QAM 4 CI

User manual

Inhaltsverzeichnis

1. Hazards and safety instructions

Before working on the QAM 4CI please read the following safety precautions and the safety

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, 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 (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 4 CI is a modern, compact transmodulator that converts 4 SAT transponder DVB-S/ S2 in 4 DVB-C channels and can decode encoded programmes using a suitable CI module. Its simple and quick assembly, configuration and programming means that it can be commissioned without problems. The QAM 4 CI device converts digital SAT signals into QAM signals so that these can be fed into cable networks. Up to 4 transponders from up to 4 different satellites can be transmitted. This makes it possible to transmit SD and HD programmes via all transponders, regardless of whether these are encoded or non-encoded.

3. Description

The compact headend QAM 4 CI from POLYTRON converts four SAT transponder (DVB-S/S2 signals) into QAM signals (DVB-C). The four inputs are each provided with a CI interface for decoding encoded signals. With this, QAM communal installations can be simply and cheaply supplemented with centrally decoded ranges. Also conceivable is use as free-to-air basic supply in a small boarding house or hotel, because around 20 programmes of 4 transponders are already made available. The headend can be simply and quickly programmed via the USB interface. No knowledge whatsoever the assigning and administration of IP addresses is required for this. The selected settings can be printed and saved and also transferred to other devices with a USB-stick. Due to the integrated LAN connection, it is possible to remotely control all parameters. The QAM headend works in the frequency range 112 to 862 MHz and converts the selected satellite transponders completely including the additional services Teletext, EPG etc. The output is also suitable for adjacent channels and has a level of 90 dBµV. The QAM 4 CI has an energy-saving switching power supply which also takes over the supplying for the LNB (1 x 250 mA).

4. Scope of delivery

1 x   QAM 4 CI

1 x   Power cable

1 x   USB-cable

1 x   USB-Stick (Programming software)

1 x   Operating instructions

1 x   Installation accessories

1 x   Drilling template

1 x   LAN crossover adaptor

1 x   LAN patch cable

5. Input Circuit

In the QAM 4 CI, the Sat-ZF signals are directly fed to input tuners. Here there are 4 equal inputs. At input 1 there is in addition 12V DC voltage for LNB supplying. In the tuner a transponder is chosen and converted into a freely selectable output frequency between 112 – 860 MHz.

6. Assembly

The installation of the QAM compact headend must take place in a well ventilated room. The ambient temperature must not be more than 45°C. It must be ensured that the air can circulate through the ventilation holes. There must be at least 15 cm of space around the device, so that the air can circulate properly. The plug must be pulled from the socket before installation or work on the cabling.

6.1. Earthing

The device must be earthed in accordance with EN 60728-11.

- Strip approx. 15 mm of the cable insulation of the earthing cable ($4mm^2$).
- Push stripped end under the earth screw and tighten the screw.

7. Installation

Connection of the SAT Signals

Connect SAT signals directly or via splitter to the sat tuner inputs. At input 1 there are 12 V DC for the supplying of the LNB.
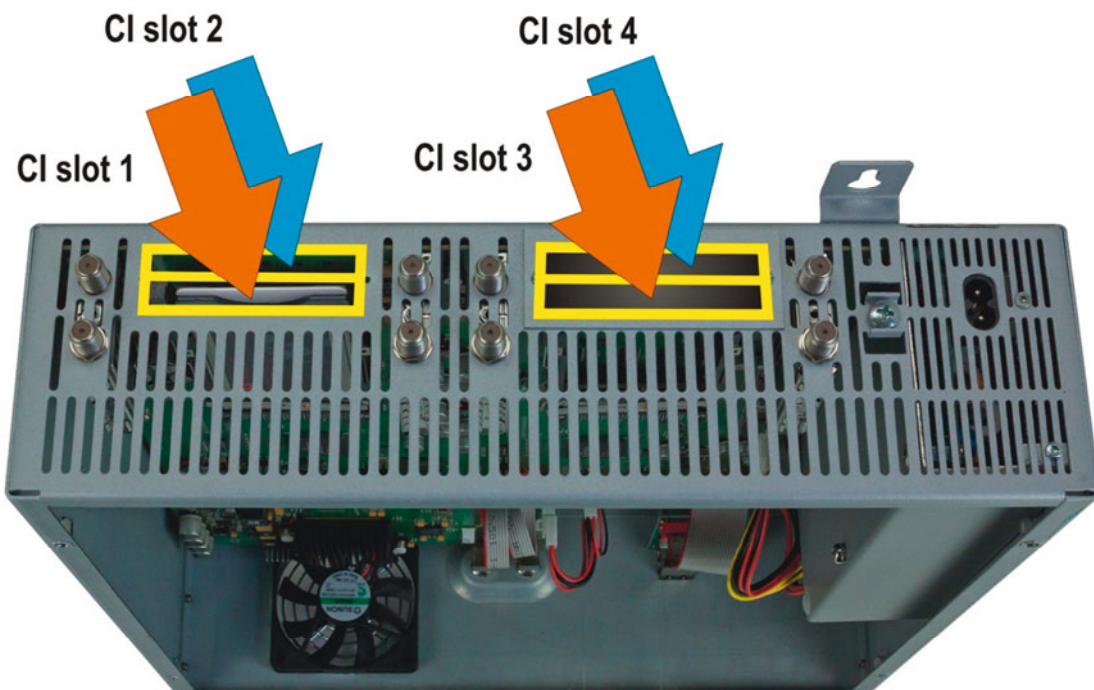
Please note that the current consumption must not be more than 350 mA at the input.
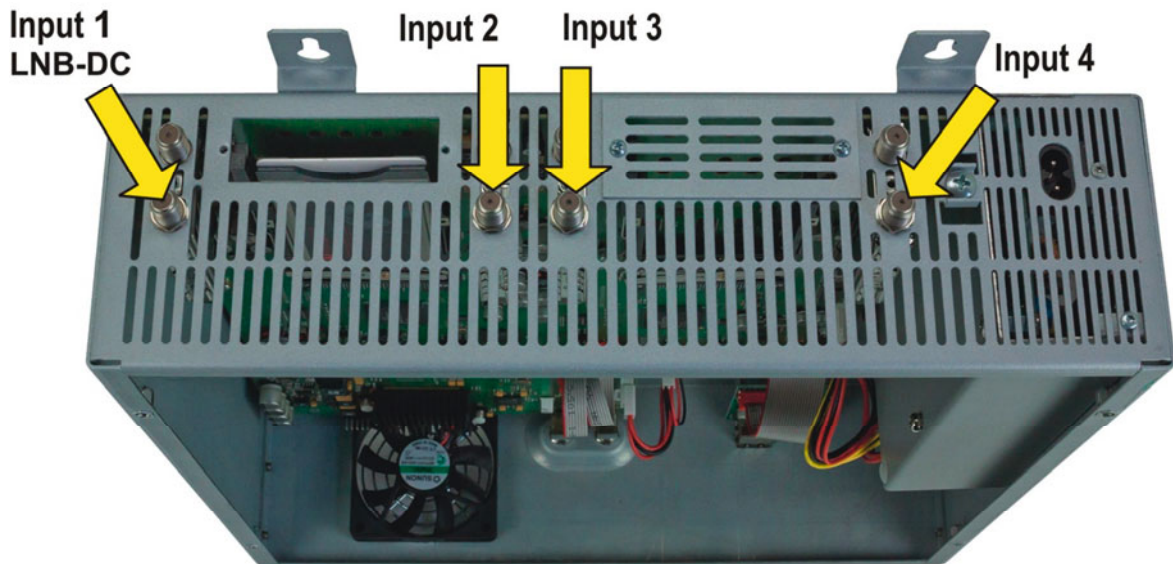
Insertion of the CI Modules

To insert the CI modules, the covers must be removed. Use the picture to see how the CI slots are assigned to the SAT inputs. Always insert the module with the address facing forwards (in the direction of the lid).

7.1. Pre-programming

The inputs and outputs of the device are pre-programmed ex-factory with a german standard frequency allocation. In order to receive the pre-programmed ASTRA transponder, the SAT inputs must be connected with the "horizontal high" level in accordance with the following picture.

Platz/ Slot	1	2	3	4
Transponder	**ARD Digital**	**ZDF Vision**	**SAT1 / Pro7**	**RTL World**
	HH 11836	HH 11954	HH 12545	HH 12188
Symbolrate	27500 kSym	27500 kSym	22000 kSym	27500 kSym
ASTRA	Das Erste	ZDF	Sat. 1	RTL
	BR FS Süd	3 Sat	Pro 7	RTL 2
	HR	Ki.Ka	Kabel 1	VOX
	SWR BW	ZDF Info	N24	Super RTL
	WDR Köln	ZDF neo	Sat. 1 Gold	N-TV
	BR FS Nord	ZDF kultur	**etc.**	**etc.**
Ausgang/ Output	**306 MHz**	**314 MHz**	**322 MHz**	**330 MHz**

7.2. Input Level

In order to ensure flawless reception, make sure that the level at the inputs is between **50** and **80 dBµV**.

☞ **When receiving digital signals it is advantageous to have a lower rather excessively high level.**

If the input level is too high, an attenuator is to be used.

7.3. Output Level

Upon delivery, the output level is **90 dBµV**. This can be changed via the device programming (see point 8.2.2). There is an output level reduced by 20 dB at the TEST socket.

Test - 20 dB   Out 112 - 860 MHz

8. Programming General

After the mains cable is connected, the device runs through an internal routine and all 4 channels are set with the previously stored data. During this, the **status LED** next to the USB socket flashes green.

Only after the **status LED** is <u>continuously</u> green or orange, contact is possible between QAM 4 and Laptop/PC.

8.1. Software Installation

Download the software package from the homepage **www.polytron.de (satc12_Vxxx.zip)** and unzip in the directory of your choice **(e.g. C:\ QAM 4)**.

The software can also be loaded from the enclosed USB stick.

8.1.1. Installation of the Driver

Start **Instal_driver.cmd**

Follow the instructions on the screen.

In some first installations the following dialog can appear. This depends on the operating system. Carry out the following instructions and select the selection fields:
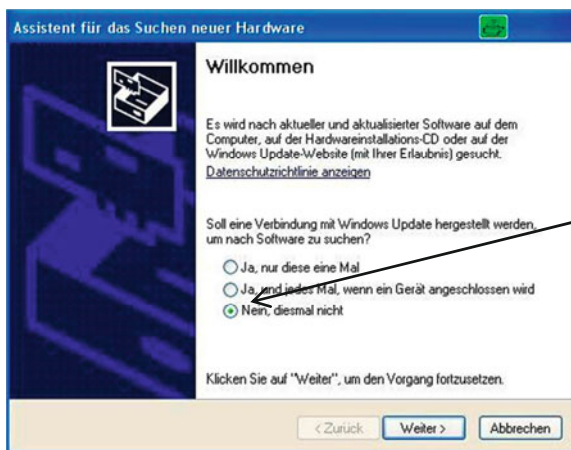
no, not this timet
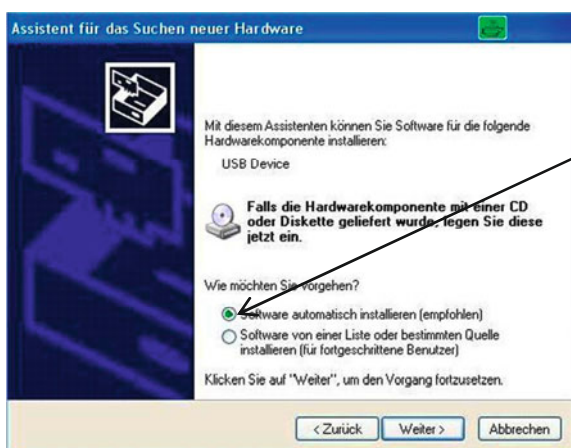
next

install Software automatically

next

9
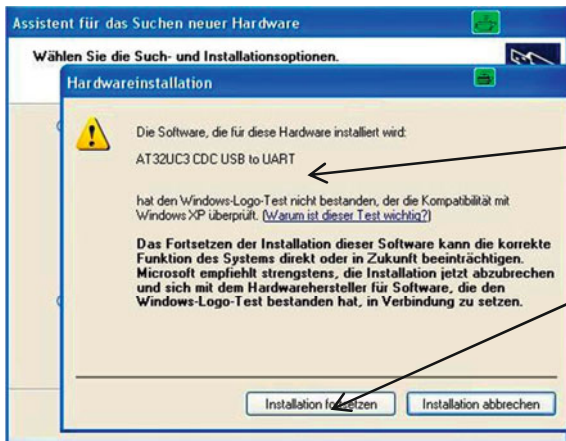
If this notice is displayed:

Continue the installation

☞

The software was installed for the following hardware

finish

The installation of the driver software is now complete.

8.1.2. Installation of the Programming Software

Install the software by starting the **"Setup.exe"** program in the desired folder.

Follow the instructions on the screen.

Close the screen displays once the installation has ended.

☞ **After the installation of the programming software on the PC, the QAM 4 can be connected to the PC with the USB cable.**

Only connect the device to the PC once the software installation has been completed.

USB

8.2. Programming of the Device Parameters

Start the program – **SATC12** →

Click on **Menu** at the top left
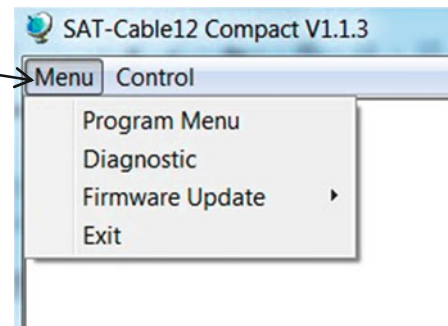
The following menu points are available:

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

Select **Program Menu**: all adjustments of the input and output parameters are carried out here. After the calling of the menu, all 4 channels are and the respective *adjusted parameters are displayed.*

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

8.2.1. Input Parameters

The desired transponder data is entered in the menu fields.
This is to be taken from the technical literature and/or the homepage of the satellite operator e.g. www.Astra.de, www.eutelsat.com etc..

TP > Transponder Frequency

Enter transponder frequency

LO > LNB Oscillator Frequency

AUTO sets the required frequency automatically.
Can however be set to **09750**, **10600** or another **OTHER** frequency.

SR > Symbol Rate

Enter symbol rate

Search > Search

After the button **Search** has been activated, the data is accepted and the desired transponder is set.

If the tuner finds the transponder **Tuner Locked** is displayed in the upper field.

Receiving Conditions

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

These are dependent upon the quality of the receiving conditions and of the SAT signals.

Recommendation: bit error ratio **BER** should be ≤1e-6

The guidelines shown apply to the signal-to-noise ratio SNR. The corresponding values of the FEC (forward error correction) are to be taken from the tables of the satellite operators. If e.g. the transponder has an FEC of 5/6, the SNR display must be at least 9 dB to guarantee good signals.

FEC	gut	sehr gut
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

8.2.2. Output Parameters

OP > Operating Mode
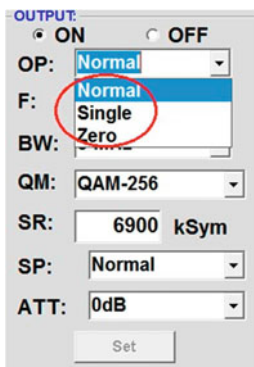
Normal> normal mode

Single> single carrier for level measurement with an analog antenna measuring device

Zero > digital channel with content 0 (constant level without fluctuations)
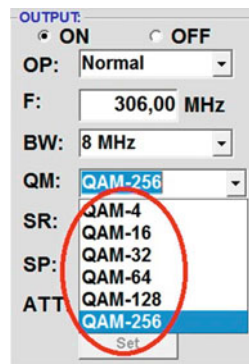
F > Output Frequency
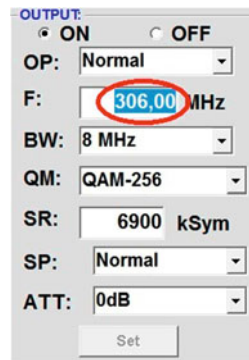
Frequency freely selectable. It is recommended to stick to the corresponding TV standard channel spacing. The frequency of the channel middle is set. (e.g. channel 21, 410- 478 MHz, set 474 MHz)
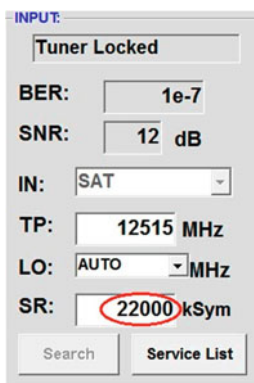
BW > Bandwidth
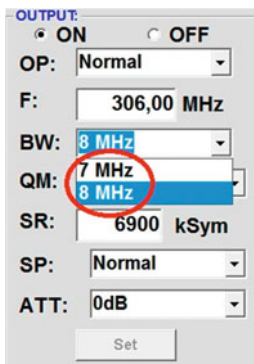
Choose bandwidth depending on output frequency between 7 MHz and 8 MHz
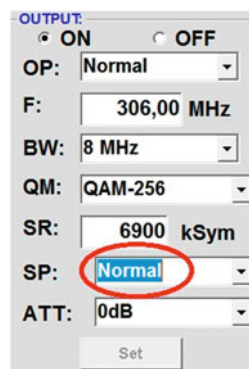
QM > QAM Mode

Setting of the possible QAM mode (16, 32, 64, 128, 256) dependent on the data rate of the input transponder. Only the QAM mode that is possible is displayed

SR > Symbol Rate

up to 7,200 kilosymbols/ sec. is dependent on the selected QAM mode (used setting in cable networks: 256 QAM / SR 6.900). Only the symbol rates that are possible are accepted.
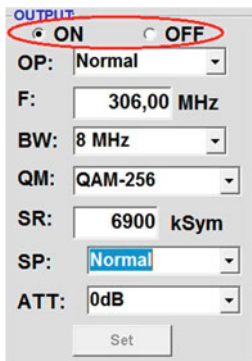
SP > Spectrum

Normal > normal mode

Inverted > Useful signal can be inverted in its spectral position. Inversion is only necessary in exceptional cases.
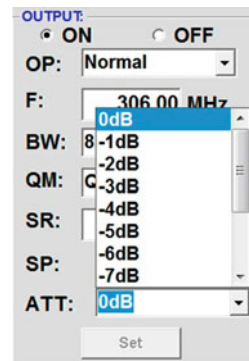
13

| On | OFF | > | Switching Off Output Channel | ATT | > Output Level |

If not all 4 output channels are to be assigned, each channel can be switched off individually with OFF.
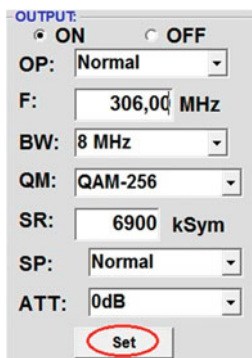
The output level at the output is 90dBµV and can be weakened in each channel by up to 12 dB in 1dB steps.

Set > Accept Programming

After the setting of all parameters press the Set button. With this, the adjusted data is accepted. Repeat steps for other channels.

☞ **N.B.: The DVB-C / QAM receivers must be programmed in accordance with the set parameters (search)**
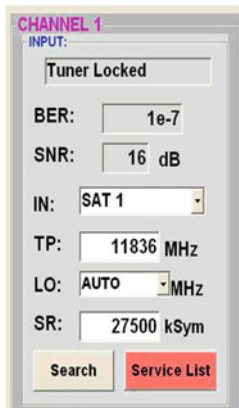
8.3. Function "Service List"

If certain services within a transponder are not desired at the output, they can be removed. Encoded services can still be selected for decoding via this function.

8.3.1. Deletion and Addition of Services
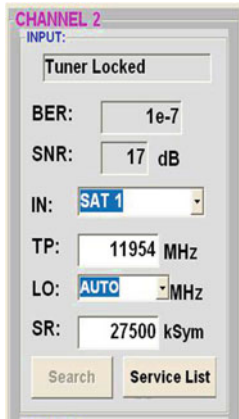
In addition to the "Search Button" another button - "Service List" - is displayed. This is only active if the tuner is locked.

If the data rate at the input is higher than the data rate that is possible at the output due to the set parameters an error message appears and the button for the Service List turns red. In this case, a reduced selection of the desired services must be made.

Clicking on this button opens the following window. The list of services available at the input is shown on the left. On the right, one can see the services contained in the output signal. The standard setting after scanning is always "Transparent" i.e. everything that is there at the input also appears at the output.
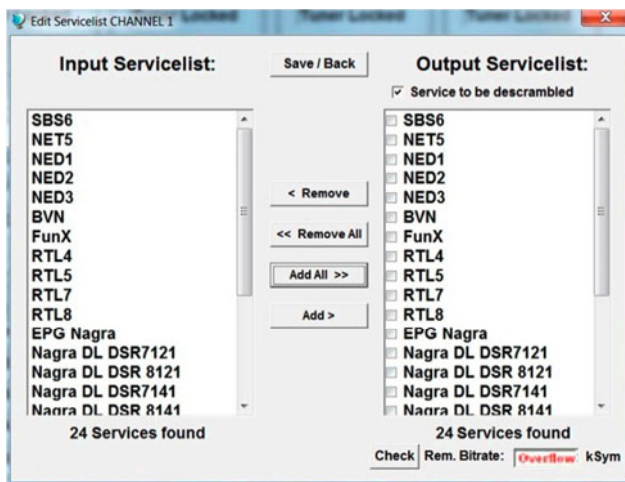

If the data rate at the output is too high, the word "Overflow" appears in the field Rem. Bitrate. This means that the data rate is too high for the set parameters, and services must be removed.

Undesired services can of course also be deleted if there is no overflow.

By clicking on a service in the input list and clicking on the command "Add", this service is added to the output list. (Double-clicking on a service in the input list automatically adds it to the output list).
Clicking on a service in the output list and clicking on the command "Remove" removes this service from the output list. (Double-clicking on a service in the output list removes the service automatically).
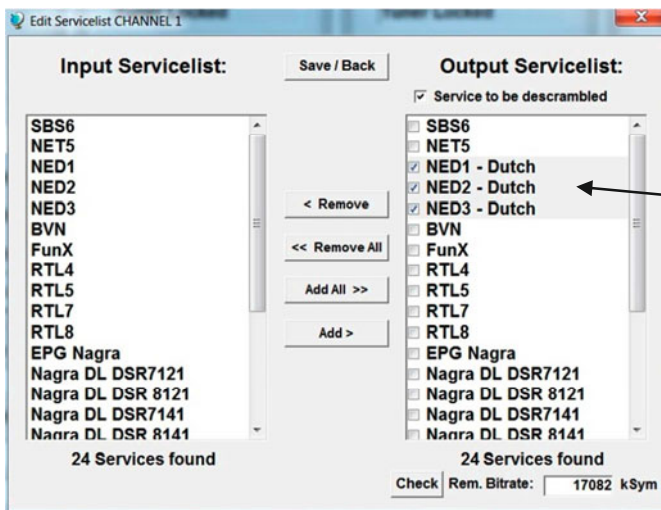
By single-clicking on the "Save/Back" button, the output list is saved and the window is automatically closed.
If you only want to accept a few services from a transponder that has many, you can first click on "Remove ALL" and then select the required services.
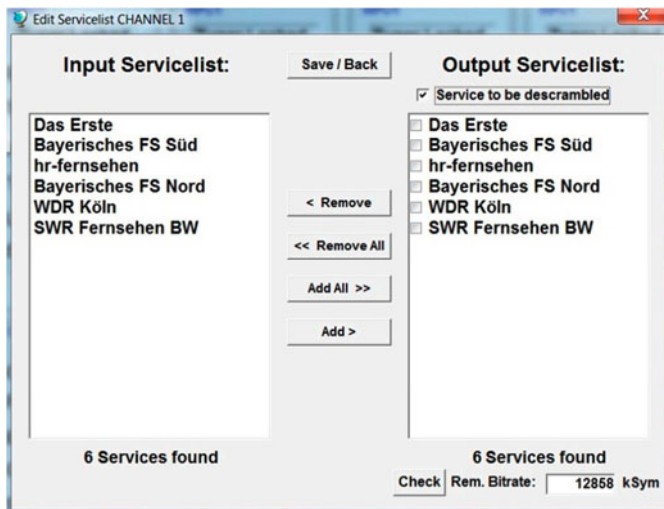
The data rate still available is shown in the field Rem. Bitrate.
This should be at least 4,000kSym.

8.3.2. Selection of the TV Channels to be Decoded

After the CAM module with the appropriate smart card has been inserted in the CI slot, press the Service List button. All available services are displayed in the input and output list. In the output list, now select the desired services to be decoded by placing a tick.

In the output list, now select the desired services by placing a tick.

Encoded and non-encoded services can be output together. With a click on the "Save/Back" button the output list is saved and the window is automatically closed.
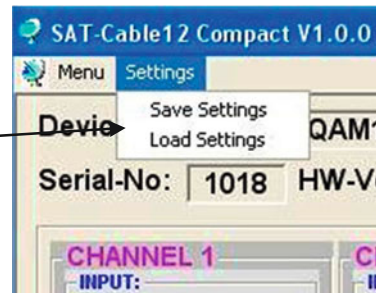
☞ **The CAM modules should always be in a switched-off state when inserted.**

8.4. Saving of the Programming

It is possible to save existing programming on a PC and/or to load it from a PC. Program combinations can thus be archived.

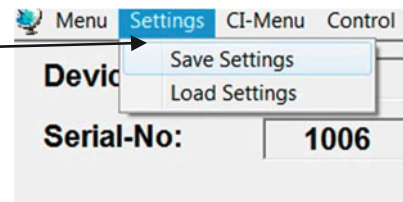The main program is opened with the menu point

Settings

8.4.1. Saving of Settings

With the menu point

Save Settings

it is possible to save the programming onto the PC. A directory and file name (e.g. object) are to be entered for this. The file name must retain the ending .c12!!

From the software version 1.04, the settings are also saved in an rft file. This is located in the same folder as the QAM 4 CI software. This file format can be opened, edited and printed with e.g. Microsoft Word, Open Office or wordpad.

8.4.2. Loading of Settings

With the menu point

Load Settings

it is possible to load existing programming from the PC onto a QAM 4 CI. For this, the desired file name is to be selected and opened in the register. The date is automatically loaded.
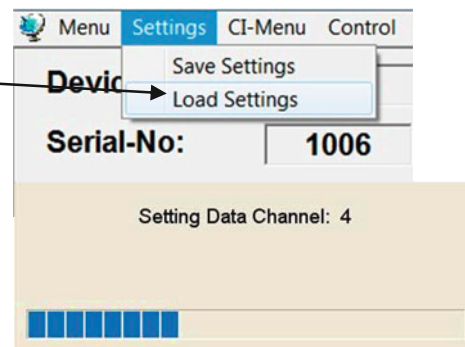
8.5. LAN Function

Click on **Program Menu** to open the programming environment. The basic settings are loaded and the user interface is started.

The QAM 4 CI possesses the IP address: 192.168.1.227 as a standard setting.
If the system is used in a network with a different network address, the IP address of the QAM 4 must be accordingly altered.
This change is carried out under the menu point **LAN-Settings**.
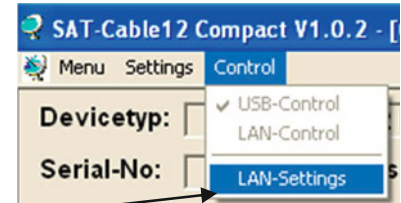
Example:
The PC operated in the network has the following settings:

IP address: 192.168.010.068

                   network share   host share

The IP address of the QAM4 CI must only differ in the last block (host share) compared with that of the connected PC. The figures 0, 255 and all figures already used are not permitted!
Example IP address: 192.168.010.100
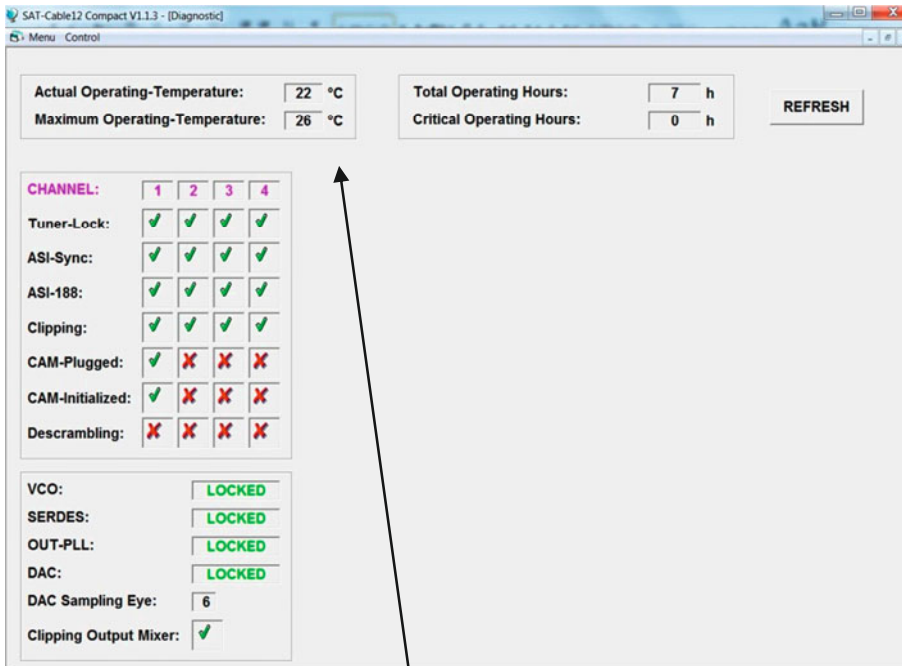All changes are saved with **Save**.

N.B.!!

The listed IP addresses are intended as examples.
All addresses must be adapted to the network at the location.
If this information is not known, the responsible
IT specialist should be contacted!

The progress of saving is displayed on the bar diagram.
This process can last up to a minute.

8.6. Diagnostics

The "Diagnosis" menu is for service purposes and can be helpful during error analysis by telephone on the **Hotline +49(0)7081-1702-12**.

The displayed data can be updated with **REFRESH**.

Menu Header Display:

|	
Actual Operating Temperature:	approx. current ambient temperature
Total Operating Hours:	operating hours
Maximum Operating Temperature:	maximum measured ambient temperature
Critical Operating Hours:	operating hours at ambient temperature of over 45°C

The temperatures shown only correspond to the actual values in the case of correct, vertical installation with a closed housing cover.

If one of the fields goes red, there is a fault or no CAM module has been inserted.

8.7. LED Key

LNB   green: 12V LNB voltage

        off: no LNB voltage (short-circuit?)

Tuner green continuous: tuner logged

        green flashing: tuner not logged

FPGA green: configured, ready to operate

        off: fault

12 V   green: 12 V power adaptor O.K.

        off: power adaptor fault

RF   green: output O.K.

        off: fault

Status green**:**   all tuners logged, ready for use

        orange: different functions in

                 programming
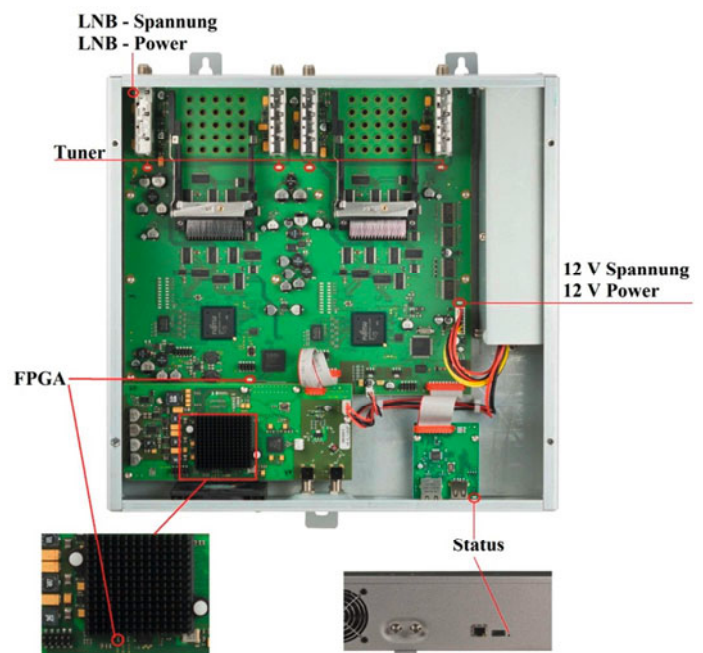
8.8. Firmware- Update

The menu firmware update is used to update the firmware of the device. This way, the devices basic software is brought up to date.

The programming of the input and output parameters carried out under 8.2 is not influenced by this.

8.8.1. CPU (µ Controller)

Load **Software: SATC12_Vxxx.zip** from the Polytron homepage and open (see 8.1)
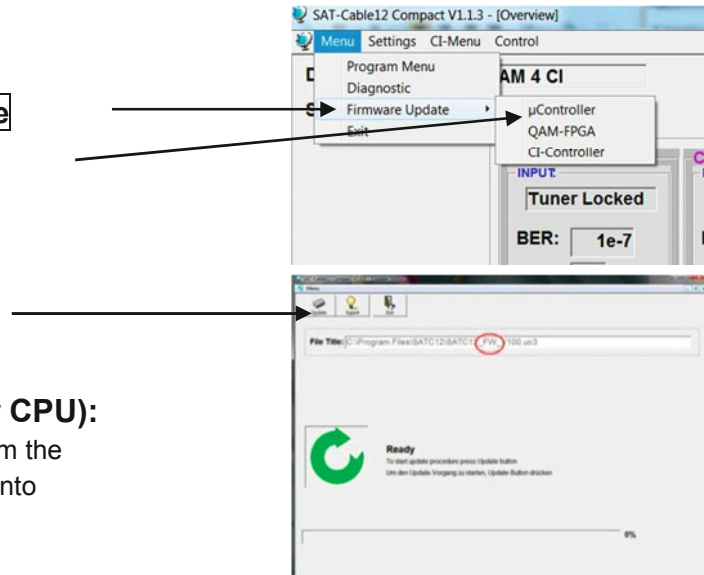

Update via Laptop/PC:

* Call menu point Firmware Update
* Select menu point   **µController**

Click on the Update button
to load new CPU software.

Update via USB Stick (only for CPU):

Download "SATC12_FW_xxx.UC3" from the homepage www.polytron.de and copy into the USB stick main directory

* Separate device from the network
* Insert USB stick
* Connect device to the network
* **Status LED red:** update running **Status- LED flashes red:** data being transferred
* **Do not remove USB stick**
* **Status LED green:** update procedure ended
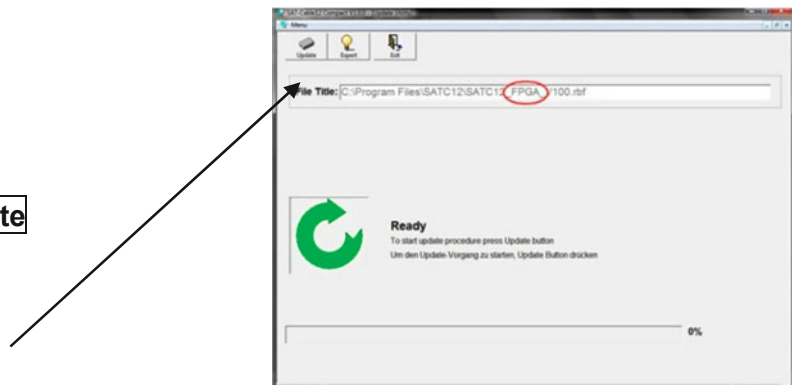* Remove USB stick

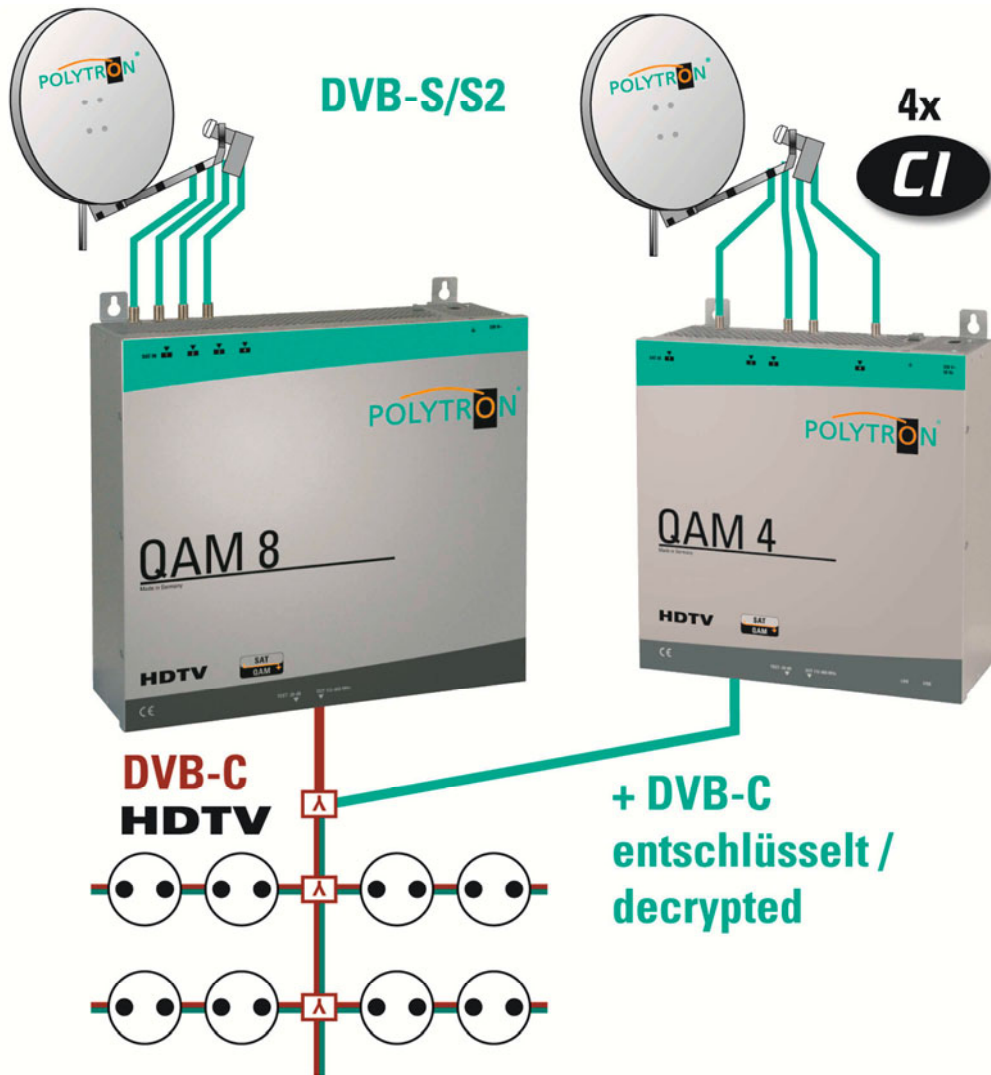### 8.8.2. FPGA (QAM- Modulator)

Software: SATC12_QAMxxx.RBF

Update via Laptop/PC:

* Call menu point Firmware Update
* Select menu point   **QAM FPGA**

Click on the Update button
to load new FPGA software.

9. Application example

10. Technical data

Typ / Type	QAM 4 CI
Artikel-Nr. / Article no.	5552040
Eingänge / Inputs	
SAT-Eingänge	4
CI-Schnittstellen	4
Eingangspegel / Input level	50–80 dBµV
LNB-Versorgung / LNB supply	12 V / max. 2 x 250 mA
Demodulator	
SR DVB-S / QPSK	1–45 MS/s
SR DVB-S2 / QPSK	1–45 MS/s
SR DVB-S2 / 8PSK	1–37 MS/s
QAM Modulator	
Modulation type	DVB-C (in accordance to the DVB standard)
Signal constellation	16, 32, 64, 128, 256QAM
Symbol rate	1–7,2 MS/s
Bandbreite / Bandwidth	7 / 8 MHz (abhängig von der Symbolrate) / α = 0,15
Datenrate / Data rate	max. 53 Mbit/s
Ausgang / Output	
Frequenzbereich / Frequency range	112–862 MHz
Ausgangspegel / Output level	90 dBµV
Regelbare Dämpfung je Kanal / Channel attenuation	0...12 dB
MER	≥ 40 dB
Leistungsaufnahme / Power consumption	40 W inkl. 500 mA LNB
Spannungsversorgung / Operating voltage	230 V, 50/60 Hz
Maße (B x H x T) / Dimensions (W x H x D)	331 x 328 x 103 mm
Gewicht / Weight	7 kg

Alle Angaben ohne Gewähr. Technische Änderungen oder Irrtumer vorbehalten.

11. Declaration of conformity

POLYTRON
— Broadband Systems —

$C\epsilon$ - Declaration of Conformity

In accordance with Low Voltage Directive 2006/95/EG
In accordance with EMC Directive 2004/108/EG
In accordance with RoHS Directive 2011/65/EU

The manufacturer

Polytron-Vertrieb GmbH
Langwiesenweg 64-71
75323 Bad Wildbad
Germany

hereby declares that the following product

Product designation: QAM 4 CI

conforms with the requirements of the above directives including any amendments.

Following standards and regulations were used:

- EN 60728-11:2011
- EN 60065:2011
- EN 50083-2:2012
- EN 50581:2012

Bad Wildbad, 15th, May 2013

Wolfgang Schlüter
Managing Director

Technische Änderungen vorbehalten
Subject to change without prior notice