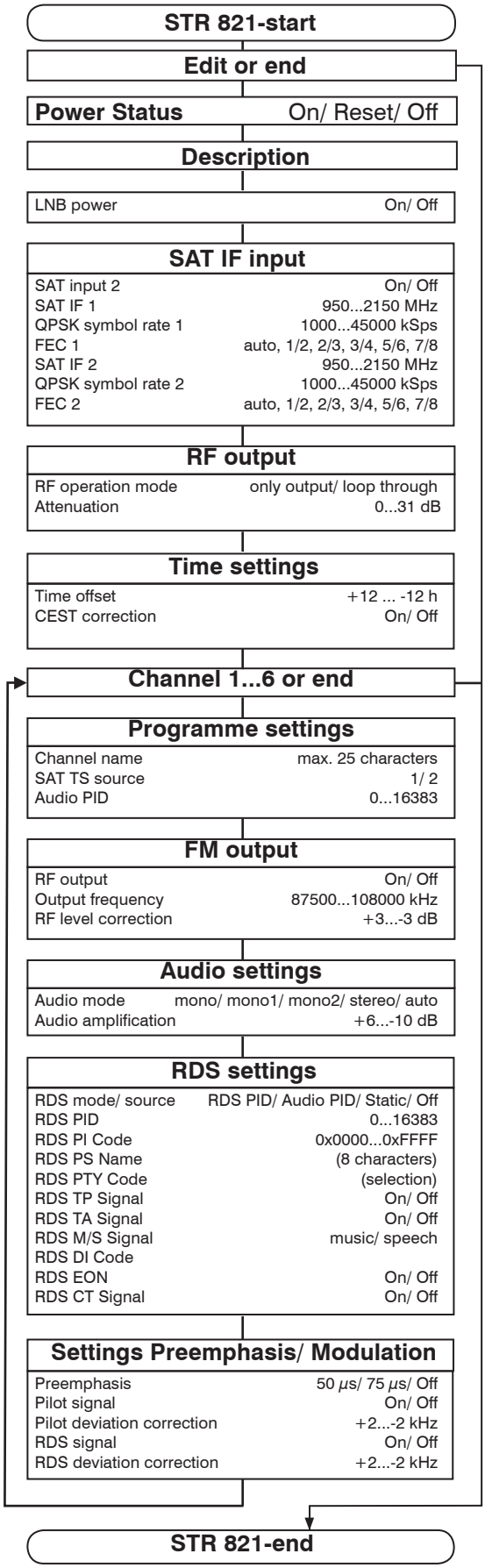
Boot controller of the FM modulator FPGA

FM modulator FPGA

RDS encoder

MPEG decoder

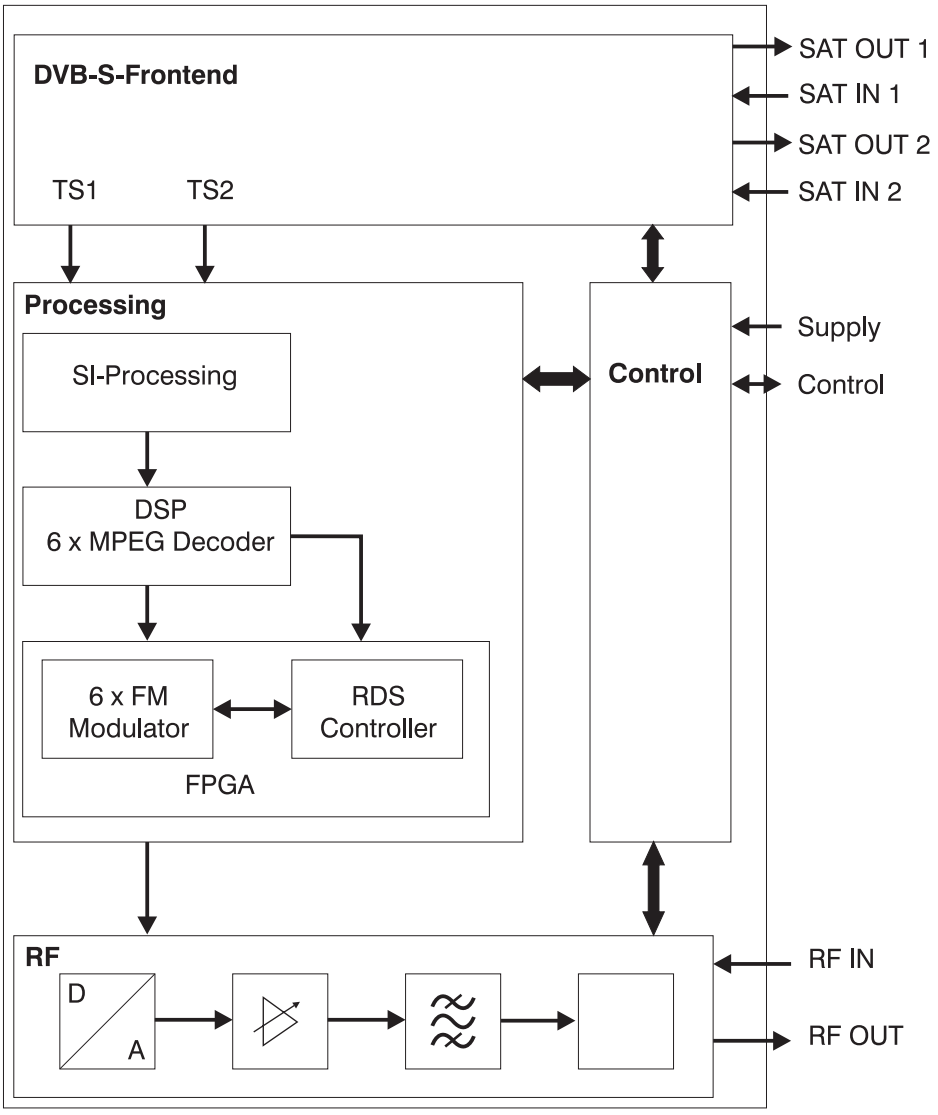
9. Manual menu control at the Headend Controller (HCB x00)



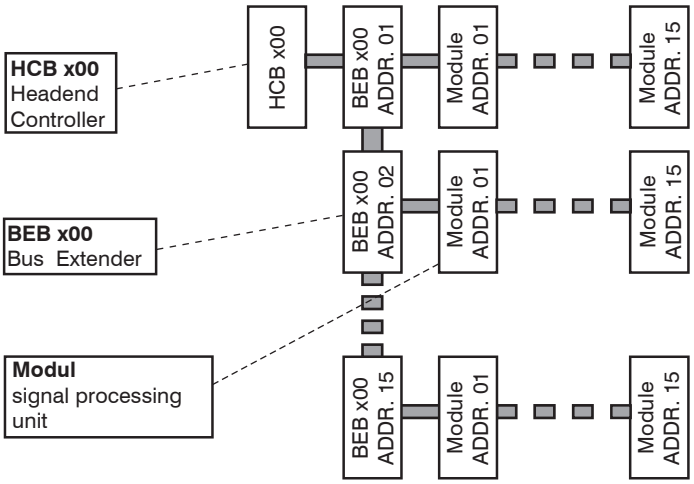
10. Trap messages

Item	Message	Type	Explanation
01	Signal OK	INFORMATION	Module works correctly.
02	Input not sync	WARNING	Input is not synchronized.
03	MPEG: Open Error	CRITICAL	Access error MPEG decoder
04	System reset	WARNING	Reset after internal error
05	MPEG-Decoder not sync	WARNING	MPEG decoder is not synchronized.
06	Power fail	CRITICAL	Error on supply voltage
07	MPEG-Decoder sync	INFORMATION	MPEG decoder is synchronized.
08	ATMEGA: Open Error	CRITICAL	Access error FM boot controller
09	NIOS: Open Error	CRITICAL	Access error RDS encoder

11. Block diagram

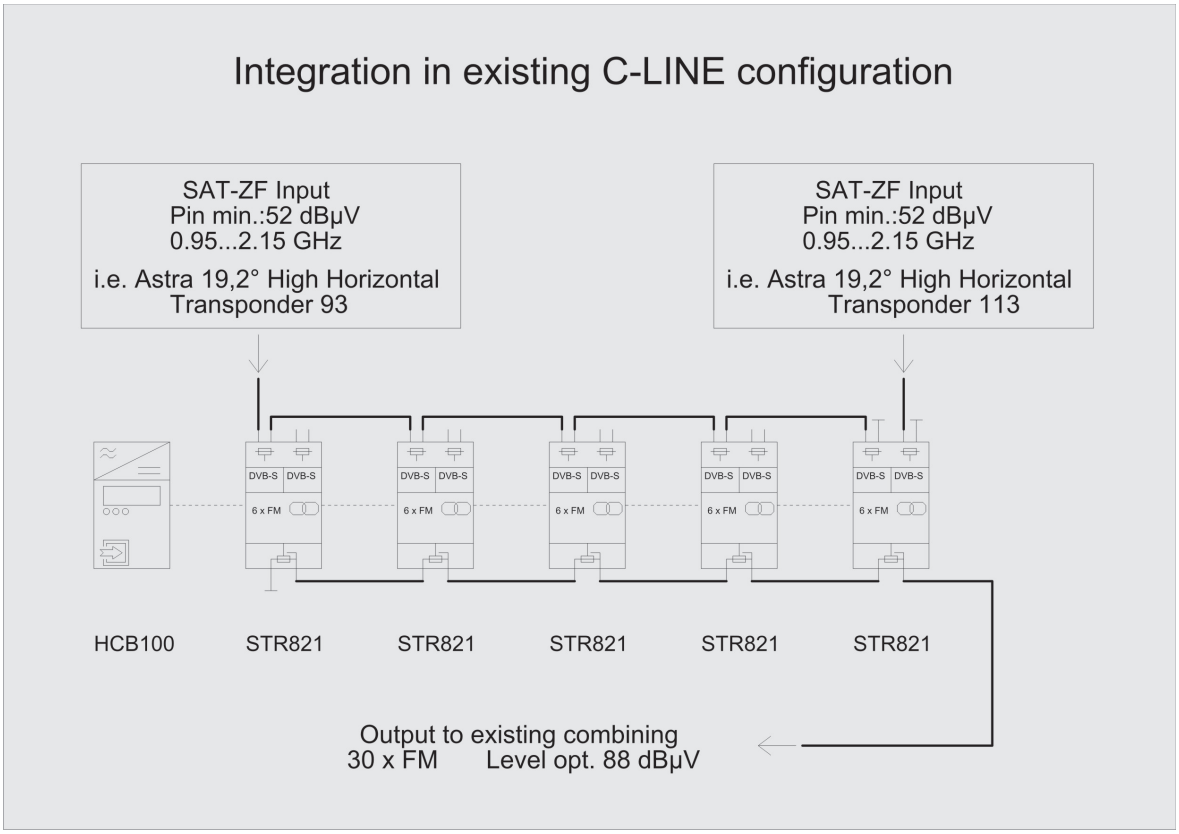


12. Head end bus structure



The number of the possible module connections (00 ... 15) to a BEB x00 depends on the total power consumption of this line!

13. Application example



14. Technical data

SAT IF input	
Frequency range	950 … 2150 MHz
Frequency step	1 MHz
AFC range	± 3 MHz
AGC level range	52 … 92 dBµV
Connector	F socket
Impedance	75 Ω
Through loss	≤ 1.5 dB
LNB remote power supply	12 V/ 400 mA, switchable
QPSK demodulator/ decoder	
Symbol rate	1 … 45 MSps
Code rate	1/2, 2/3, 3/4, 5/6, 7/8
Roll off	35 %
Signal processing	EN 300 421 (DVB - S) [1]
FM modulator/ FM output	
Max. FM deviation	75 kHz
LF level range (deviation correction)	-10 … +6 dB
Frequency range	87.5 … 108 MHz
Frequency step	50 kHz
Output impendance	75 Ω
Output return loss	> 16 dB
Amplitude response 40 Hz...15 kHz, reference 400 Hz, preemph. 50 µs	< ± 0.5 dB
Rejection of modulation frequencies between 18.9…19.1 kHz and 23…100 kHz	> 40 dB
Total harmonic distortion between	
40 Hz…15 kHz bei 40 kHz Hub	> 66 dB at 400 Hz
40 Hz…15 kHz bei 75 kHz Hub	> 60 dB at 400 Hz
Difference-tone-attenuation D2 between	
40 Hz…15 kHz	> 70 dB
SNR weighted (pre- and deemphase 50 µs, R, L)	> 66 dB (Quasi-Peak-Detector, CCIR weighted)
SNR unweighted (pre- and deemphase 50 µs, R, L)	> 72 dB (Quasi-Peak-Detector, CCIR unweighted)
Cross-talk attenuation in range	
40 Hz…100 Hz	> 38 dB (- 26 dBFS)
100 Hz…15 kHz	> 40 dB (- 26 dBFS)
Output frequency inaccuracy after 24 hours on 25 °C	< ± 2 kHz
Temperature depended frequency inaccuracy	< ± 2 kHz
Spurios between	
47…87.5 MHz and 111…862 MHz	≥ 64 dB
87.5…111 MHz	≥ 60 dB
Frequency error	≤ 3 kHz
Output level (switchable)	
direct output (w/o direct. coupler)	max. 6 x 110 dBµV
with directional coupler	max. 6 x 100 dBµV
Total level	1 dB (0 … 31 dB)
Individual level	0.5 dB (± 3 dB)
Connector	F socket
Stereo coder	
Processing	Multiplex, CCIR
Deviation pilot	6.7 kHz
RDS coder	
Processing	EN 62106:2001 [2]
Deviation	2.4 kHz
Supported services	PS, PTY, TP, TA, EON, PI, RT, MS, CT, DI
Operating parameters	
Current/ voltage	12 V (± 0.2 V)/ 850 mA (without LNB feed)
Residual ripple of supply voltage	≤ 10 mV_{pp}
Enviromental conditions	
Temperature range	-10 ... +55 °C
Temperature range for data keeping	5 ... 45 °C
Relative humidity	≤ 80 % (non condensing)
Method of mounting	vertical
Location of mounting	splash-proof and drip-proof
Miscellaneous	
Dimensions (l x w x h)	
without 19” adapter	50 x 276 x 148 mm
with 19” adapter	50 x 301 x 148 mm
Weight	1,200 g
Delivery content	
1 x Bus connector	
3 x F connecting cable 140 mm	

15. Bibliography

[1] EN 300 421 : Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for 11/12 GHz satellite services

[2] EN 62106:2001 : Specification of the radio data system (RDS) for VHF/ FM sound broadcasting in the frequency range from 87.5 to 108.0 MHz (IEC 62106:2000); German version

[3] EN 60728-11: Cable network for television signals, sound signals and interactive services Part 11: safety (IEC 607278-11: 2005). German version EN 60728-11: 2005

[4] RFC 1157 Request for Comments (RFC): RFC Database; url: http://www.rfc-editor.org/rfc.html

16. Glossary

AFC	**A**utomatic **F**requency **C**ontrol
AGC	**A**utomatic **G**ain **C**ontrol
AM	**A**mplitude **m**odulation
AP	**A**nschluss**p**latte (front circuit board)
ASI	**A**synchronus **S**erial **I**nterface
ATV	**A**nalog **Tele**vision
AV	**A**udio/ **V**ideo
BER	**B**it **E**rror **R**atio
CCIR	**C**omité **C**onsultatif **I**nternational **R**adiocommunication
CEST	**C**entral **E**uropean **S**ummer **T**ime
CT	**C**lock **T**ime
C/N	**C**arrier to **N**oise ratio
D/A	**D**igital/ **A**nalog
DI	**D**ecoder-**I**dentifications-Control code
DSP	**D**igital **S**ignal **P**rozessor
DVB	**D**igital **V**ideo **B**roadcasting (-C Cable, -S Satellite, -S2 Satellite 2, -T Terrestial)
EON	**E**nhanced **O**ther **N**etwork
ETSI	**E**uropean **T**elecommunications **S**tandards **I**nstitute
FIFO	**F**irst **I**n–**F**irst **O**ut
FM	**F**requency **m**odulation
FPGA	**F**ield **P**rogrammable **G**ate **A**rray
HTTP	**H**yper**t**ext **T**ransfer **P**rotocol
ID	**Id**entifier
IIC	**I**nter-**I**ntegrated **C**ircuit
IP	**I**nternet **P**rotocol
LED	**L**ight **E**mitting **D**iode
LNB	**l**ow-**n**oise **b**lock converter
MC	**M**icro**c**ontroller
MIB	**M**anagement **I**nformation **B**ase
MPEG	**M**oving **P**icture **E**xperts **G**roup
MS	**M**usic/ **S**peech
NIM	**N**etwork **I**nterface **M**odule
PCR	**P**rogram **C**lock **R**eference
PI	**P**rogramm **I**dentification
PID	**P**rogram **Id**entifier
PLL	**P**hase **L**ocked **L**oop
PMT	**P**rogram **M**ap **T**able
RDS	**R**adio **D**ata **S**ystem
PS	**P**rogram **S**ervice Name
PTY	**P**rogram **Ty**pe
QPSK	**Q**uadrature **P**hase **S**hift **K**eying
RF	**R**adio **F**requency
RT	**R**adio **T**ext
SNMP	**S**ingle **N**etwork **M**anagement **P**rotocol
SPI	**S**erial **P**eripheral **I**nterface
SPTS	**S**ingle **P**rogram **T**ransport **S**tream
TA	**T**raffic **A**nnouncement
TP	**T**raffic **P**rogram
TS	**T**ransport **S**tream
UTC	**U**niversal **T**ime **C**oordinated
VPS	**V**ideo **P**rogramming **S**ystem

17. Document history

Version	Date	Modification	Author
1.00	28.10.2008	Basic document	Häußer, Poch
1.01	24.11.2009	Revision	Häußer

Options available upon request! Subjects to changes due to technical progress.

CE Declaration of Conformity

The Manufacturer

BLANKOM Antennentechnik GmbH · Hermann-Petersilge-Str. 1 · 07422 Bad Blankenburg · Germany

herewith declares the conformity of the product

Product name:	SAT-AUDIO Transmodulator
Type:	STR 821
Product number:	9085.01

according to the following regulations

EN 50083-2
EN 60728-11 (as far as relevant)

and additional device-specific regulations, enclosed above, which this product is subjected to.

Date: 03.11.2009

Signature:

(Managing Director)