

QAM 12

QAM 12 EM

QAM 8 EM



Operating instructions

MADE IN GERMANY

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1. Hazards and safety instructions

Before working with the basic unit QAM 8 EM/ QAM 12 EM / QAM12 please make sure you read the following safety rules carefully!

Power supply and power cord

The device must be operated only at a power supply with a voltage of 230 V / 50 Hz.



Connection cable

Place the connection cable always trip proof !
Replace the power cord only with an original power cord.

Potential equalization / grounding

Proper grounding and installation of the device must be carried out according to EN 60728-11 / VDE 0855-1 regulations.

Operation without grounding or potential equalization of equipment is not allowed.

Humidity and placement location

The device must not be exposed to dripping or splashing water. If water condensation occurs, one must wait until the device is completely dry. The device must be installed on a vibration-free location.

Ambient temperature and heat effect



The maximum allowable ambient temperature is 45 ° C.

The ventilation holes of the device must **NOT** be covered under any circumstances. Too much heat or heat accumulation affect the life of the device and can be a source of danger.

To prevent heat buildup and to ensure good ventilation, the device must be mounted horizontally (eg. on a wall). The device must not be mounted above, on top, or near heat sources (e.g radiators, heating plants), where the device is exposed to heat radiation or oil vapors. The installation must be done **only** in rooms that ensure compliance with the permissible ambient temperature range, even under changing climatic conditions.



If the device exceeds the maximum operating temperature, it automatically switches to a reduced power consumption. The device is out of function during that time.

Once the temperature has reached again the allowable range, it automatically switches back on.

Warning:

When installed in rooms such as storage or attic one should pay particular attention on compliance with the ambient temperature. Because of the danger of fire due to overheating or lightning strike, it is recommendable to install the device on a noncombustible surface. Combustible surfaces are wood beams or bars, wood boards, plastic materials, etc.

Conditions to ensure electromagnetic compatibility (EMV - EMC ?)

All covers, screws and connectors must be securely mounted and tightened, contact springs must not be bent or oxidized.

Opening the case

ATTENTION

Device's case opening and repairs must be performed only by authorized personnel. First to be done is to pull the network plug.

Replacing of fuses must be done only with fuses of same type, value and melting characteristics.



No maintenance work during storms



ATTENTION

This module contains ESD components! (ESD = Electrostatic Sensitive Device). An electrostatic discharge is an electrical current pulse, which can flow also through an electrically insulated material, when triggered by large voltage difference.

To ensure the reliability of ESD components, it is necessary to consider their most important handling rules:

Electrostatic sensitive components can be processed only on electrostatic protected area (EPA)!

- Pay attention permanently to potential equalization (equipotential bonding)!
- Use wrist straps, approved footwear for personnel grounding!
- Avoid electrostatically chargeable materials such as normal PE, PVC, polystyrene!
- Avoid electrostatic fields >100 V/cm !
- Use only labeled and defined packing and transportation materials!

Damage caused by faulty connections and / or improper handling are excluded from any liability.

Waste disposal

Electronic equipment is not household waste but should be properly disposed on electrical and electronic equipment waste - in accordance with Directive 2002/96/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL.

Please take this device at the end of its use for proper disposal at the designated public collection points.



WEEE-Reg.-Nr. DE 51035844

2. General Information

The QAM 8 and QAM 12 devices are modern, compact transmodulators, which transfer the SAT transponder DVB-S / S 2 (8 x resp. 12 x QPSK / 8PSK) into DVB-C (8 x resp. 12 x QAM). The simple and quick installation, configuration and programming, enables an unproblematic operation. The QAM 8 and QAM 12 devices convert digital SAT signals into QAM signals so that they can be fed into cable networks. It is possible to transfer 8 resp. 12 transponders of different satellites. Thus, a transfer of SD and HD programs over all transponders is possible, regardless whether they are encrypted or unencrypted.

3. Device models

QAM 8 EM	4 SAT- Levels selectable via switching matrix (Switching of further SAT- levels is possible)
QAM 12 EM	4 SAT- Levels selectable via switching matrix (Switching of further SAT- levels is possible)
QAM 12	without integrated switching matrix, up to 12 different SAT- levels possible

4. Description

The QAM 8 or QAM12 converts random DVB-S or DVB-S2 Transponder (QPSK/ 8PSK) in DVB-C channels (QAM). The output frequency range is 112-860 MHz, individually adjustable. This frequency range can be fed into an existing coaxial distribution network. It is not relevant whether it is a network with a star, tree or mixed structure.

The QAM 12 is available in two options, as QAM 12 and QAM 12 EM. The latter with integrated input matrix, the first without.

Subscribers are able to receive all programs present at the selected transponders with a commercial DVB-C receiver or TV with integrated DVB-C tuner. It is irrelevant whether the individual programs in SDTV or HDTV, will be broadcast as a pay-TV or free to air signals.

Programming is done via a laptop / PC. This is connected via the included USB cable to the USB socket on the motherboard. Programming of QAM 8 or QAM 12 via a graphical user interface is easy and quick.

5. Scope of delivery

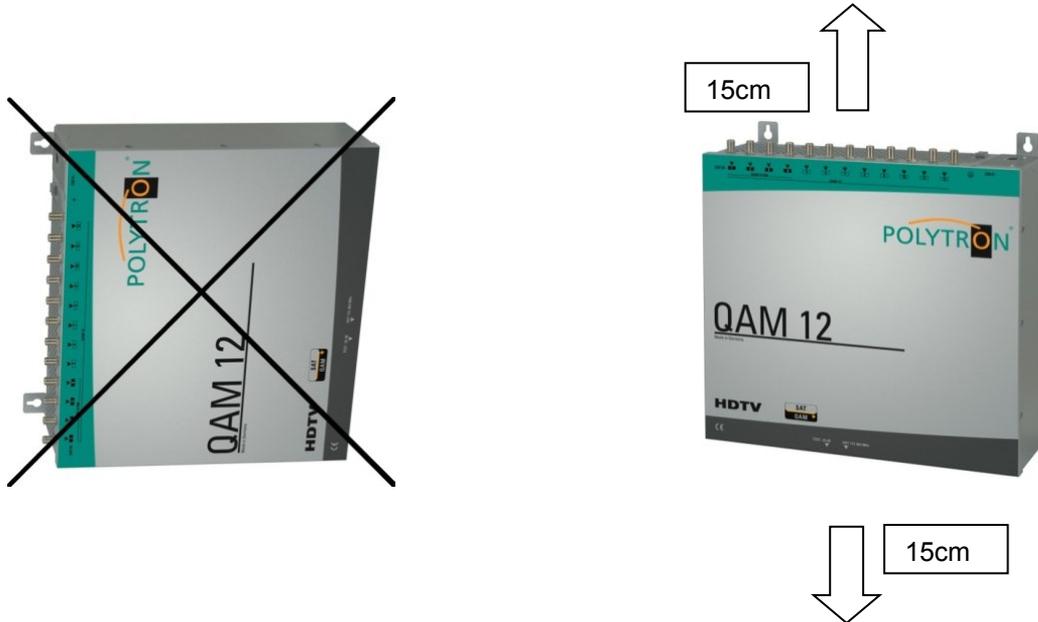
- 1 x QAM 8 or QAM 12
- 1 x Power cable
- 1 x USB-cable
- 1 x USB-Stick (Programming software)
- 1 x Operating instructions
- 1 x Installation accessories

6. Input circuit

The QAM 8 EM and QAM12 EM differs from the QAM 12 through an additional switching matrix. With the 4 in 8 resp. 4 in 12 matrix, four-SAT IF freely selectable signals can be switched to the 8 resp. 12 tuner. Here a transponder is selected and converted into a freely selectable output frequency between 112 – 860 MHz. With QAM 12 SAT-IF signals are directly fed to the input tuners, which is also possible with QAM 8 EM or QAM12 EM.

7. Assembling

The assembly of QAM 8 or QAM12 must be made in a well ventilated area. The ambient temperature must not exceed 45 ° C. It is necessary to ensure that air can circulate through the ventilation holes. A minimum distance of min. 15 cm must be maintained around the device so that air can circulate freely. For the assembly or for work on the cabling, the power cord should be pulled.



7.1 Grounding

The device must be grounded according to the EN 60728-11.

- Cable insulation of the grounding wire (4mm²) should be stripped about 15 mm.
- Push the stripped end under the ground screw and tighten the screw.



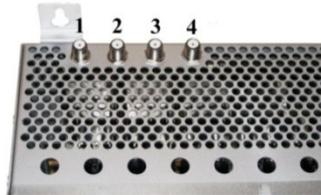
8. Installation

Remove the screws and remove the cover up.



8.1 QAM 8 EM and QAM 12 EM

Connect the various levels of the four satellite inputs (SAT 1, SAT 2, SAT 3, Sat 4) (see paragraph 10.1)



It is possible to connect levels of different LNB's.

The LNB voltage is fixed at the inputs 1 and 4.

The power consumption of the connected LNB's should not exceed 250mA per input.

Please note that a digital-compatible Quattro LNB (eg Polytron OSP AP 94) is used.

If the LED of the LNB supply is not lit, the LNB supply is interrupted or disturbed.



Please consider!

Total allowed power consumption of all connected LNBs cannot not amount to more than 500mA.

8.1.1 QAM 8 EM and QAM 12 EM Default setting of the input

The inputs and outputs of the device are programmed from factory with a standard frequency assignment. (see paragraph 13).

To receive the pre-ASTRA transponders, the SAT inputs must be connected as in the picture below.



Preprogrammed assignment

8.2 QAM 12

Connect SAT signals directly or via distributors to the satellite tuner (see paragraph 10.2).

12 V DC are located at all the inputs of the tuner, for the eventual power supply of the LNBs. Please make sure that the power consumption does not exceed 250mA per input and 500mA in total.



See also appendix examples
pages 18- 19

8.3 Input level

To ensure a good reception, make sure that the level at the inputs is between **50** and **80 dB μ V**.



When receiving digital signals, it is more beneficial to have a lower level rather than a too high level.

At too high input levels an attenuator should be used.

8.4 Output level

The output level is 90 dBmV at delivery. This can be changed by using the programming device (see section 9.2.2).

A reduced to 20 dBmV output level is applied at the TEST jack.



9. General programming

After connecting the power cord, the device runs through an internal routine and all 8 resp 12 channels are set to the previously stored data.

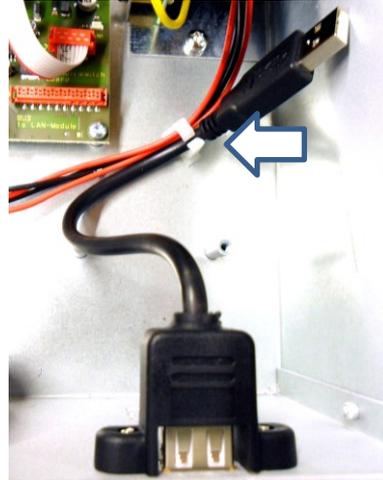
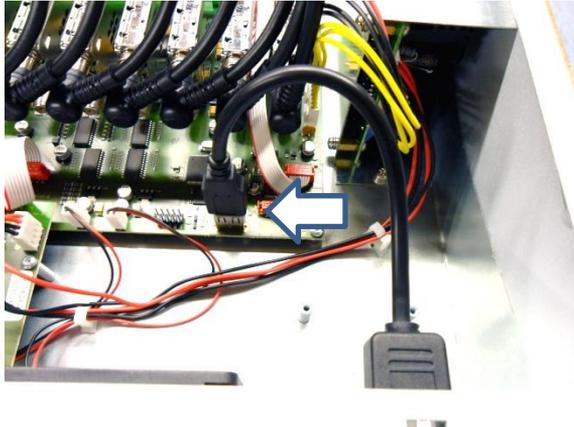
During this time the status LED next to the USB jack blinks green.

Only after the status LED has turned on continuously on green or orange a connection between the headend and laptop / PC is possible.

Connect the device only after the Software Installation on the PC.



If the USB socket should not be available from outside, so you can disconnect the connection cable. The cable must be pushed into the white clamp (picture). The USB plug may not touch the PCB or power supply. Now the programming is only possible inside the housing..



9.1 Software Installation

Download the software package from the homepage www.polytron.de (**satc12_Vxxx.zip**) and unzip it in a desired path (**z. B. C:\QAM12**).

The software can be loaded also from the supplied USB- Stick.

9.1.1 Installation of the driver

Start **Instal_driver.cmd**

Follow the instructions on the screen.

For some initial installations the following dialog may appear. That depends on your operating system. Perform the following instructions and make the selections for the selectable fields:



No, not this time

Next



Automatically install software

Next



If this notice is displayed:
Continue the installation



The software was installed for the following hardware

Finish

The installation of the driver software is now finished.

9.1.2 Installation of the programming software

Install the software in the desired folder by launching the program „Setup.exe“.

Follow the instructions on the screen.

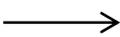
Close the screen at the end of the installation.



After the installation of the programming software on the PC, the QAM device can be connected to the PC using the USB cable.

9.2 Programming of the device parameters

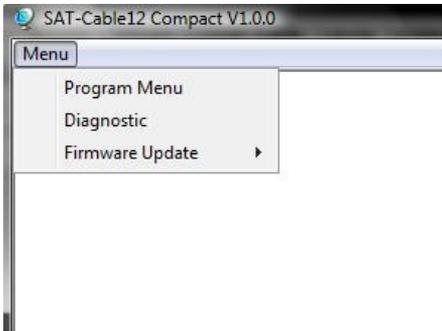
Start the program **SATC12**



Left click on top on **Menu**

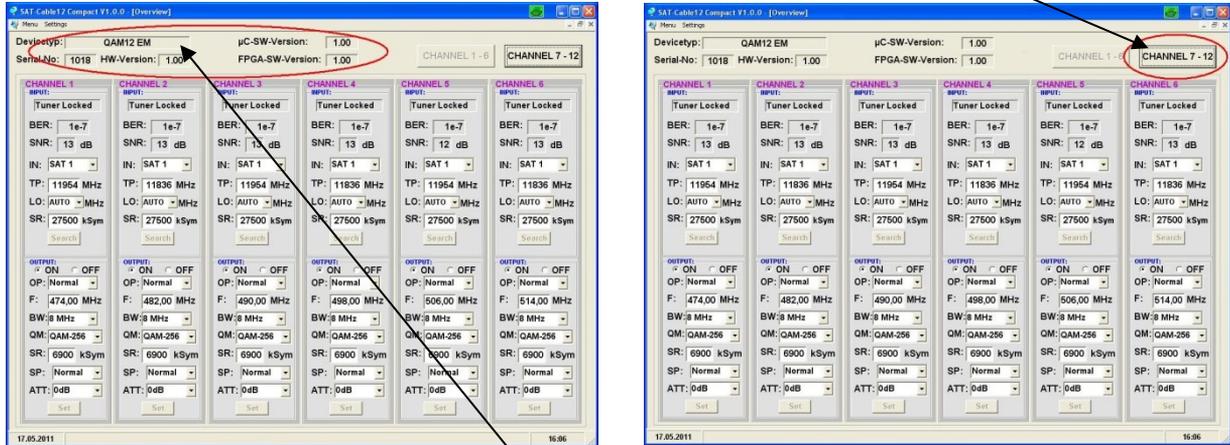
Following menu items are available:

- Program-Menu
- Diagnostic
- Firmware-Update
- Exit



In „**Program-Menu**“ all settings of input and output parameters are made. After calling the menu each of the 8 or 12 channels are retrieved and the *corresponding parameters settings* are displayed.

For better clarity, the menu is split between two pages in the channels 1-6 and 7-12.



At the top part of the menu, the device data is displayed, such as type, serial number, hardware version and software versions for the CPU and FPGA.

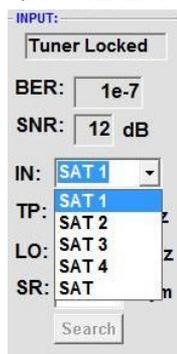
With the menu item „**Settings**“, it is possible to save or load an existing programming.
See section 9.3



9.2.1 Input parameters

IN > Selection of the input signal source

QAM 12 EM



Selection of the desired Sat-IF level from **SAT 1** to **SAT 4** or the direct input at tuner with **SAT**

QAM 12



For the version without input matrix this menu item stays set on **SAT**

The desired transponder data shall be entered in the menu fields.

This data can be found on the homepage of the satellite operators e.g. www.Astra.de, www.eutelsat.com, etc.

TP > Transponder frequency

Enter transponder frequency

LO > LNB Oscillator frequency

AUTO is automatically set on the needed frequency. The frequency values **09750**, **10600** or **OTHER** can be also selected.

SR > Symbol rate

Enter symbol rate

Search > Search

After pressing the button **Search** the data is accepted and the desired transponder set.

If the tuner finds the transponder, **Tuner Locked** is displayed on top.

Reception conditions

The quality of the input signal can be evaluated with the bit error rate **BER** and signal to noise ratio **SNR**.

These are dependent on the quality of the reception conditions and the SAT signals.

Recommendation: bit error rate **BER** should be $\leq 1e-6$

For signal to noise ratio, **SNR** the following displayed guidelines apply.

The corresponding values of the FEC (forward error correction) shall be taken from tables of the satellite operators.

If for example the transponder has an FEC of 5/6, the SNR display should be min. 9 dB.

FEC	good	very good
1/2	5-7dB	8-11dB
2/3	7-9dB	10-13dB
3/4	8-10dB	11-14dB
5/6	9-11dB	12-15dB
7/8	10-12dB	13-16dB

9.2.2 Output parameters

OP > Operating Mode

Normal > Normal operation

Single > single carrier for level measurement with an analogue antenna measurement instrument

Zero > digital channel with content 0. (constant level without fluctuations)

F > Output frequency

Frequency freely selectable
It is recommended to keep the TV-Standard channel spacing. Eingestellt

Frequency of the channel center. (e.g. channel 21, 410-set 474 MHz)

BW > Band width

Select bandwidth according to output frequency between 7 MHz and 8 MHz

QM > QAM-Mode

Settings of the possible QAM-Mode (16, 32, 64, 128, 256) are dependent on the data rate of the input transponder. Only the possible QAM- Mode will be displayed.

SR > Symbol rate

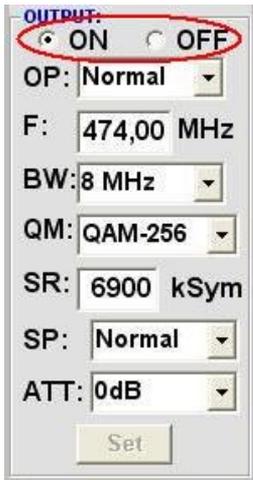
Up to 7.200 kiloSymbole/ sec. It is dependent on the selected QAM-Mode (usual setting in cable networks: 256 QAM / SR 6.900). Only the possible Symbol rates will be accepted.

SP > Spektrum

Normal > Normal operation

Invers > signal can be inverted in its spectral range. The inverting is necessary only in exceptional cases.

On **OFF** > **shutdown output channel**



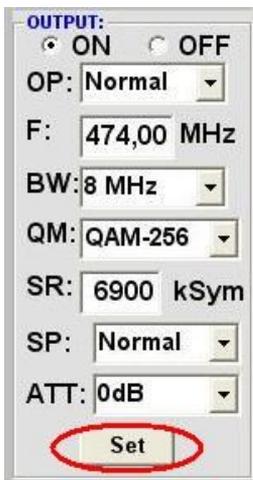
If not all 8 resp. 12 output channels are occupied, each channel can be individually turned off with **OFF**.

ATT > output level



The output level at the output is 90dB μ V and for each channel can be attenuated to 12 dB in 1dB steps.

Set > accept programming parameters



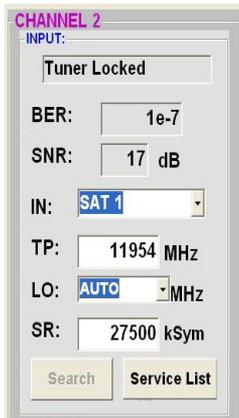
After setting all the parameters press the **Set** button. With this all the settings will be accepted. Repeat steps for other operating channels.



Note: The DVB-C / QAM receiver must be programmed according to the set parameters (search).

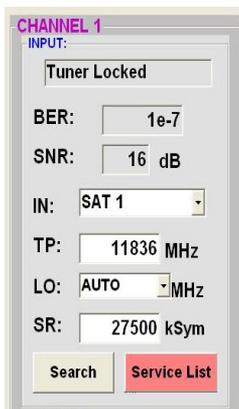
New function „Edit Service list“:

To delete services



CHANNEL 2
INPUT:
Tuner Locked
BER: 1e-7
SNR: 17 dB
IN: SAT 1
TP: 11954 MHz
LO: AUTO MHz
SR: 27500 kSym
Search Service List

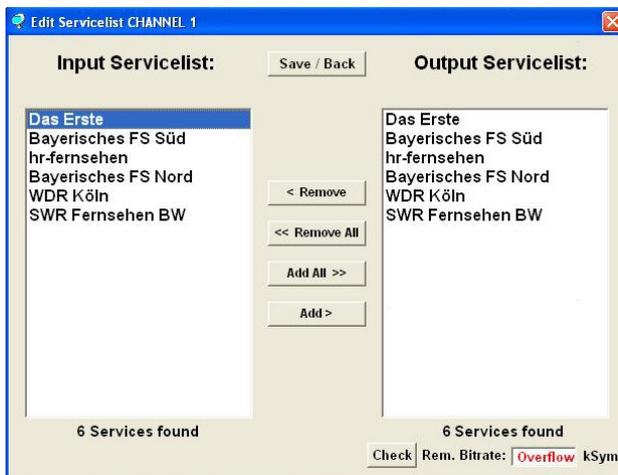
With the required software version the button „Servicelist“ will be available. This button is only active, if the tuner is locked.



CHANNEL 1
INPUT:
Tuner Locked
BER: 1e-7
SNR: 16 dB
IN: SAT 1
TP: 11836 MHz
LO: AUTO MHz
SR: 27500 kSym
Search Service List

If the input data rate is too high, for the output data rate, depend on the adjusted parameters of the output channel, an error message appears. Then the Service list button is colored red.

If you click on the Service List button, then the following window appears. On the left side is the input service list. There you can see the available services. On the right side you can see the services which are available on the output. After the scan the default is always all channels on the output available.



Edit Servicelist CHANNEL 1

Input Servicelist:	Output Servicelist:
Das Erste	Das Erste
Bayerisches FS Süd	Bayerisches FS Süd
hr-fernsehen	hr-fernsehen
Bayerisches FS Nord	Bayerisches FS Nord
WDR Köln	WDR Köln
SWR Fernsehen BW	SWR Fernsehen BW

6 Services found 6 Services found

Check Rem. Bitrate: **Overflow** kSym

If the data rate is too big for the adjusted output channel, an error message appears in the field Rem. Bitrate: the word „Overflow“. That means; the data rate for the adjusted parameters is too high and the data rate must be reduced by deleting services. Also, you can delete unnecessary services, if „Overflow“ will not be shown.

By a double-click on the respective service in the input or output list, these can be added to the output list or removed from it.

By clicking on the „Save/Back“-button, the output list is saved and the window is automatically closed.

If you have many services from one transponder, but only want a few, you can first click on „Remove ALL“ to select the services you need.



In the field Rem. Bitrate the remain bitrate will be shown.

The bitrate should be minimum 4000 kSym.

Dual Channel Function

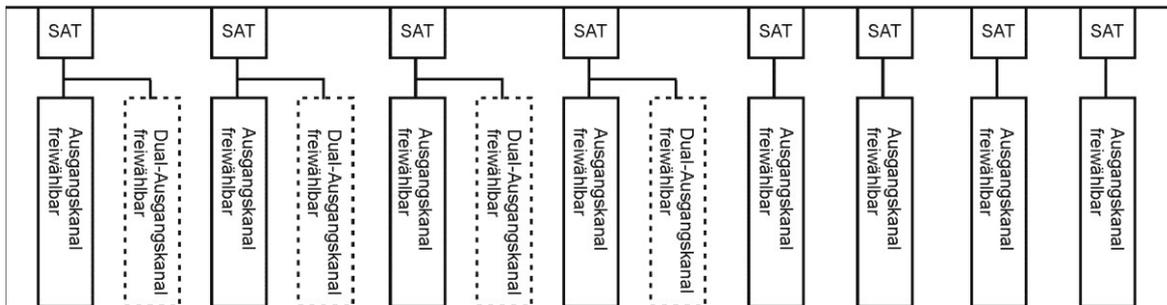
For headend QAM 8 EM

Application:

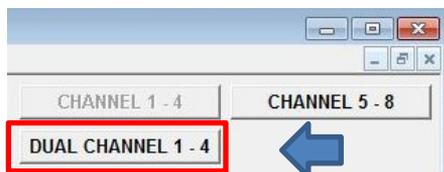
Sometimes the data rate of a transponder is too high to place the TV programs in one 7 or 8 MHz DVB-C channel.

With the Dual channel function it's possible to split a transponder into two DVB-C output channels.

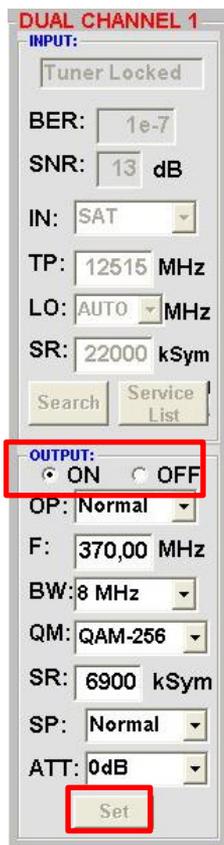
Block diagram of the complete channel



If the Dual Channel Function is needed please click on following Button.



The button is top right.



It's not possible to change the input parameter .
It shows the transponder, where the parameter could be changed.

To activate the Dual Channel switch from OFF to ON.

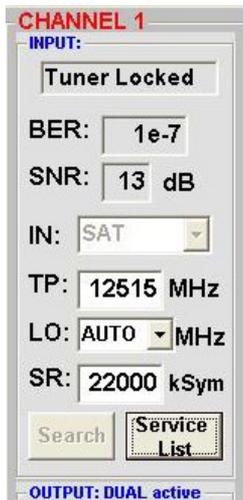
Now the output frequency and other parameters, for the second channel could be changed.

The second output channel is totally independent from the first output channel.

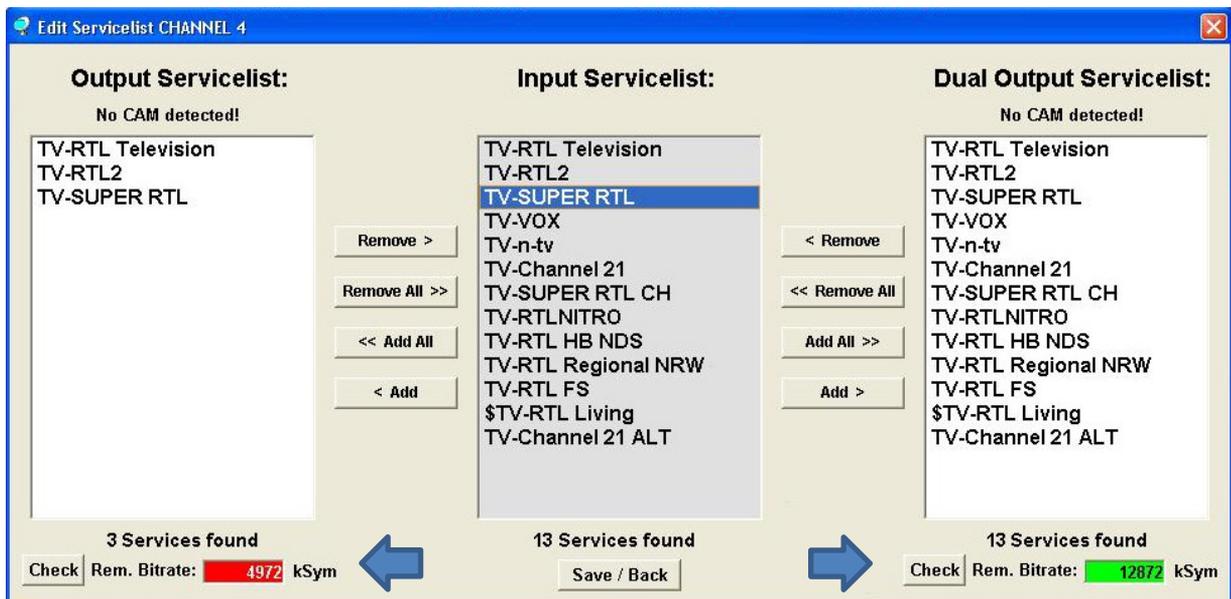
To save the parameters please click „Set“.



← Back to the main menu.



To split the TV programs to both of the output channels, please click the button „Service List“. If the second DVB-C output channel is switched on, a blue script appear „DUAL active“.



The table in the middle „Input Servicelist“ shows all channels of the transponder. With the button Add and Remove the TV programs can be allocate to the both outputs. To control the Bitrate please click the button “Check”
 The field Bitrate is marked by colors.
Green means: The remaining bitrate is higher than 10000 kSym.
Yellow means: The remaining bitrate is less than 10000 kSym.
Red means: The remain bitrate is less than 5000 kSym.
Overflow mean: The datarate is to big for the adjusted DVB-C parameters.

To decode the favored TV programs a hook must be placed in front of the TV program name
 The Button „Save / Back“ the parameters will be saved and the main menu appears.

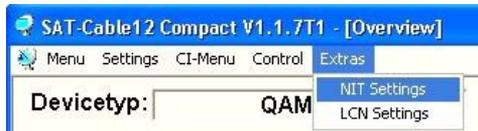
LCN function for the allocation of program positions

for the headends QAM 4 CI-S, QAM 8 and QAM 12

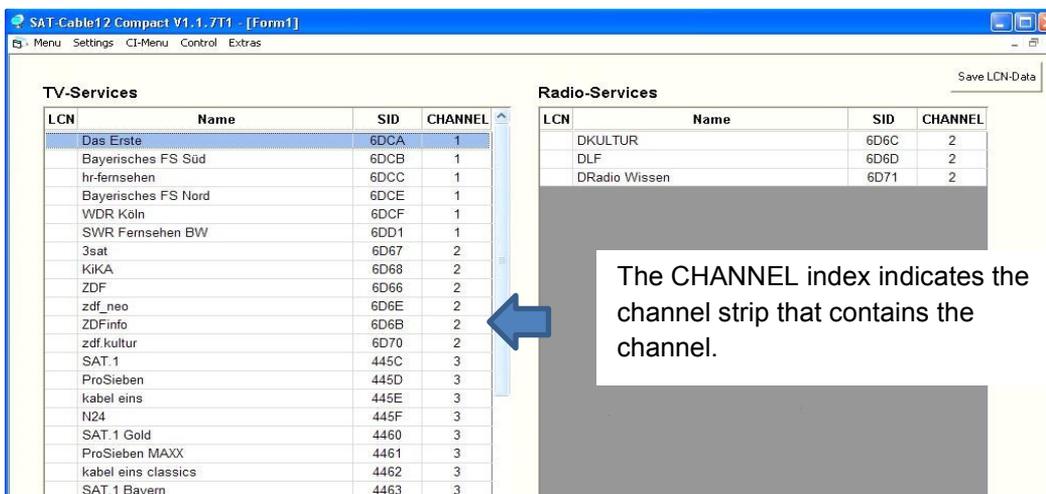
It's a requirement that the receivers support LCN.

As of µC software 1.12 and FPGA software 1.08 the function LCN is possible.

It is located under the menu item "Extras / LCN settings"



If the software is not the right version the menu won't display "Extras". In this case, please download the latest software at www.polytron.de. You will find the software in the directory services/ manuals.



In the column LCN, you can enter the desired service position. After these the services are sorted in order of the LCN numbers. Programs that didn't get a position code will follow behind the marked programs.

9.3 Storage of the programming

It is possible to save an existing programming on a PC or to download it from a PC. Thus, an archiving of programming configurations can be performed. This simplifies the work with QAM 12.

Open the main program with the menu item

Settings



9.3.1 Storage of the settings

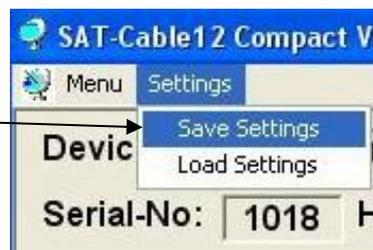
Use the menu item

Save Settings

to save the programming on the PC.

A path name and a file name should be entered.

(e.g. object)



9.3.2 Load settings

Use the menu item

Load Settings

to load an existing programming from

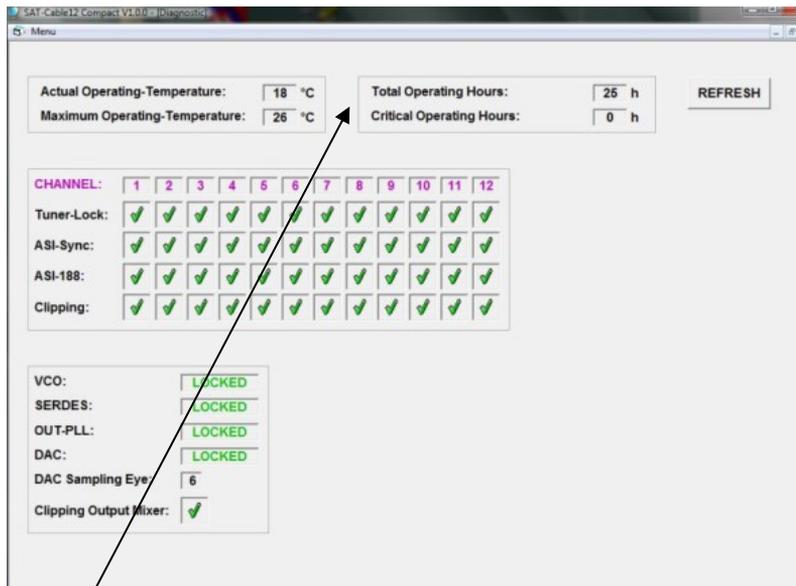
PC to QAM 8 or QAM 12.

Select the desired file name from corresponding path and open it.

The data is automatically loaded.



9.4 Diagnosis



The „Diagnose“ menu is used for service purposes and may be useful for error analysis on the telephone **Hotline +49(0)7081-1702-12.**

With REFRESH you can update the displayed data.

Header menu display:

Actual Operating Temperature: aprox. actual environment temperature
 Total Operating Hours: total number of operating hours

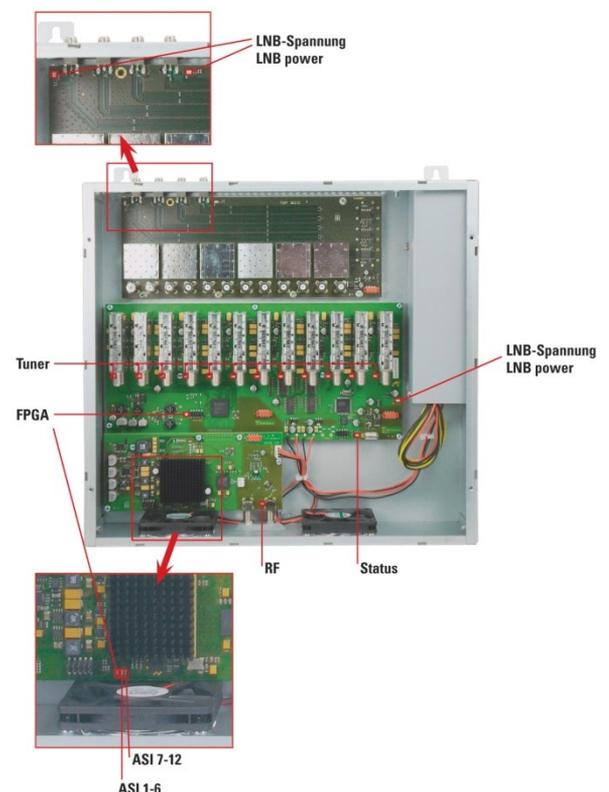
Maximum operating Temperature: maximum measured environment temperature
 Critical Operating Hours: number of operating hours at over 45°C environment temperature

The reported temperatures correspond to the actual value only for professional, vertical installations and a closed housing cover.

If one of the fields is displayed in red, an error has occurred.

9.5 LED-Analysis/Interpretation

LNB	green:	12V LNB- voltage
	off:	no LNB- voltage (short circuit?)
Tuner	green continuous:	Tuner logged
	green blinking:	Tuner not logged
FPGA	green:	configured, operational
	off:	error
ASI	green:	interfaces o.k.
	off:	error
RF	green:	output o.k.
	off:	error
Status	green:	all tuners logged, operational
	orange:	different functions in programming



9.6 Firmware update

The menu Firmware Update serves to update the firmware of the device. Thus, the basic software of the device is brought up to date.

The programming of the input and output parameters performed in the section 9.2 is not affected.

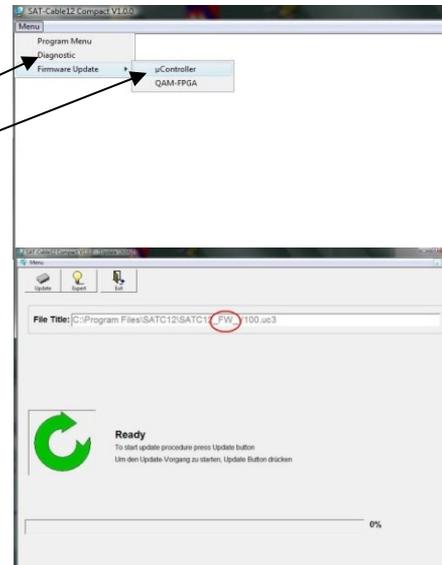
9.6.1 CPU (μ -Controller)

Software: Load the **SATC12_Vxxx.zip** from Polytron Homepage and open it. (see 9.1)

Update over Laptop/PC:

- Select menu item **Firmware Update**
- Select menu item **μ Controller**

click **Update** button,
new CPU software is loaded.



Update over USB stick (only for CPU):

Download the file „SATC12_FW_xxx.UC3“ from homepage www.polytron.de and copy it on the main directory of the USB stick.

- Disconnect the device from power supply
- Insert the USB stick
- Connect the device to the power supply
- **Status- LED red:** Update in progress
- **DO NOT remove the USB stick**
- **Status- LED green:** Update process is completed
- Remove the USB- Stick



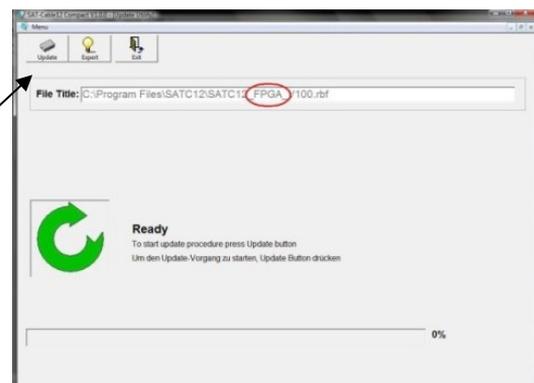
9.6.2 FPGA (QAM- Modulator)

Software: SATC12_QAMxxx.RBF

Update over Laptop/PC:

- Select menu item **Firmware Update**
- Select menu item **QAM- FPGA**

Click the **Update** button,
new FPGA software is loaded.

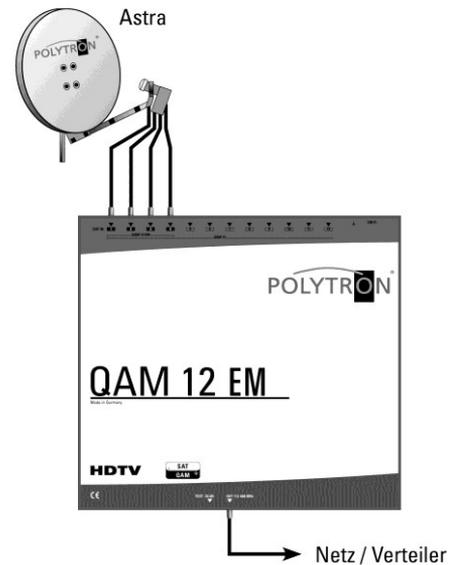


10. Application examples

10.1 QAM 12 EM

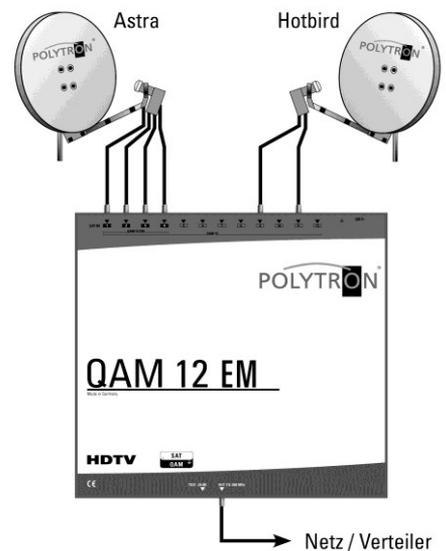
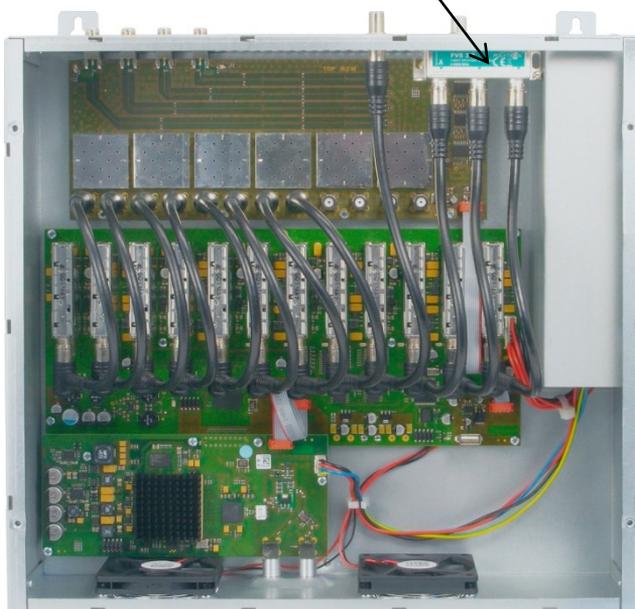
Example 1:

All tuner inputs are connected using the satellite input matrix. (Delivery state)



Example 2:

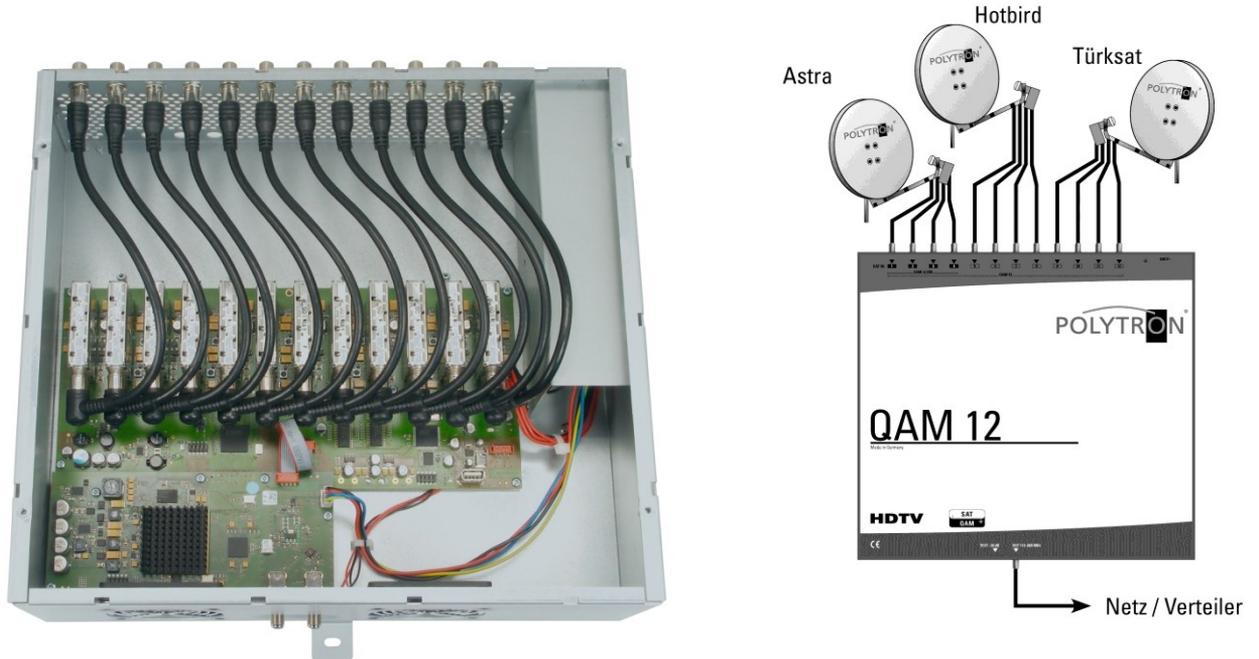
Tuner inputs are connected using the satellite input matrix and 2 additional levels of another satellite are connected to a distributor/splitter **FVS 3 P**.



10.2 QAM 12

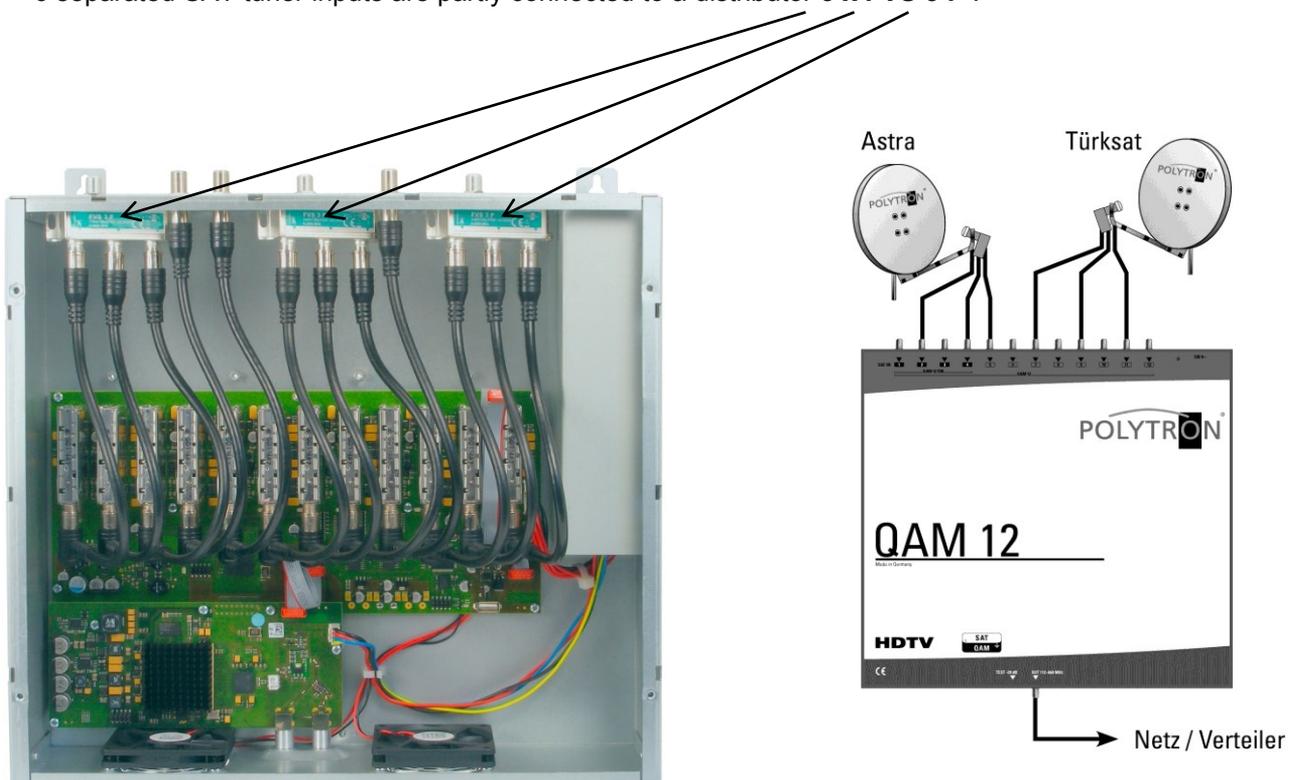
Example 1:

12 separated SAT tuner inputs for external distribution panel (delivery state)



Example 2:

6 separated SAT tuner inputs are partly connected to a distributor 3 x FVS 3 P .



11. Technical data

- **Electrical specifications**

- Power supply 230 VAC,
- Mains frequency 50/60 Hz
- Power consumption < 60W incl. 500mA LNB

- **Mechanical specifications**

- Temperature range 0°C...+45°C
- Storage temperature -25°C...+75°
- Relative humidity 95% (not condensing)
- Dimensions (W x H x D) 360 x 125 x 380mm
- weight 7,1Kg (QAM 12 EM)

- **Input**

- connector F- jack
- Frequency range 950 - 2150 MHz
- Tuning steps 1 MHz steps
- AFC- range +/- 5 MHz (depending on baud rate)
- AGC- adjustment range 50- 80 dB μ V
- LNB- voltage 12V / max. 2 x 250mA
- Impedance 75 Ω

- **DVB-S2 Demodulator**

- Symbol rate QPSK 1 – 45 MS/ s
- 8PSK 1 – 37 MS/ s
- Code rate DVB- S 1/2, 2/3, 3/4, 5/6, 7/8
- DVB-S2 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
- Roll off 0.35, 0.25, 0.20

- **QAM- Modulator**

- QAM- Modulation DVB-C (Standard)
- QAM- constellation 16; 32; 64; 128; 256
- Fault protection/ FEC Reed Solomon (204, 188)
- Symbol rate 1,0 – 7,2 MS/s
- Bandwidth 7 / 8 MHz (abhängig von der Symbolrate) / $\alpha = 0,15$
- Data rate max. 53 Mbit/s
- Spectrum Normal / Invers
- Test signals
- QAM- Test signal (Zero- content) digital
- Analog (Single- carrier) analog

- **HF- output**

- connector F- jack / 75 Ω
- Output frequency range 114 - 858 MHz
- Tuning steps 250 kHz
- Channel allocation suitable for adjacent channels
- Output level 90 dB μ V
- Level attenuation (per channel) 0 - 12 dB

- **Signal quality**

- MER > 40 dB
- Spurious > 50 dB

- **Test output**

- connector F- jack
- attenuation 20dB (+/- 2dB)

12. New functionality „Password“:

➔ Protection against unauthorized access to the Program-Menu.

The password function isn't activated in the factory settings and can be switched on from µC-SW-Version 1.31 on, like described as follows:

- Start program [SATC12] ➔



- Klick on **Extras** in the upper row.



- Klick on **Password Settings**. It appears following pop-up window, please urgently note the serial-number, because this will be needed to reset the password, if required.

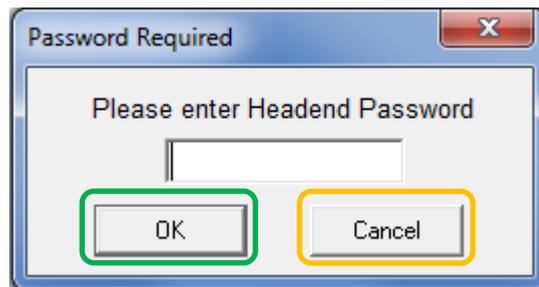


- Place a tick in the check-box to select **Use Password**.
- Enter the password (min.6 / max.10 digits) in the input field **Password** (consisting of letters, numbers or special characters in random sequence) and retype the password in the input field **Retype Password**.
- By clicking on **Change Password** a new password can be created.

➔ Click on **Save** to store the password-settings. ←

- Exit the program [SATC12] or go on with the settings, if necessary.

After next time starting the program [SATC12] please enter the password in the input field and then click on **OK** to confirm the password or click on **Cancel** to correct the password, if required.



➔ Please note: **In this pop-up window is no change of the password possible.**

Should the password get lost or has fallen into oblivion we willingly help you relating to the generally password-reset. For this purpose we urgently need the serial-number of the device, as already mentioned on page 1. The serial-number you can also find on the label which is affixed on the outer side of the housing.

The generally password-reset can only be applied by POLYTRON, for this procedure you will get a new password to reactivate the access to the device again.

By removing the tick in the check-box **Use Password** you can certainly also deactivate the password function, but you will need the password to log on before.



13. Default setting

Please see supplemental sheet

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