HDC 7016

16 DVB S2 Tuner / 2 ASI-IN / IP-IN to 16 DVB-C & IP out

Data sheet and Instruction Manual

V 1.1

Technical changes w/o further notice

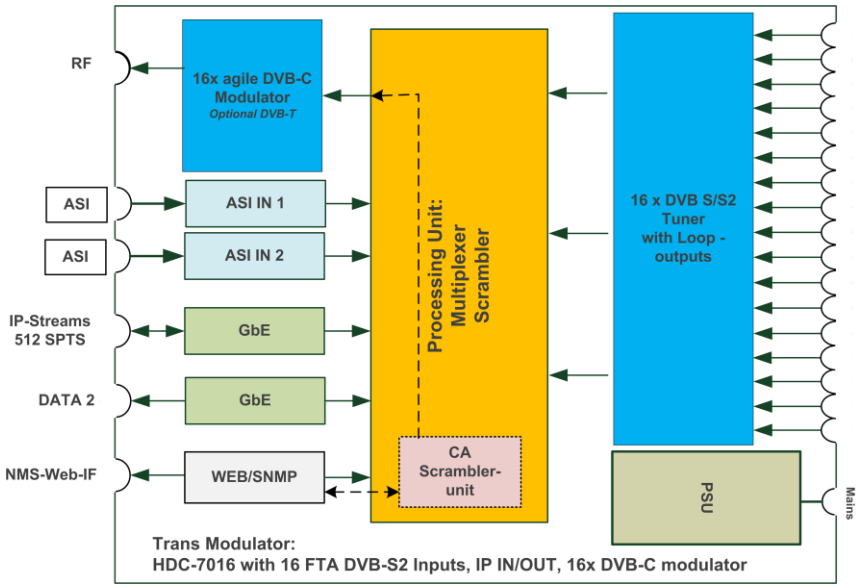
Table of content:

Introduction:

The BLANKOM HDC-7016 is a high performance and cost-effective QAM modulator.
It has 16 DVB-S/S2 FTA (Free to Air unencrypted) tuner inputs, 16 groups of multiplexing, with 16 groups CA scrambling capabilities, 16 RF-output channels DVB-C QAM modulating and supports a maximum of 512 IP-Stream inputs through Gigabit Ethernet port. Modulating to 16 non-adjacent DVB-C QAM carriers (50MHz...960MHz) output through the RF output interface. To meet customers' various requirements, this device is also equipped with 2 ASI input ports which selected services can be mixed (remultiplexed) to the output channels.
The BLANKOM HDC-7016 is also characterized with an high integration level, high performance and very cost effective. This is very adaptable to new generations of CATV headend systems i.e. in hospitality environments.

Features:

- 16 Channel DVB-C (QAM) Headend System
- 16 DVB-S/S2 tuner inputs for 16 FTA satellite transponders
- 512 IPTV inputs (UDP, RTP)
- 2 ASI inputs
- 16 groups multiplexing +16 groups CA scrambling
- 16 groups QAM modulating
- Excellent RF output performance index, MER ≥ 40 dB
- Accurate PCR adjusting; PSI/SI editing and inserting
- Web management, Updates via web
- DiSEqC 1.0 LNB control for up to 4 satellites
- Dual power supply (optional)



Technical Data:

Function	**16 channel DVB-C Headend with Satellite, IPTV and ASI input**
INPUT	**16 DVB-S/S2 FTA Tuner**
	512 IPTV channels over UDP and RTP protocol
	2 ASI input, BNC interface
OUTPUT	**16 DVB-C groups which can be multiplexed from any combination of input channels**
Tuner section	**16 DVB-S/S2 tuners with input frequency range: 950-2150 MHz**
	Symbol rate: 2-45 MSps (supports SCPC and MCPC)
	Signal strength: -65…-25dBm
	QPSK, 8PSK; supporting DiSEqC 1.0 LNB control for up to 8 satellites
Multiplexing	**16 multiplexers, Maximum PID remapping: 128 per input channel**
	PID remapping (automatically or manually), Accurate PCR adjusting, Generate PSI/SI table automatically
Scrambling	**Max simulcrypt CA: 4**
	Scramble Standard: ETR289, ETSI 101 197, ETSI 103 197
	Local/remote connection
Modulation	**16 DVB-C (QAM) channels, Standard EN300 429/ITU-T J.83A/B**
	RF frequency 50~960 MHz, 1 kHz step
	RF output level 87~107 dBµV, 0.1 dB step
	Constellation 16/32/64/128/256QAM
	MPTS / SPTS over UDP, 10/100/1000 Base-T Ethernet interface (UDP unicast / multicast)
SYSTEM	
Control	**Remote management Web NMS（10M/100M）**
GENERAL	
Dimensions	**482mm×300mm×44.5mm, 19" 1U, 3.7 kg**
Power	**AC 110V±10%,50/60Hz or AC 220V±10%, 50/60Hz, 25 W, dual power supply optional**
Temperature	**0…45°C (operation), -20…80°C (storage)**

Anmerkung:

Alle von uns veröffentlichten Betriebsanleitungen richten sich an den Antennen- und IT-Fachmann, der über grundlegende Kenntnisse der Empfangs-, Netzwerk- und Anlagentechnik verfügt. Die Einhaltung aller relevanten Vorschriften und Richtlinien für den Aufbau und Betrieb von solchen Anlagen obliegt dem Installateur und/oder dem Betreiber. Insbesondere sind die in den jeweiligen Ländern geltenden Vorschriften und Richtlinien für die Inbetriebnahme speziell für den Stromanschluss und alle mit den Produkten in Zusammenhang stehenden und geltenden Normen und Gesetze einzuhalten.

Remark:

All operating instructions published by us are intended for the antenna and IT specialist who has basic knowledge of reception, network and system technology. Compliance with all relevant regulations and guidelines for the installation and operation of such systems is the responsibility of the installer and/or the operator. In particular, the regulations and guidelines applicable in the respective countries for commissioning, especially for the power connection, and all standards and laws related to the products must be complied with.

Annotation:

Tous les modes d'emploi que nous publions sont destinés aux professionnels de l'antenne et de l'informatique qui ont des connaissances de base en matière de réception, de mise en réseau et de technologie des équipements. Le respect de toutes les réglementations et directives pertinentes pour l'installation et l'exploitation de ces systèmes relève de la responsabilité de l'installateur et/ou de l'exploitant. En particulier, il convient de respecter les réglementations et directives applicables dans les pays respectifs pour la mise en service, notamment pour le raccordement électrique, ainsi que toutes les normes et lois relatives aux produits.

Annotazione:

Tutte le istruzioni per l'uso da noi pubblicate sono destinate al professionista dell'antenna e dell'informatica che ha una conoscenza di base della tecnologia di ricezione, di rete e delle apparecchiature. Il rispetto di tutti i regolamenti e le linee guida pertinenti per l'installazione e il funzionamento di tali sistemi è responsabilità dell'installatore e/o dell'operatore. In particolare, devono essere rispettati i regolamenti e le linee guida applicabili nei rispettivi paesi per la messa in funzione, soprattutto per il collegamento alla rete elettrica e tutte le norme e le leggi relative ai prodotti.

Anotación:

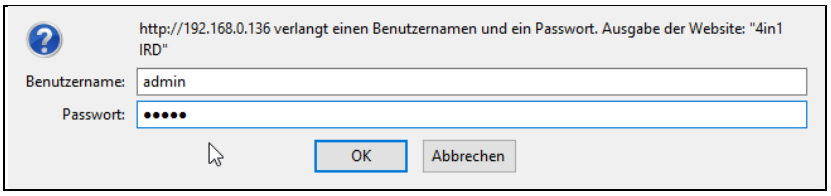
Todas las instrucciones de uso publicadas por nosotros se dirigen al profesional de la antena y de la informática que tiene conocimientos básicos de recepción, de redes y de tecnología de equipos. El cumplimiento de todos los reglamentos y directrices pertinentes para la instalación y el funcionamiento de dichos sistemas es responsabilidad del instalador y/o del operador. En particular, deben cumplirse los reglamentos y directrices aplicables en los respectivos países para la puesta en marcha, especialmente para la conexión de la energía y todas las normas y leyes relacionadas con los productos.

Anotação:

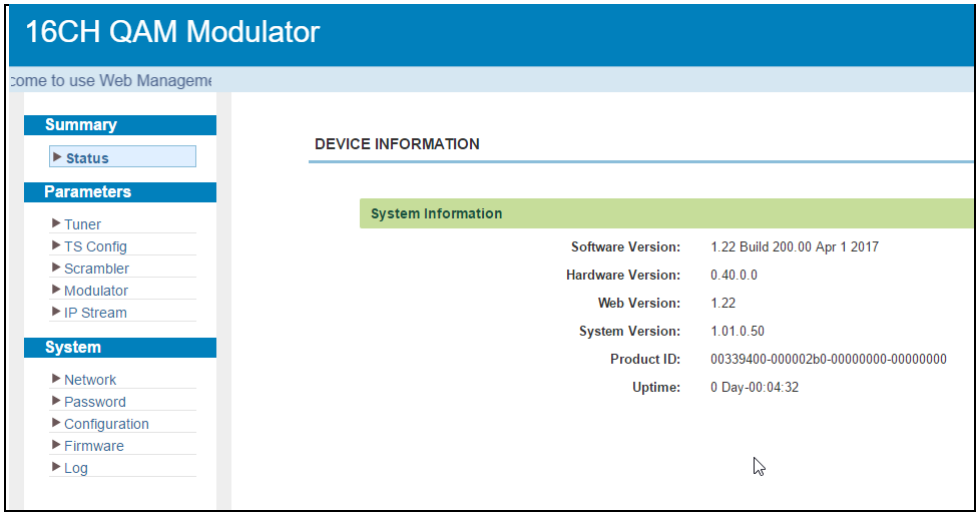
Todas as instruções de operação publicadas por nós são destinadas ao profissional de antena e TI que possui conhecimentos básicos de recepção, rede e tecnologia de equipamentos. O cumprimento de todos os regulamentos e diretrizes relevantes para a instalação e operação de tais sistemas é de responsabilidade do instalador e/ou do operador. Em particular, os regulamentos e diretrizes aplicáveis nos respectivos países para comissionamento, especialmente para a conexão de energia e todas as normas e leis relacionadas aos produtos devem ser obedecidas.

Let's start with the Web-Interface:

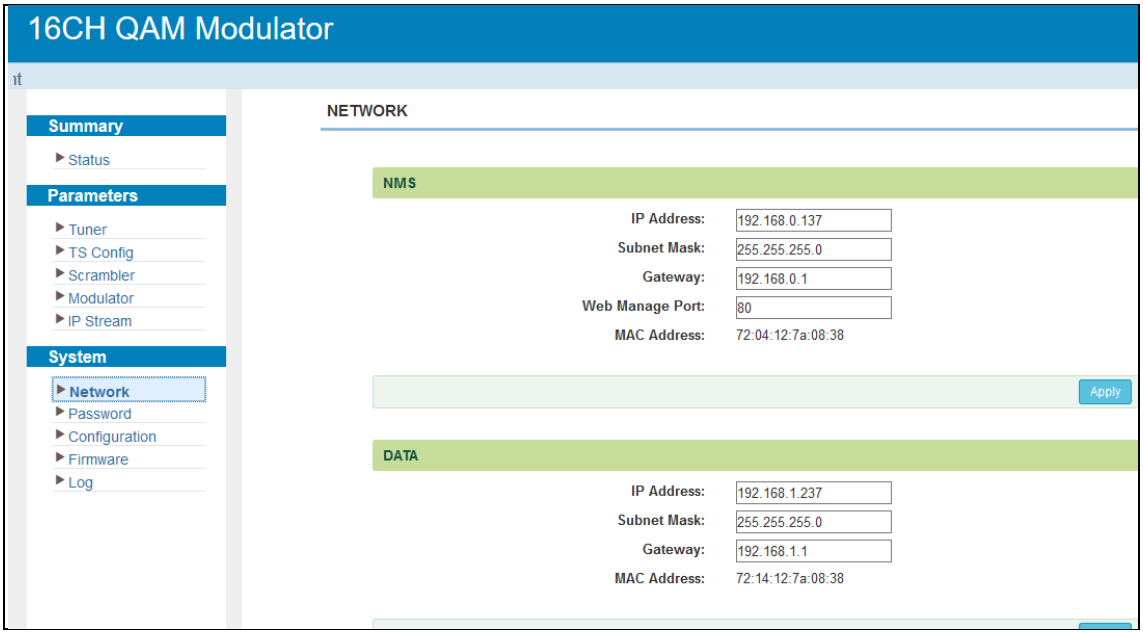
The user can control and set the configuration of the device with any computer by connecting to the webserver by the 100BaseT NMS Port. The user should ensure that the computer's IP address is different from other device's IP address; otherwise, it might cause an IP conflict.
Default Login-Data on 192.168.0.136 (default factory address) are **admin/admin**:



Note: We recommend using the newest version of the browser Firefox.



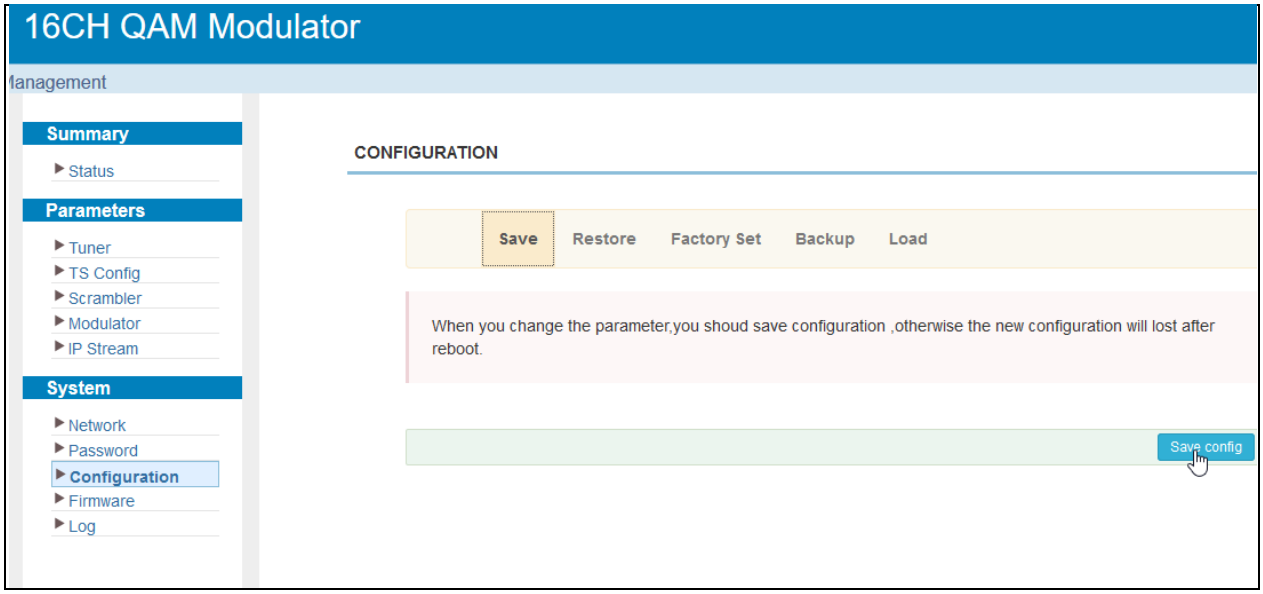
Network settings:



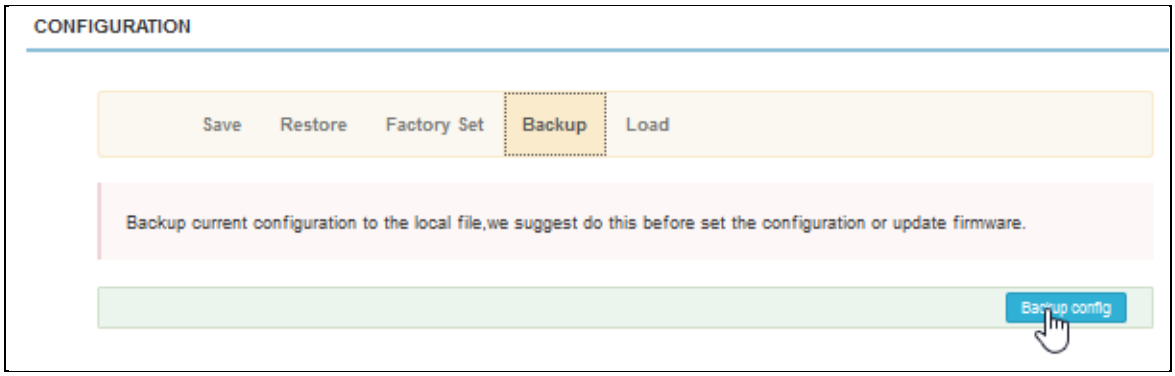
We assume that the user is familiar with IP settings and already knows his own system to connect the unit to. If you use the **Output Streaming** feature: **We recommend using 2 separate Switches**! At least a 100BaseT for the Management NMS RJ45 port and a second one with Gigabit Ethernet 10/100/1000BaseT with at least Layer 2+ with IGMP V2 features. Otherwise you might flood your IP-Streaming network with unnecessary Data, which might overload connected IPTV STB's because they almost have only 100BaseT capacity (Never ones use 1GbE ports) but too many inputs into a STB can result in side effects. If you need to select a Switch, we recommend HP Procurve 2530 24G or 48G which are cost effective, easy to configure, can be trunked and supporting IGMP V2. If the switch needs routing functions, the bigger brother of this series might be the right choice.
Because to not accidently put DATA and NMS port in the same sub-network the data – port setting does not allow this by default. Usually the DATA GbE Port needs an IP address- otherwise the Switch or the receivers (i.e. IPTV STB's) cannot locate the source of the streams.

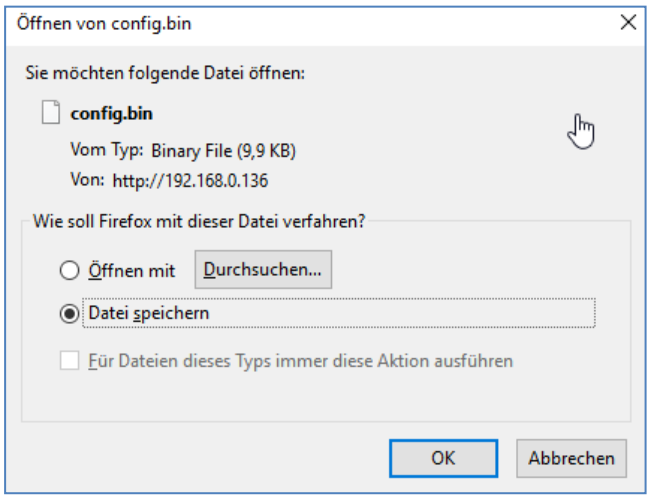
APPLY and better to

Safe & restore, Backup & load configs:



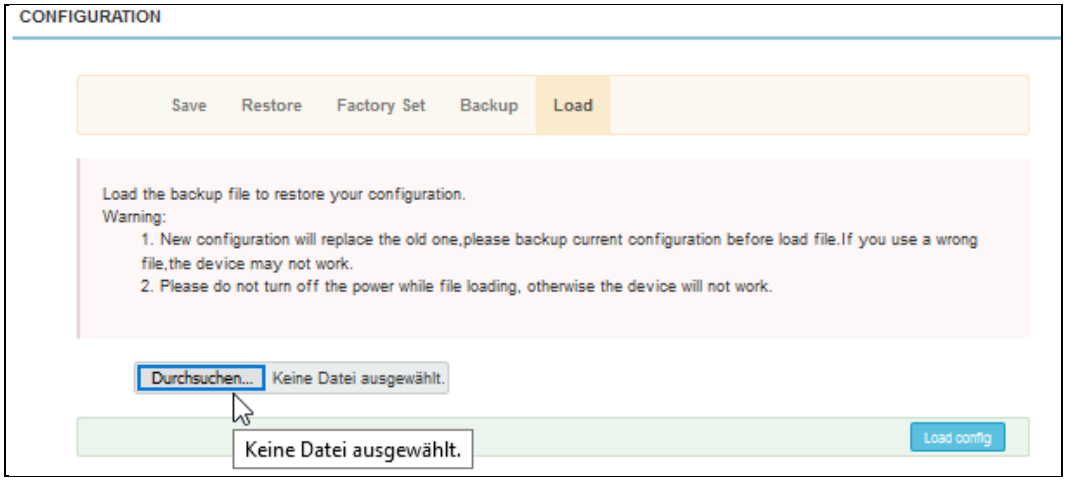
We highly recommend to safe the configuration to be able to restore it at all time just in case the unit was accidently w/o power or any other interruptions happened.
This method is only temporary so we recommend to use the Backup and Load function instead:



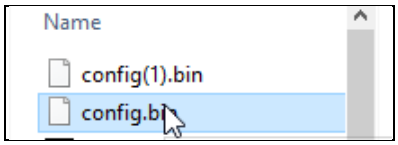


Safe/Store the config.bin file on your local PC.

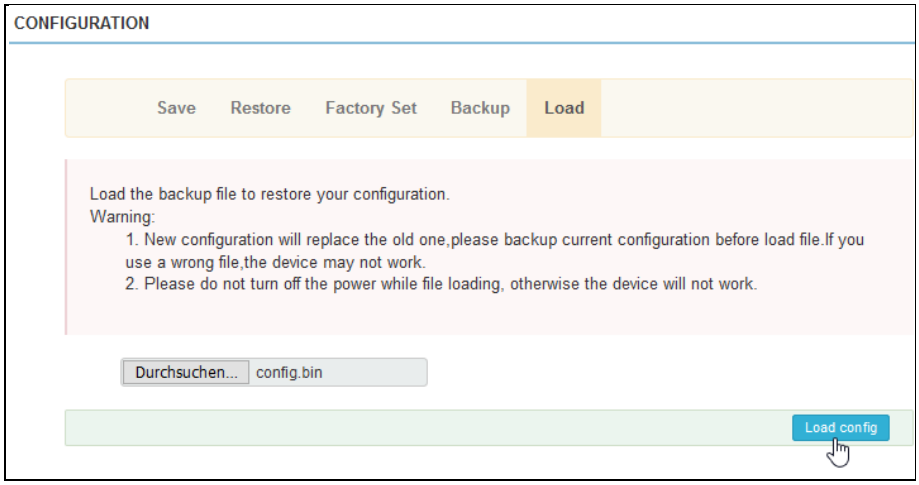
Restoring this config:

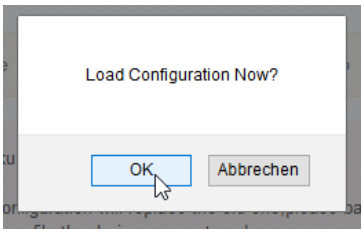


Select the file and start the upload:

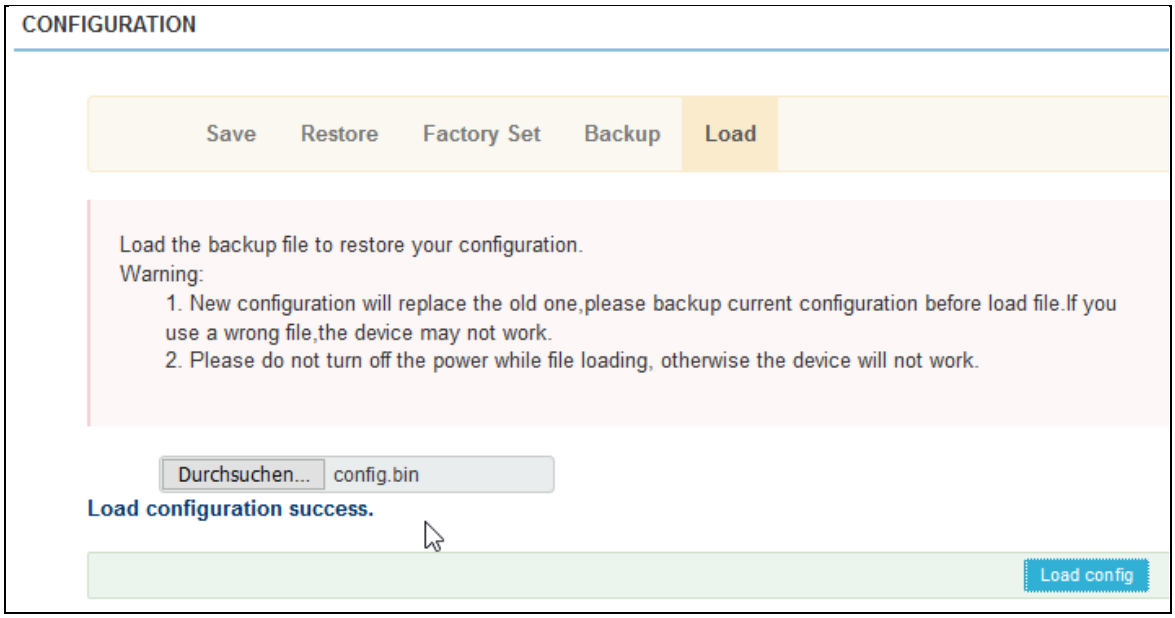


than LOAD config



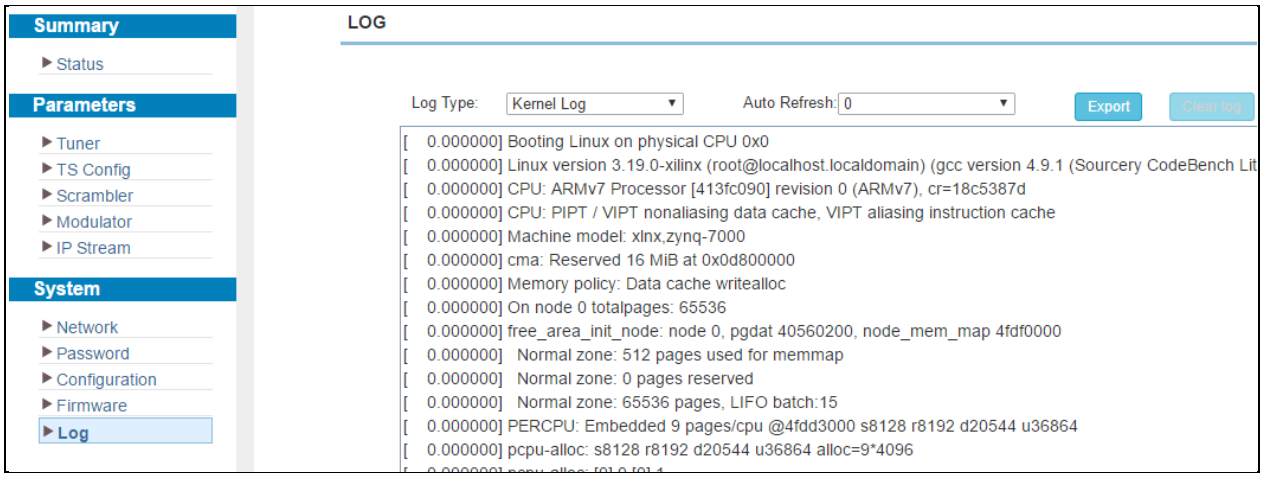


confirm it please…



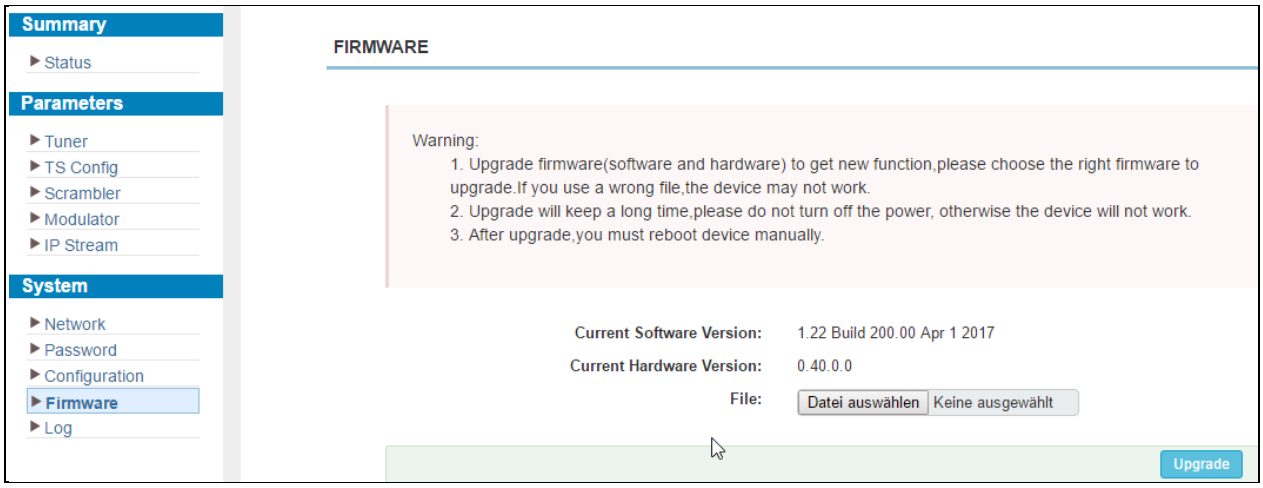
Remark: Time & Date Settings like in our other units is actually not implemented. So the unit currently acquires this information from your logged in browser/PC settings. Future releases may enable these settings.

Logfiles:



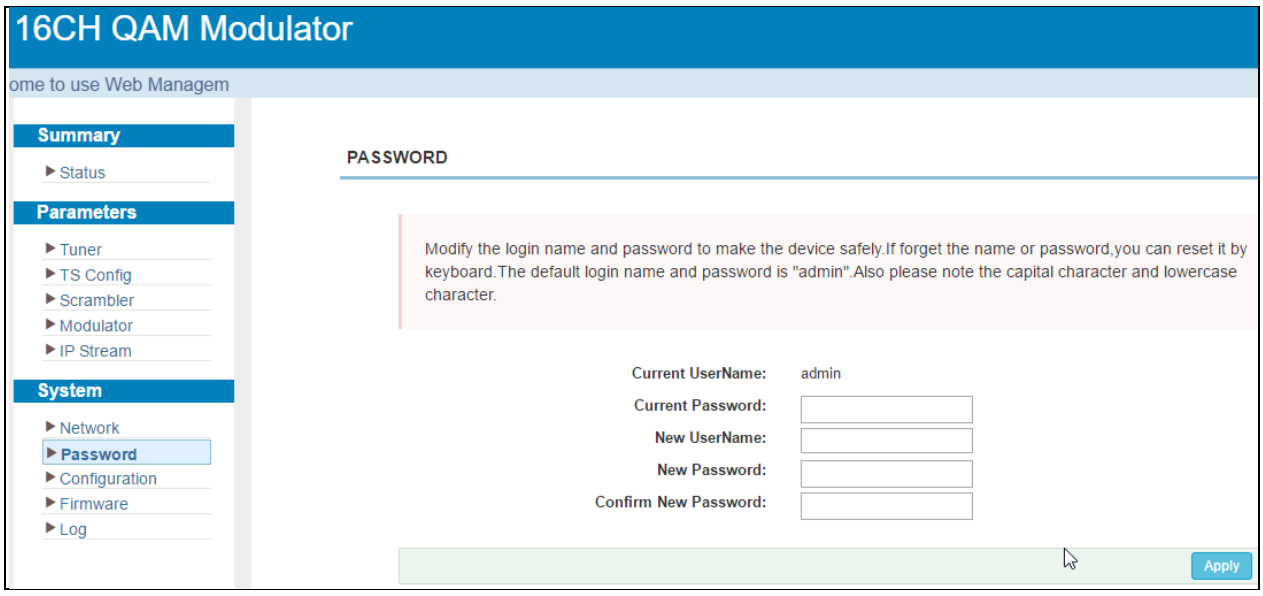
Kernel Log and System Log can be reviewed and exported – for service issues – just in case.

Firmware upgrade:



Self explaining…

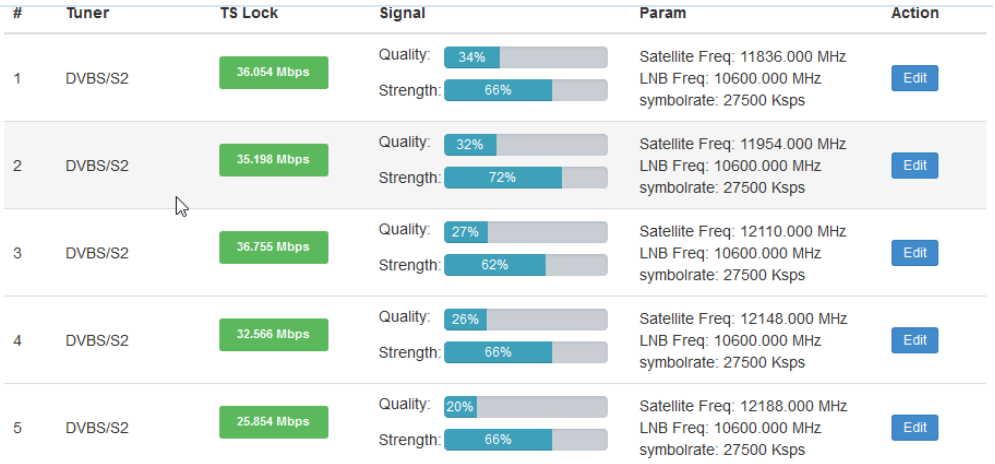
Username/Password changing:



The default username / PW can be changed to your needs. Please make sure you do not lose it or a complete factory Reset (Front panel RESET button) must be initiated. And the configuration would get lost -> Backup…

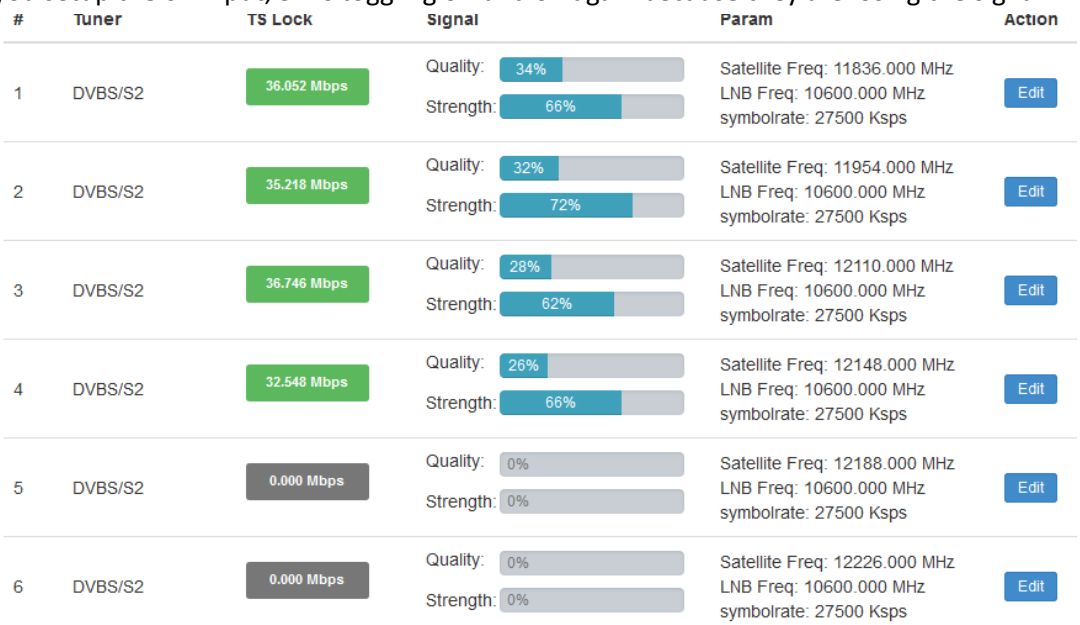
Tuner configuration DVB S/S2:

We start this configuration with an Example by combining Inputs and even **loop** some out- to next In-puts. ***We recommend not using this method***, because the extra attenuation of the LOOP-OUT Ports may cause a too weak Signal-Input to the next RF-IN as shown here.
We will setup here 2 Satellites as an Example: ASTRA 19° EAST (SAT Pos. 1) and Hotbird 13° EAST (SAT Pos.2).
Input: 1st RF IN is directly connected to the Multiswitch, 2nd looped from the first and so on until port 8:
But that's way too much attenuation from loop to next RF IN:



#	Tuner	TS Lock	Signal	Param	Action
1	DVBS/S2	36.054 Mbps	Quality: 34% Strength: 66%	Satellite Freq: 11836.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
2	DVBS/S2	35.198 Mbps	Quality: 32% Strength: 72%	Satellite Freq: 11954.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
3	DVBS/S2	36.755 Mbps	Quality: 27% Strength: 62%	Satellite Freq: 12110.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
4	DVBS/S2	32.566 Mbps	Quality: 26% Strength: 66%	Satellite Freq: 12148.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
5	DVBS/S2	25.854 Mbps	Quality: 20% Strength: 66%	Satellite Freq: 12188.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit

If you setup the 6th Input, 5th is toggling off and on again because they are losing the signal.

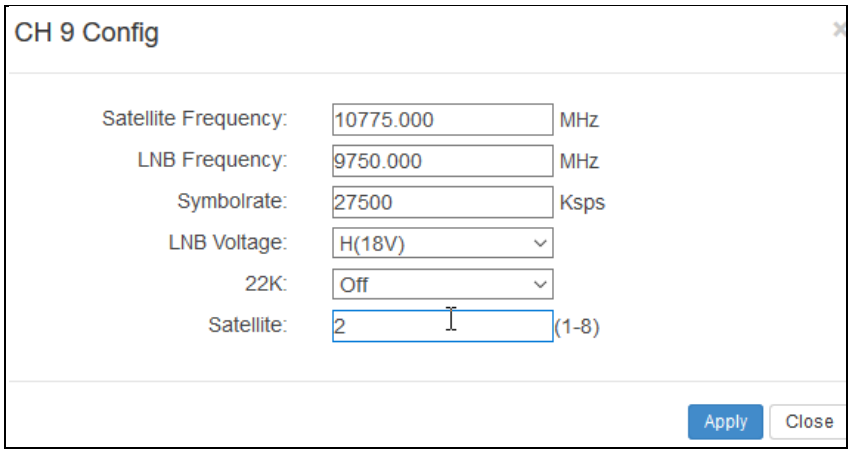


#	Tuner	TS Lock	Signal	Param	Action
1	DVBS/S2	36.052 Mbps	Quality: 34% Strength: 66%	Satellite Freq: 11836.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
2	DVBS/S2	35.218 Mbps	Quality: 32% Strength: 72%	Satellite Freq: 11954.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
3	DVBS/S2	36.746 Mbps	Quality: 28% Strength: 62%	Satellite Freq: 12110.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
4	DVBS/S2	32.548 Mbps	Quality: 26% Strength: 66%	Satellite Freq: 12148.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
5	DVBS/S2	0.000 Mbps	Quality: 0% Strength: 0%	Satellite Freq: 12188.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
6	DVBS/S2	0.000 Mbps	Quality: 0% Strength: 0%	Satellite Freq: 12226.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit

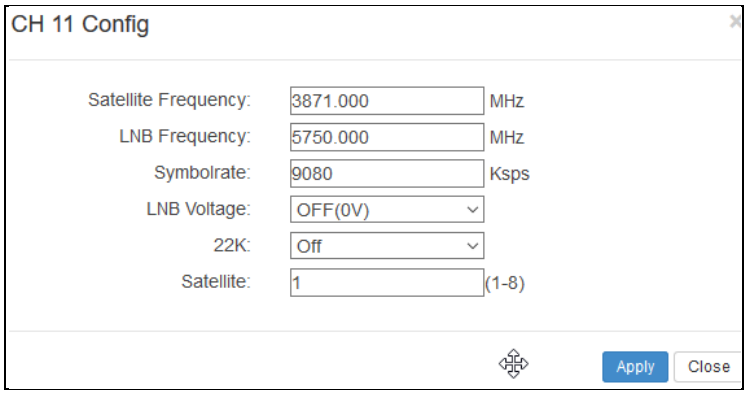
And anyway if you chose to use them also in Loop-connected mode, only one of the inputs should serve the Multiswitch with 13VDC(Vertical) or 18VDC (Horizontal) and 22KHz (High Band) signal should be only sent by one port if you are using a Splitter for several ports to be combined. Otherwise, if every RF-IN port has a direct connection to a SAT-Matrix or Multiswitch, each parameter needs to be setup accordingly for every single port.

Connected Ports 9-16 with an external active SAT Splitter 1 to 8 to the Multiswitch.

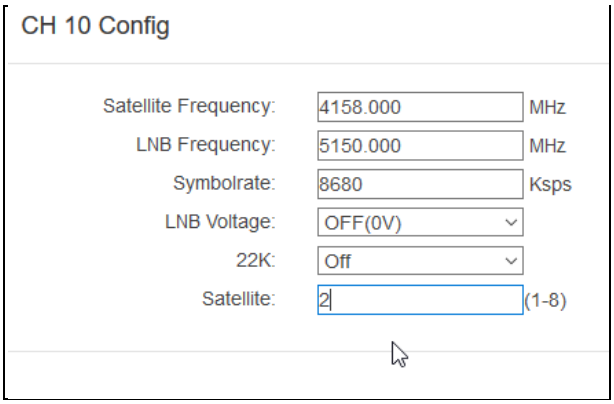
Now we check Sat-Pos. 2 = Hotbird 13° East by DiSEqC:



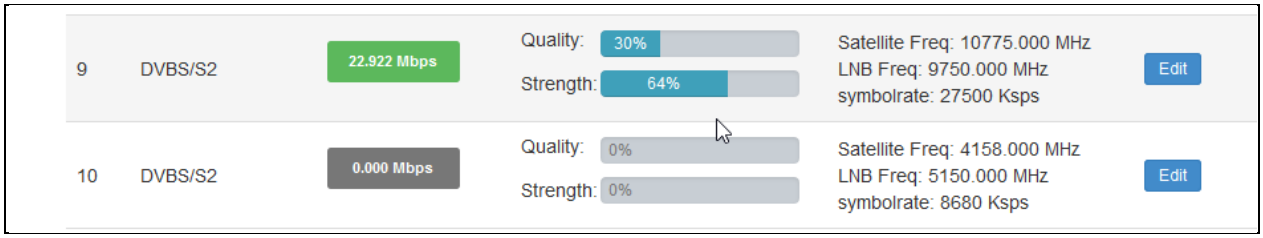
Assure before, that all 13/18V settings from tuner 9-16 @ the splitter are off:



and DiSEqC is set to the same sattelite:



e Voila:



Now better to change the first 8 inputs and use a 1:8 active splitter with DC Pass (sourced from the H/V-DC supplied to the coax-cable):

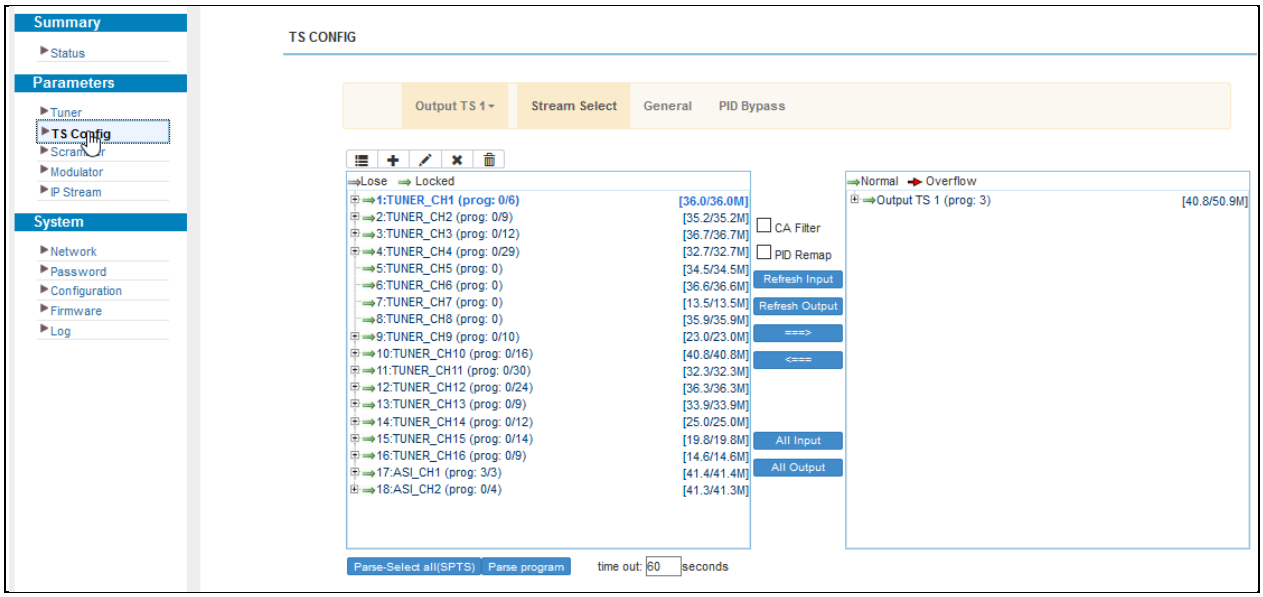
#	Tuner	TS Lock	Signal	Param	Action
1	DVBS/S2	36.067 Mbps	Quality: 33% Strength: 66%	Satellite Freq: 11836.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
2	DVBS/S2	35.219 Mbps	Quality: 33% Strength: 70%	Satellite Freq: 11954.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
3	DVBS/S2	36.725 Mbps	Quality: 31% Strength: 62%	Satellite Freq: 12110.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
4	DVBS/S2	32.577 Mbps	Quality: 31% Strength: 66%	Satellite Freq: 12148.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
5	DVBS/S2	34.515 Mbps	Quality: 30% Strength: 70%	Satellite Freq: 12188.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
6	DVBS/S2	36.592 Mbps	Quality: 31% Strength: 68%	Satellite Freq: 12226.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
7	DVBS/S2	23.720 Mbps	Quality: 29% Strength: 62%	Satellite Freq: 12422.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit
8	DVBS/S2	36.254 Mbps	Quality: 30% Strength: 64%	Satellite Freq: 12266.000 MHz LNB Freq: 10600.000 MHz symbolrate: 27500 Ksps	Edit

and 9-10 keeping as it was for Hotbird:

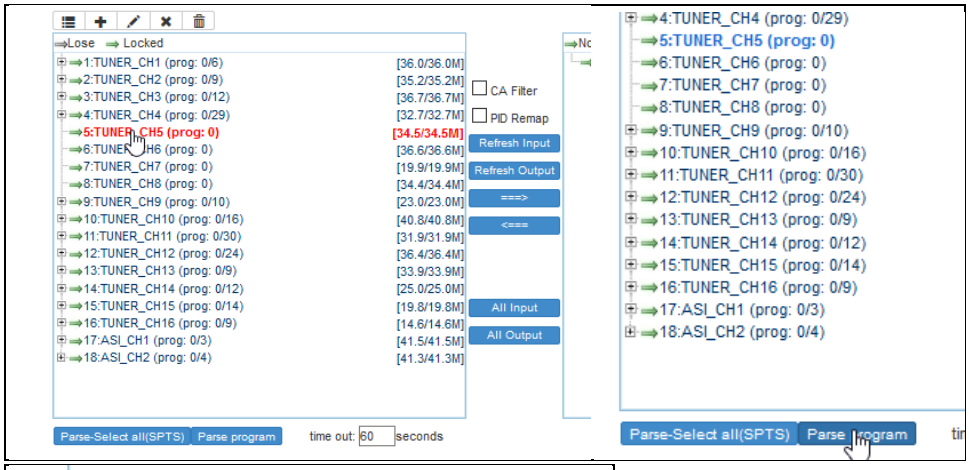
9	DVBS/S2	23.023 Mbps	Quality: 31% Strength: 64%	Satellite Freq: 10775.000 MHz LNB Freq: 9750.000 MHz symbolrate: 27500 Ksps	Edit
10	DVBS/S2	40.772 Mbps	Quality: 29% Strength: 60%	Satellite Freq: 10815.000 MHz LNB Freq: 9750.000 MHz symbolrate: 27500 Ksps	Edit
11	DVBS/S2	32.479 Mbps	Quality: 31% Strength: 60%	Satellite Freq: 10853.000 MHz LNB Freq: 9750.000 MHz symbolrate: 29900 Ksps	Edit
12	DVBS/S2	36.726 Mbps	Quality: 30% Strength: 58%	Satellite Freq: 11054.000 MHz LNB Freq: 9750.000 MHz symbolrate: 27500 Ksps	Edit
13	DVBS/S2	33.921 Mbps	Quality: 30% Strength: 62%	Satellite Freq: 11137.000 MHz LNB Freq: 9750.000 MHz symbolrate: 27500 Ksps	Edit
14	DVBS/S2	24.996 Mbps	Quality: 30% Strength: 58%	Satellite Freq: 11179.000 MHz LNB Freq: 9750.000 MHz symbolrate: 27500 Ksps	Edit
15	DVBS/S2	19.772 Mbps	Quality: 31% Strength: 62%	Satellite Freq: 11296.000 MHz LNB Freq: 9750.000 MHz symbolrate: 27500 Ksps	Edit
16	DVBS/S2	14.547 Mbps	Quality: 30% Strength: 64%	Satellite Freq: 11334.000 MHz LNB Freq: 9750.000 MHz symbolrate: 27500 Ksps	Edit

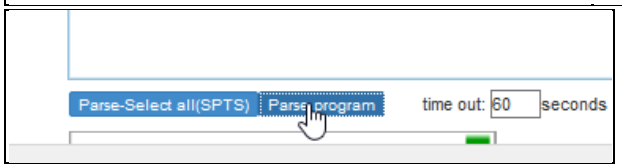
Signal quality of 1…8 are much better now.

Now that we have setup 16 SAT-Inputs, I have additional connected the 2x ASI ports from an external source to the unit:



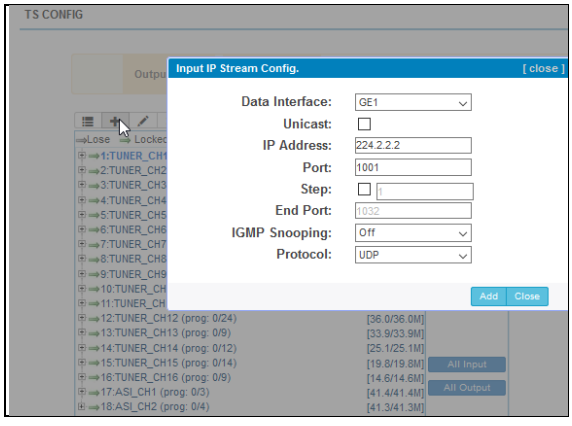
Now we **parse the inputs** to collect each TS data:



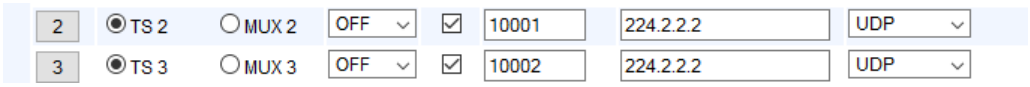


If the parsing wasn't sufficient, maybe increase the time-out value for the demultiplexer to 100s or more… depending on how many information might be detectable but 60 sec are usually OK.

With press the "+" you can add Channels from the Gigabit input:

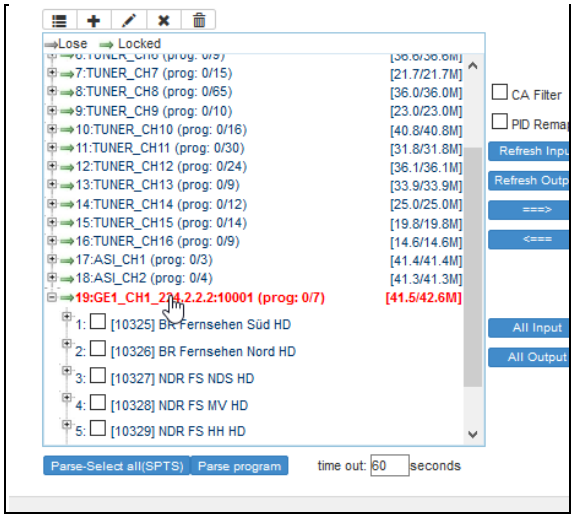


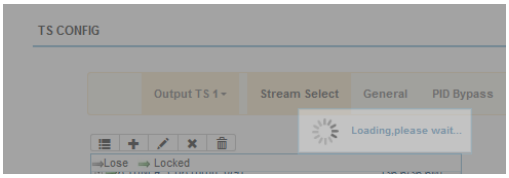
we have TS2/3 from the external source on:



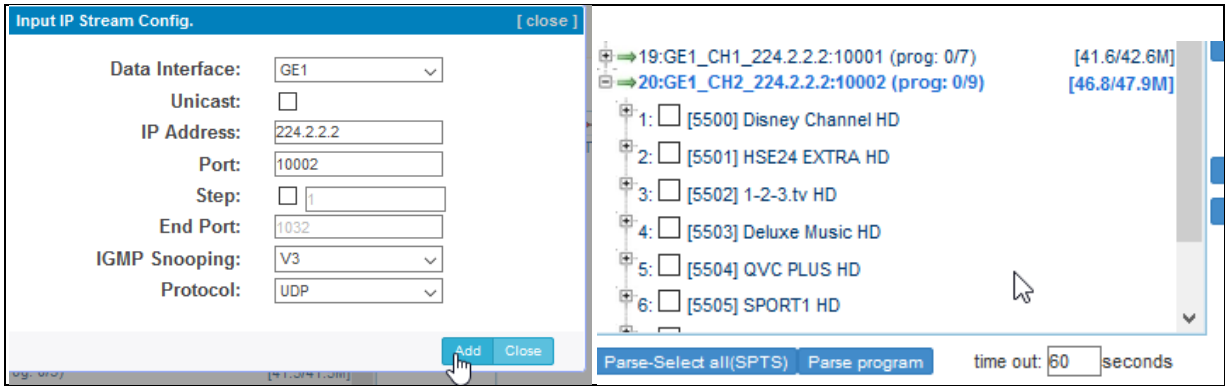
So importing them now, SET IGMP to V2 or V3 please (depending on your GbE Switch you are using, this makes a lot of sense). We recommend to use HP 2530 24G or 48G- sufficient, easy to operate and not that expensive like Cisco. Do not mess-up with just IGMP Snooping in very cheap Layer 2 Switches. You need full IGMP-Support V2/3 as at least Layer 2+ Switches, better Layer 3.
Otherwise, you are passing the streams to all ports even if they don't want them. Imagine: with 2 MPTS streams each has approximately 50 Mb/s = 100 Mb/s in total, every connected device with a 'only' fast Ethernet 100 BaseT - like Management ports – will be flooded with unwanted data and maybe not reachable any more.

Parse program and here we go:



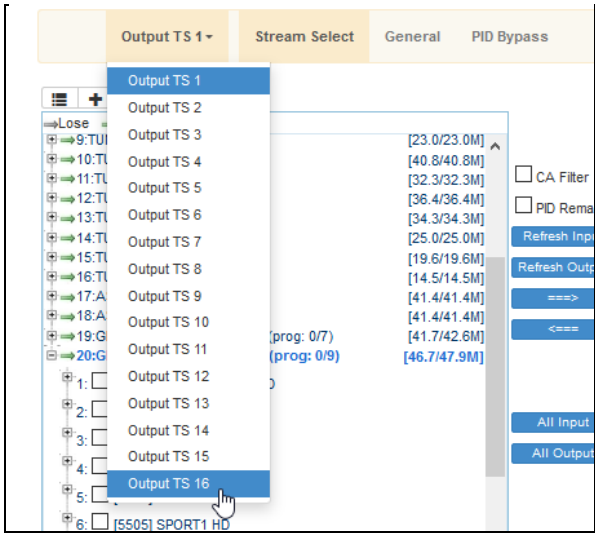


next Stream:

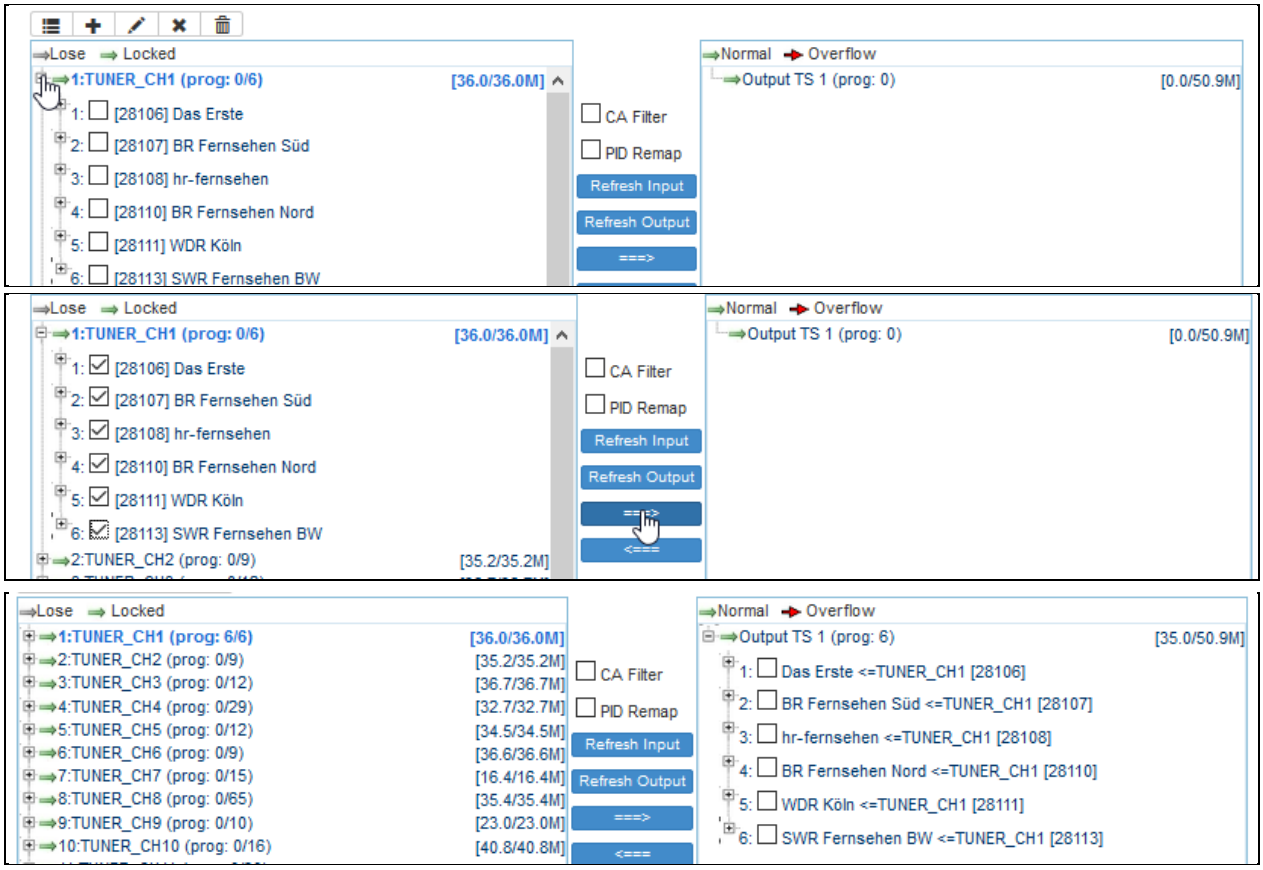


Remarkable.

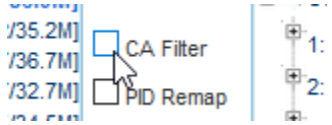
Now we need to select and create Output Transport streams:



Passing all of Input 1to out TS1:

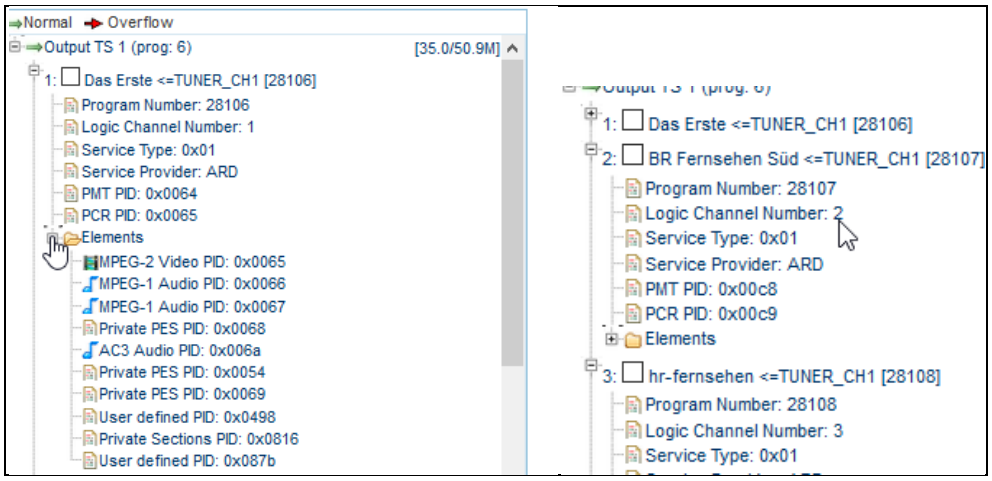


isn't that simple?

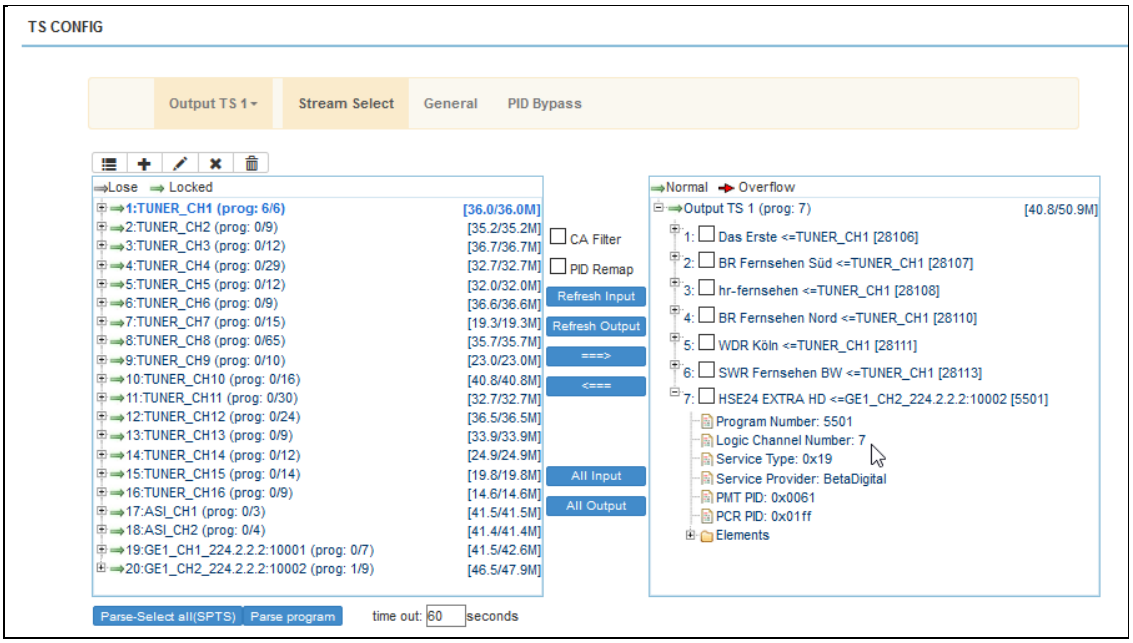
Just some hints: If the content is FTA not encrypted and no CI-Flag set in the TS, you can skip set the CA-Filter: 

and PID remapping is often not necessary. Maybe only to avoid collisions in a multiplex from different sources… but that later…

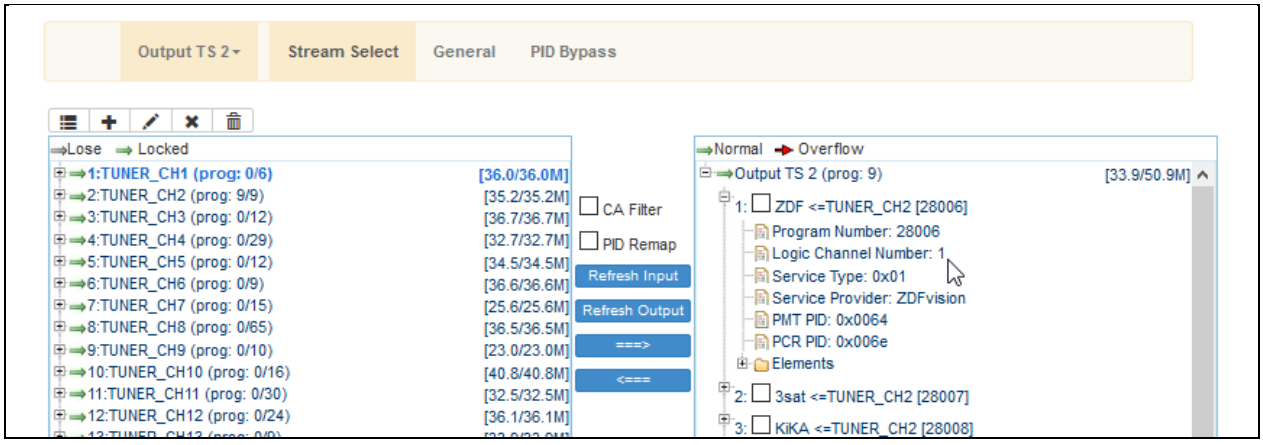
get more info's:



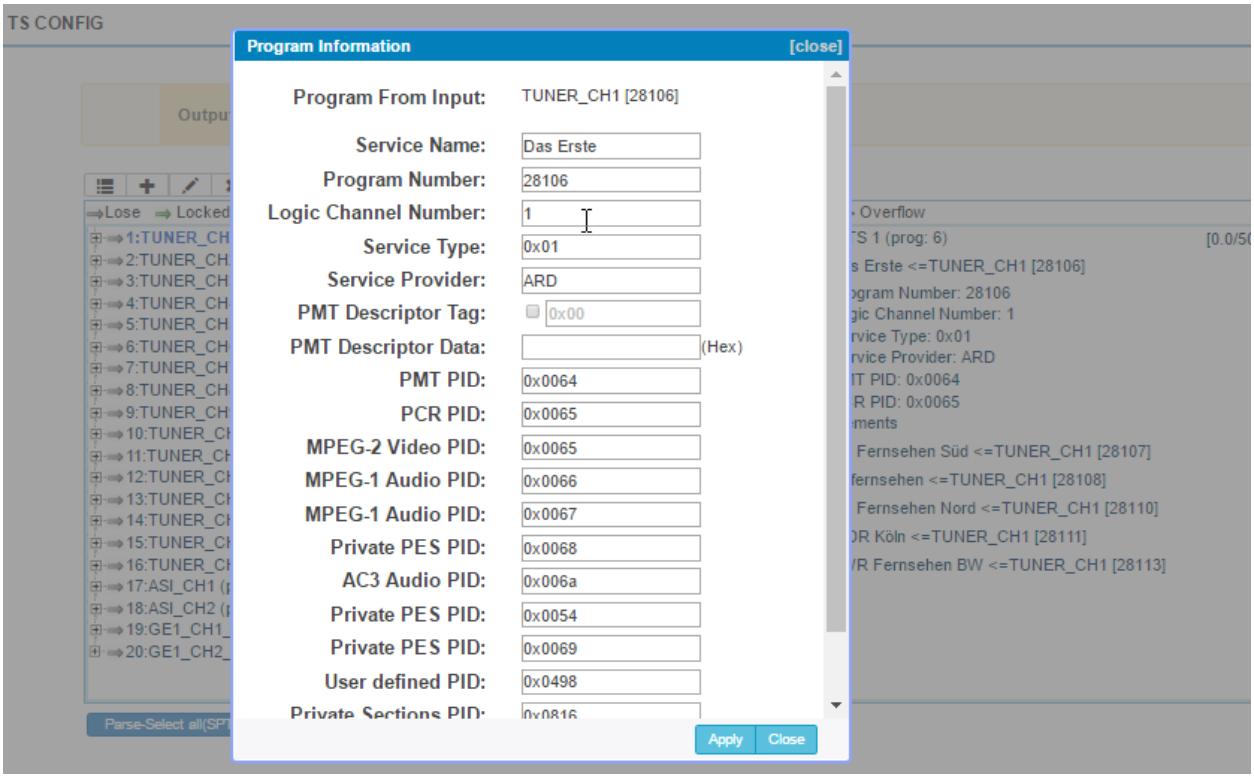
the PSI-SI multiplexer already assigns LCN's to the NIT which is Logical Channel Number Sorting for your TV/STB if it supports LCN's. These can be re-numbered in a later step manually.



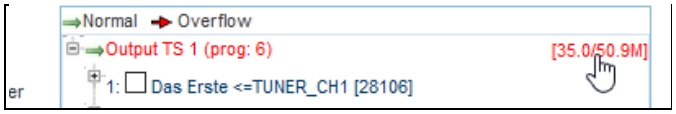
compare it:



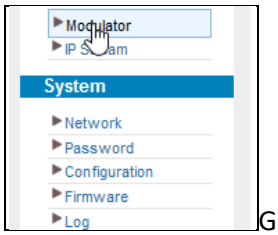
Change single output TS values by clicking right the service opens a popup:



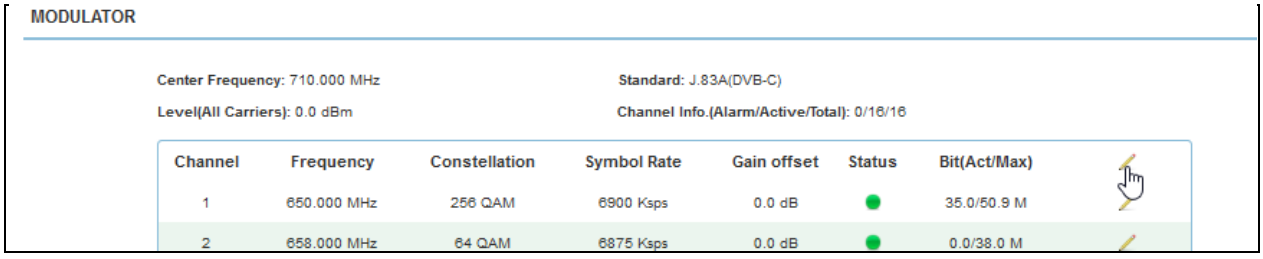
Another hint: we have some space left in this stream:

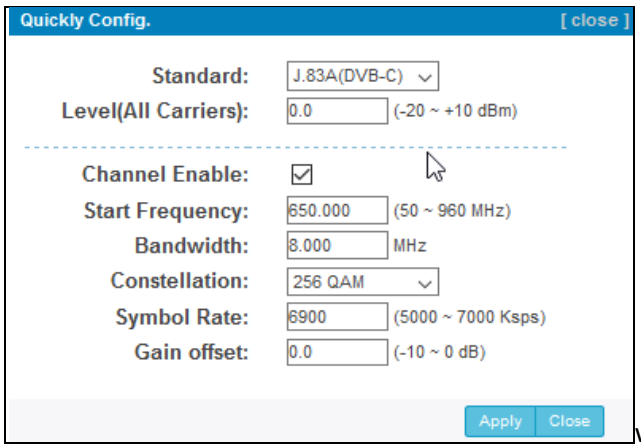


because I previous have set the output QAM-channel to 256QAM / 6900 SR, … let's check this for the others as well, to not underestimate the QAM Datarates – because DVB-S2 transponders can carry more than a QAM Channel can carry:



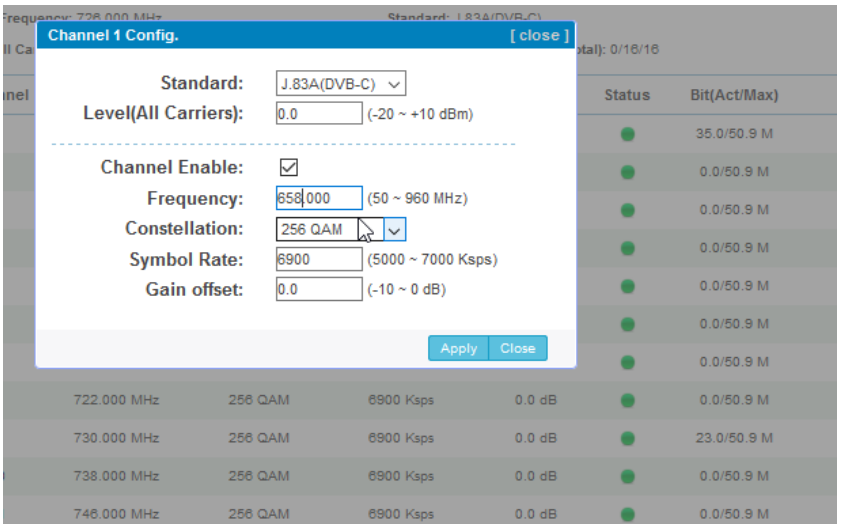
General Settings for all is recommended first





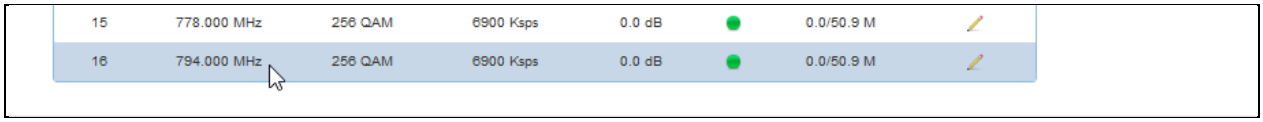
we stay @ DVB-C Annex A/C not using J83B (ITU) Annex B which is used in US and Korea…

Lets test the GAP: changed to start all from 666MHz and used the first on reducing – 8MHz, so we will get a GAP in the bandwidth:



Result:

Also this is possible: Adjusted an 8MHZ at the end of the 15th channel.



So now we are able to

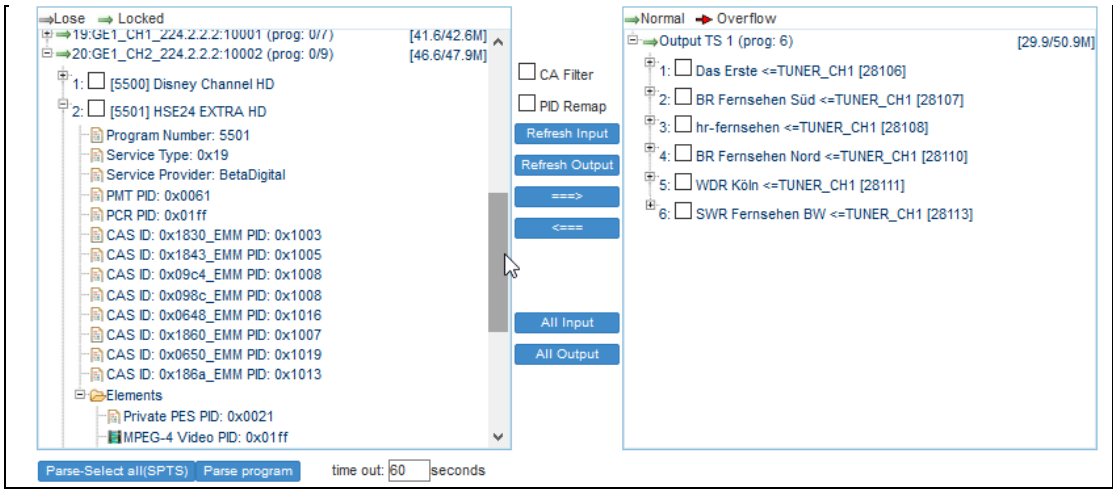
Create 16x QAM-Channels:

Almost with Free to Air TV and Radio Services:

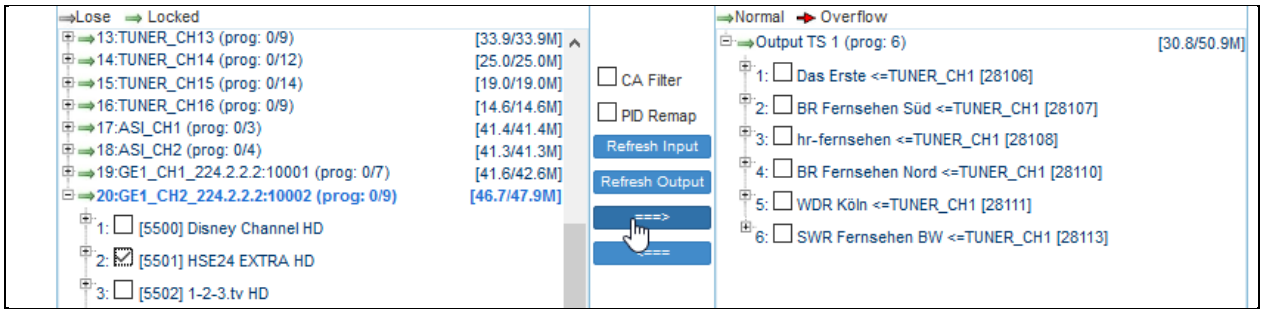
Level(All Carriers): 0.0 dBm **Channel Info.(Alarm/Active/Total):** 0/16/16

Channel	Frequency	Constellation	Symbol Rate	Gain offset	Status	Bit(Act/Max)	
1	658.000 MHz	256 QAM	6900 Ksps	0.0 dB		35.0/50.9 M	
2	674.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
3	682.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
4	690.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
5	698.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
6	706.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
7	714.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
8	722.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
9	730.000 MHz	256 QAM	6900 Ksps	0.0 dB		23.0/50.9 M	
10	738.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
11	746.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
12	754.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
13	762.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
14	770.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
15	778.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	
16	794.000 MHz	256 QAM	6900 Ksps	0.0 dB		0.0/50.9 M	

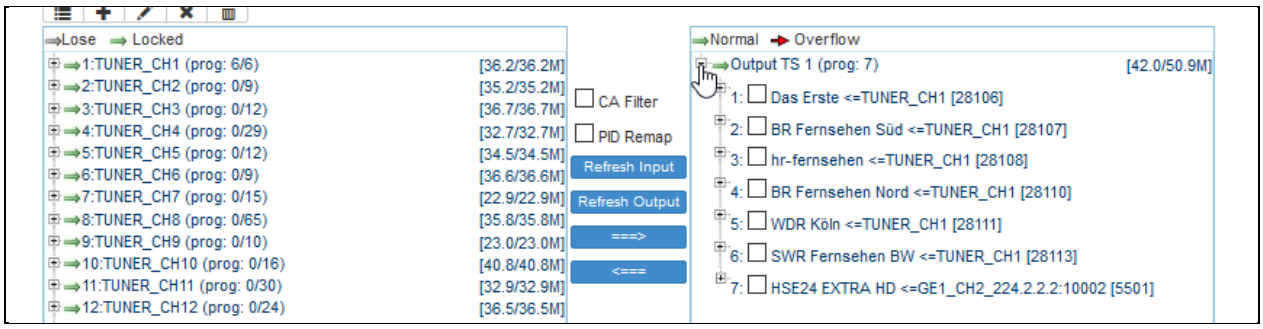
As you can see, the almost max. data rate in a QAM-DVB-C Annex A/C channel is: 50.9 Mb/s.
Because TV services usually do not use constant bitrates (see Sports, they increase bitrates per service)…
We need to consider an average overhead of 10-15%: 50.9 – 15% = 43 Mb/s and we would be safe.
Back to TS CONFIG-Menu:



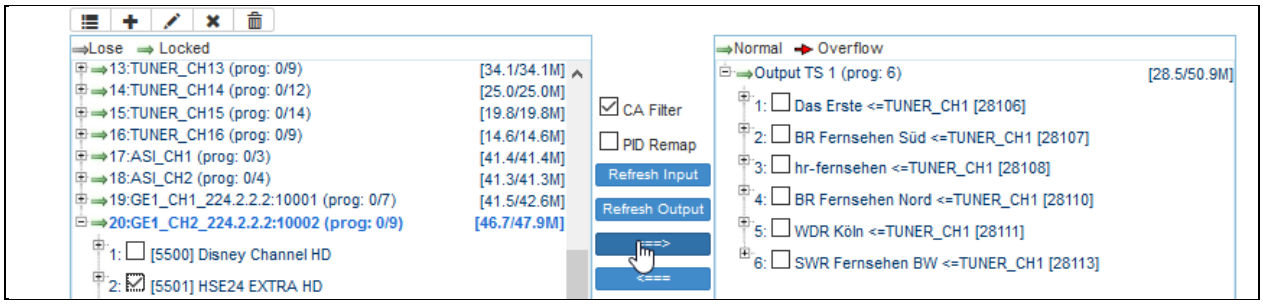
This might be irritating because in the GE1-Stream Input, all are encrypted except: HSE24 HD, and 1-2-3TV HD and QVC PlusHD. So we add one of these to TS1:



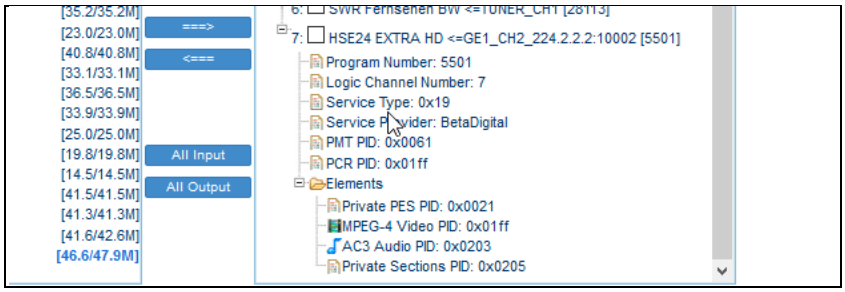
Looks promising:



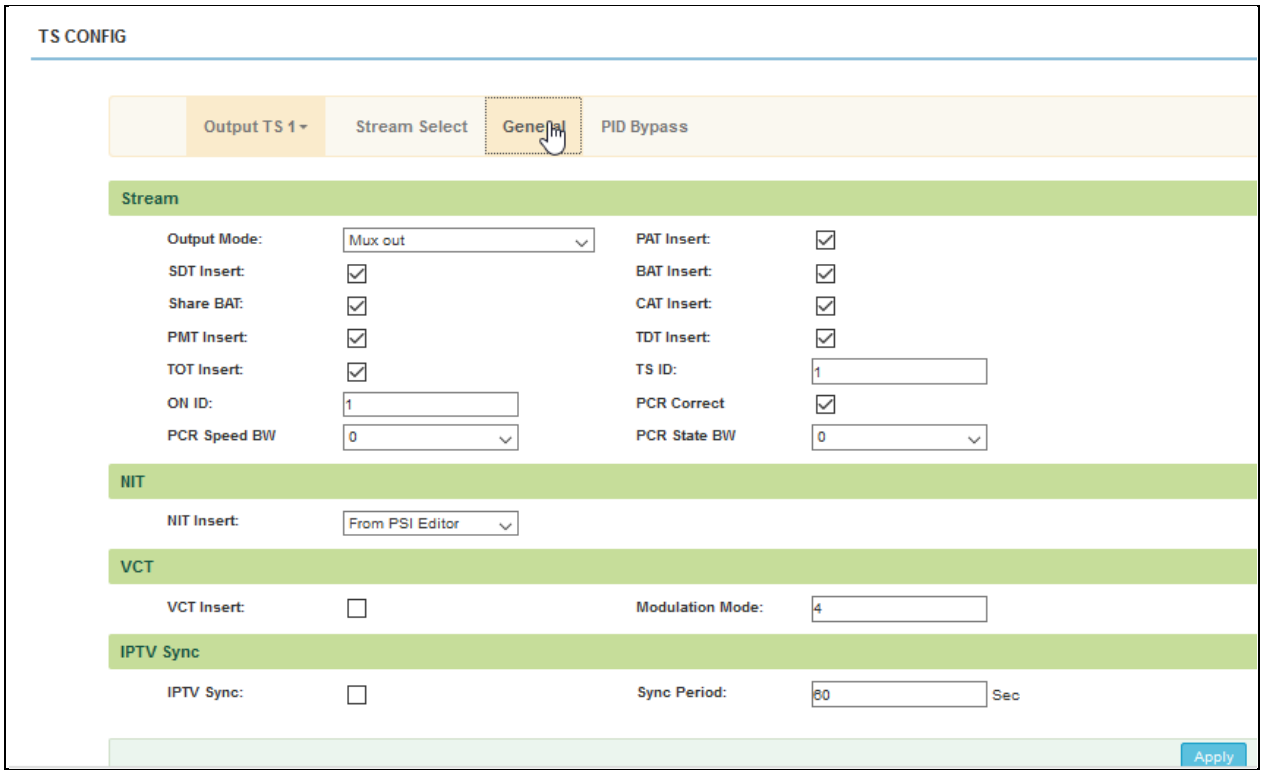
So we see, we have 8Mbit space… to less for another HD channel…
Now checking the CA-Filter feature:



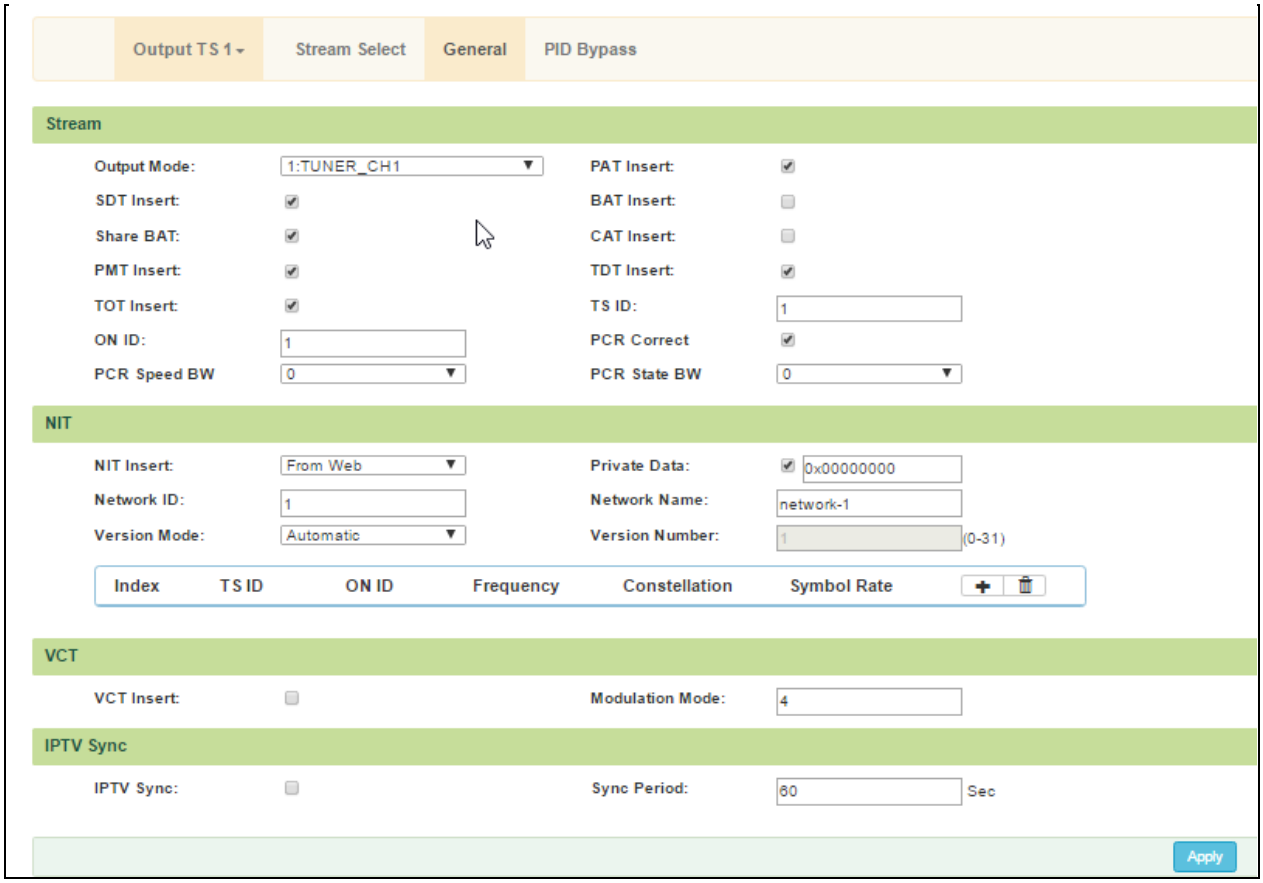
and whoops, the CA-PIDs are gone … great!!!:



Next step:

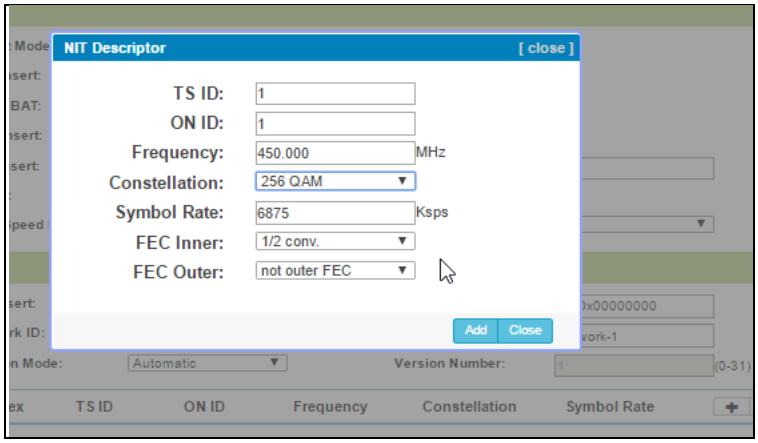


That setting with Mux needs to be done if the output QAM exists by mixing different sources. The DVB-Tables need to be re-created.



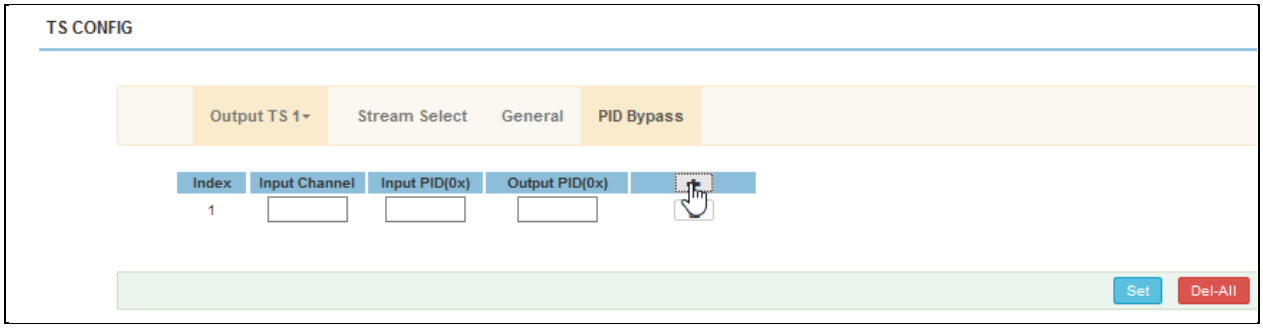
Useful for passing In to Out Tuner to QAM…

Here is the possibility shown to create the NIT according to your setup manually:

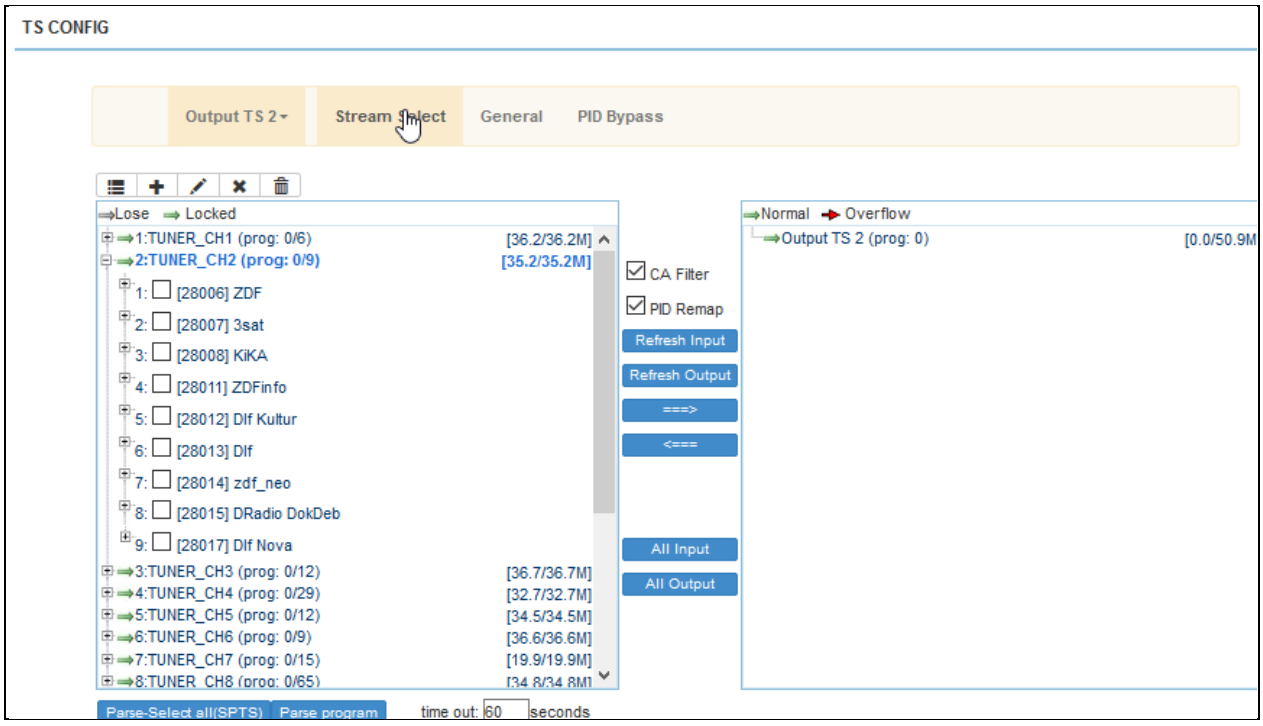


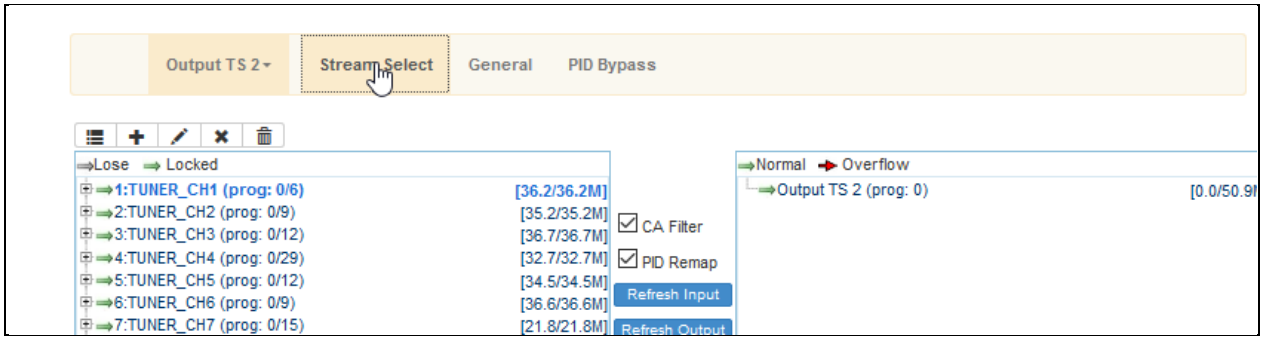
Otherwise an external PSI editor can be used and the NIT-file uploaded to the unit. Disadvantage: If you change something, you need to create/correct and upload that again.

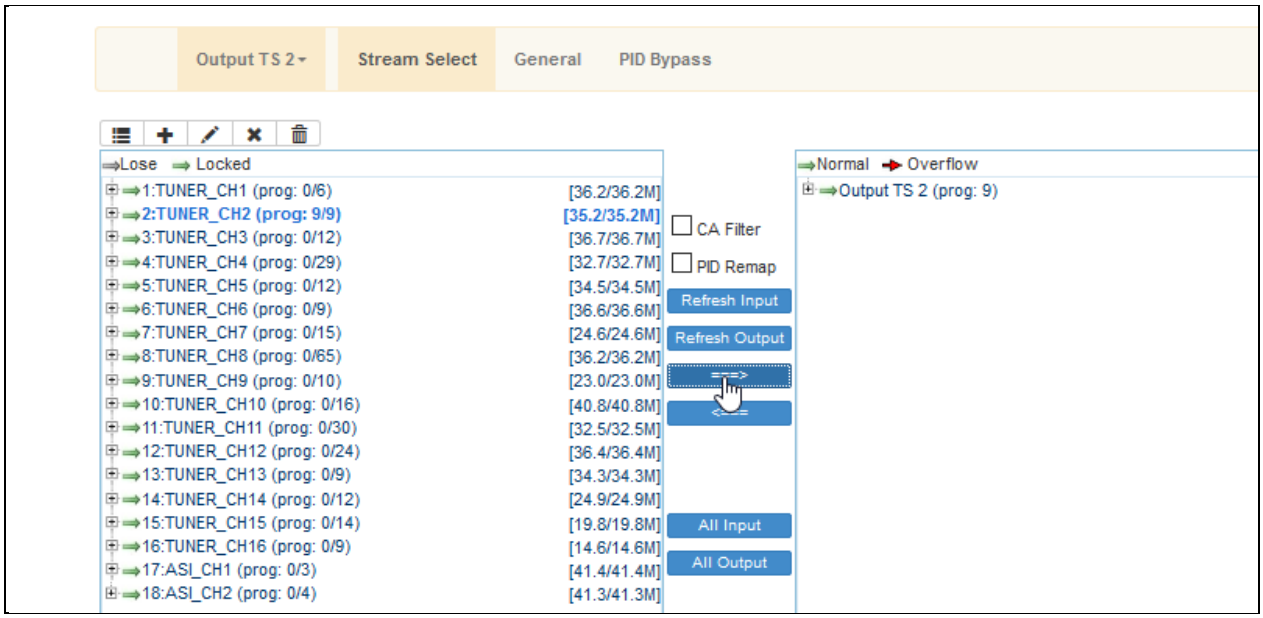
PID bypass can be used if some selective particular Input PID need to be passed to the QAM channel. now we wanne pass just an input to the output…:



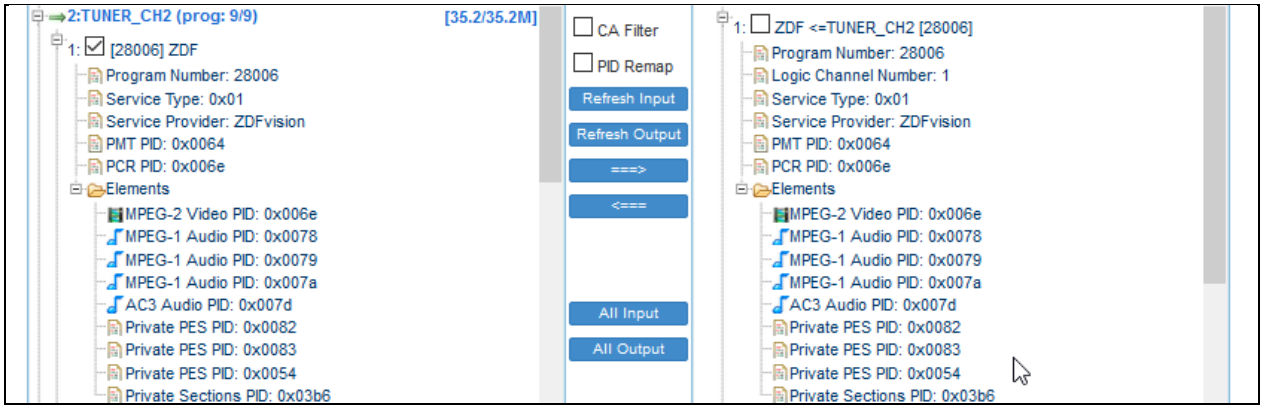
Repeat these steps for every output STREAM:





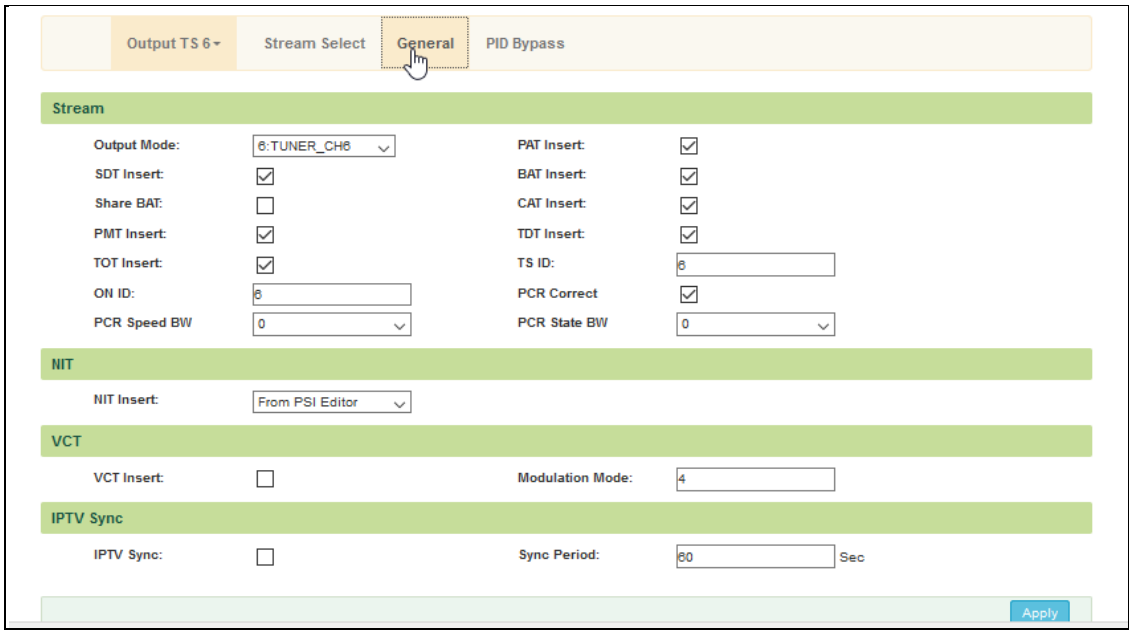


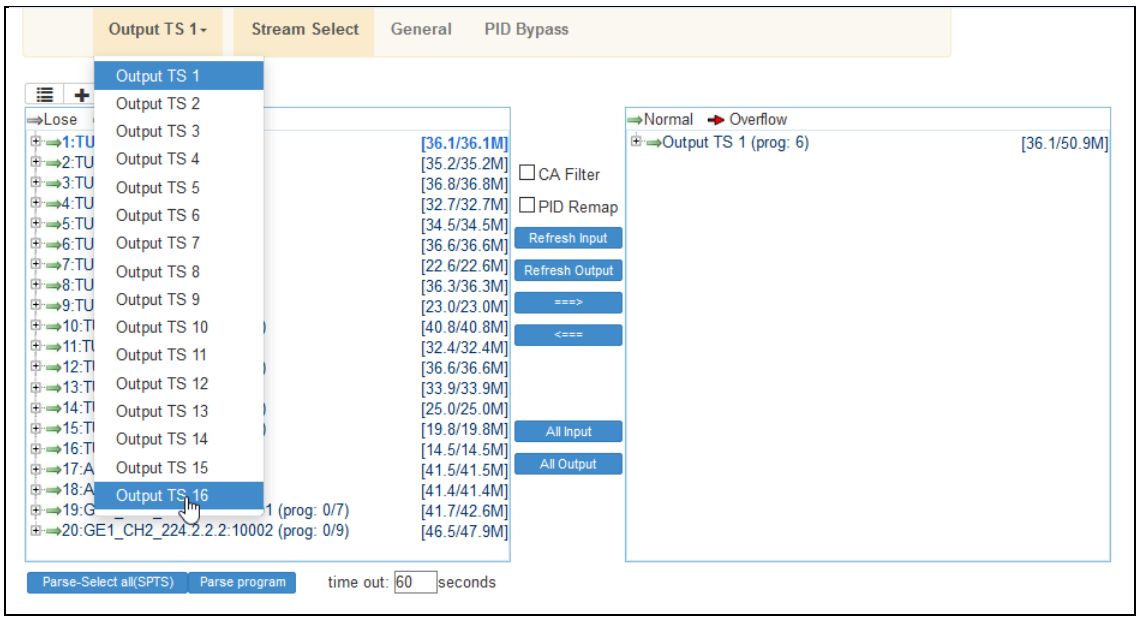
no CA filter necessary, neither PID remapping. The easiest way to do DVB-S(2) into QAM…:



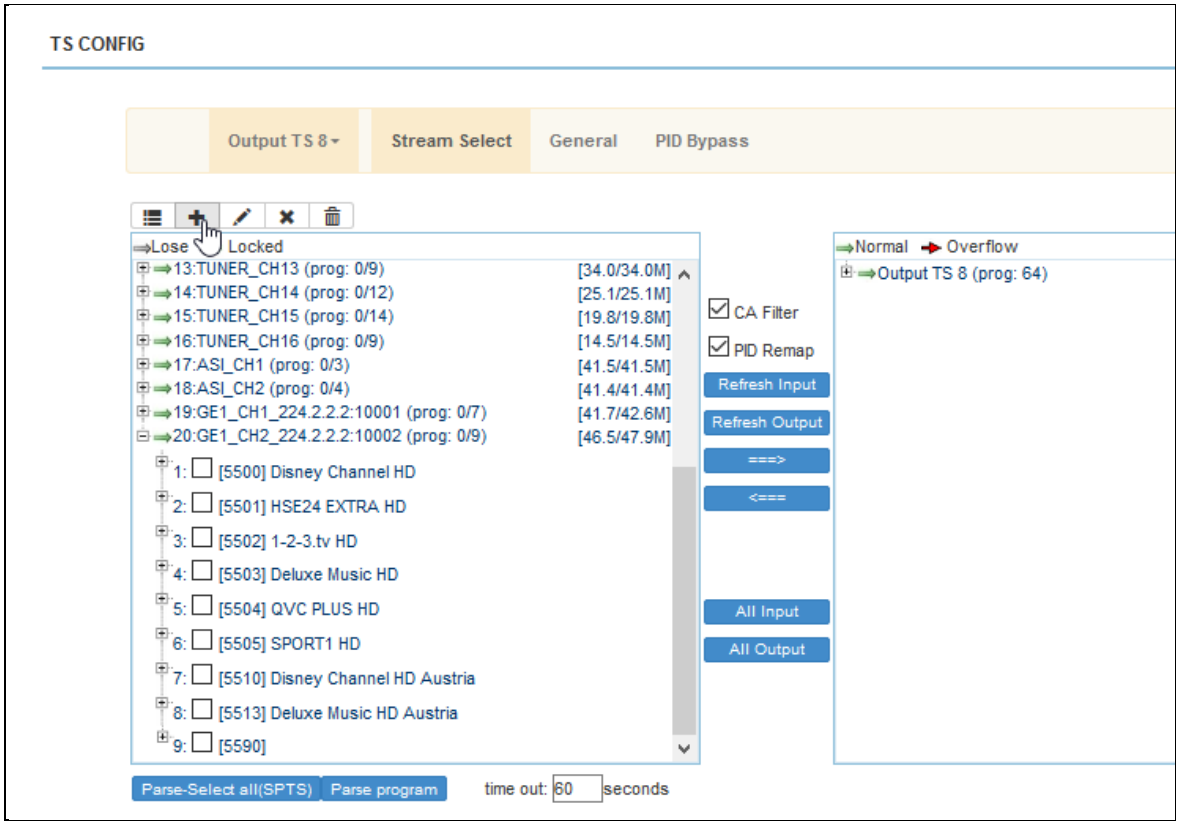
Setting up all 16 QAM channels and lets tune the TV…

Just passing in to output :

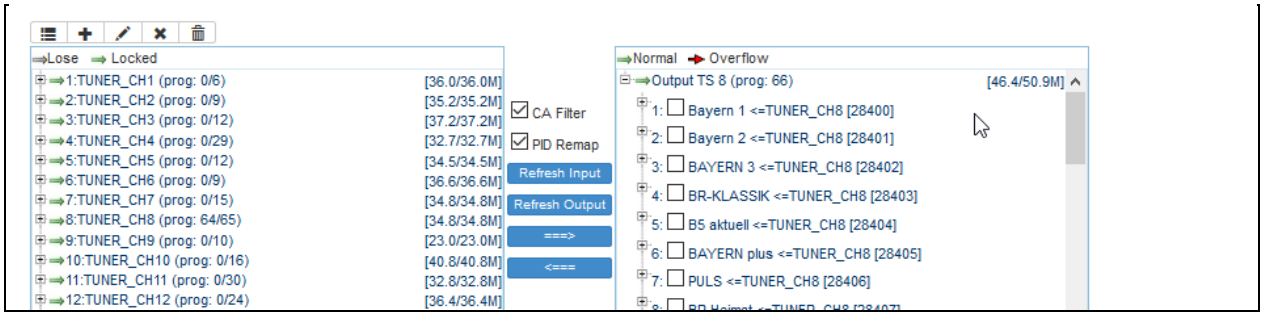




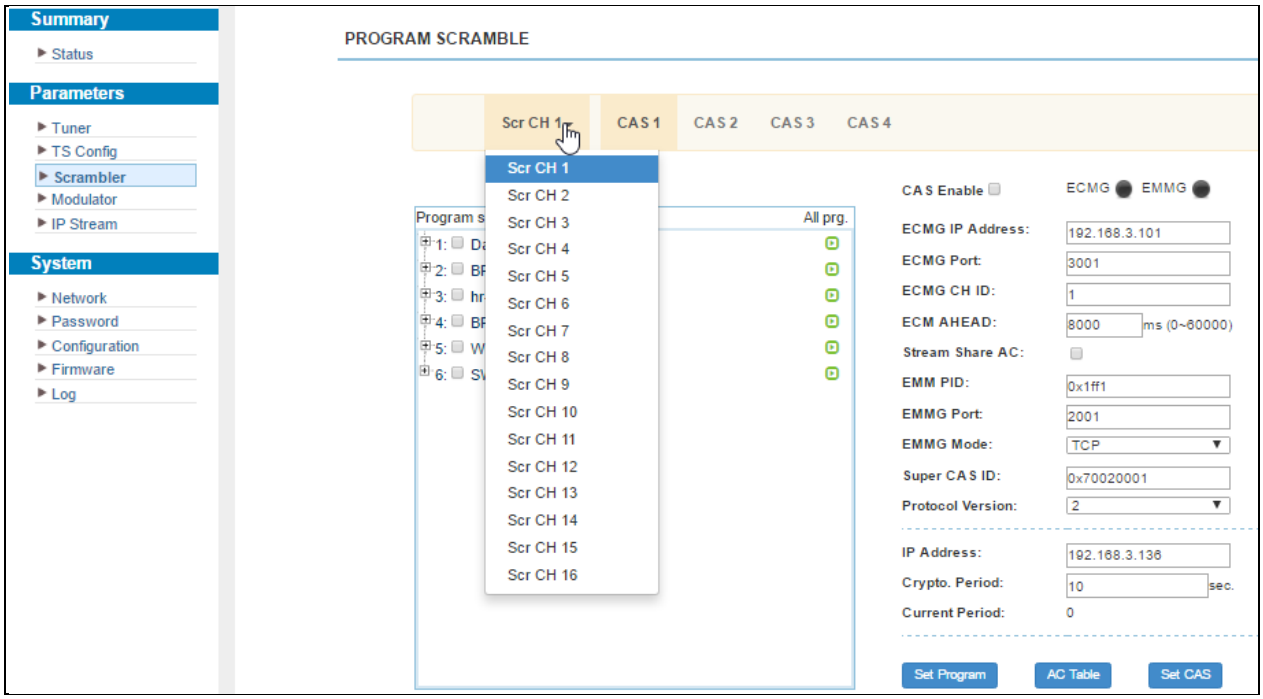
If you are muxing with IP MPTS Inputs, you have to start "+" action for every TS In to out again…:



and first use the tuner services, than the IP ones…



Scrambling:



Select which and what to encrypt and connect the unit to the IP-Address of the CA-Server. The values need to be set according to that system.

Final DVB-C QAM Setup ready:

Level(All Carriers): 0.0 dBm Channel Info.(Alarm/Active/Total): 0/16/16

Channel	Frequency	Constellation	Symbol Rate	Gain offset	Status	Bit(Act/Max)	
1	658.000 MHz	256 QAM	6900 Ksps	0.0 dB		40.3/50.9 M	
2	674.000 MHz	256 QAM	6900 Ksps	0.0 dB		33.9/50.9 M	
3	682.000 MHz	256 QAM	6900 Ksps	0.0 dB		19.4/50.9 M	
4	690.000 MHz	256 QAM	6900 Ksps	0.0 dB		32.3/50.9 M	
5	698.000 MHz	256 QAM	6900 Ksps	0.0 dB		34.5/50.9 M	
6	706.000 MHz	256 QAM	6900 Ksps	0.0 dB		36.6/50.9 M	
7	714.000 MHz	256 QAM	6900 Ksps	0.0 dB		21.8/50.9 M	
8	722.000 MHz	256 QAM	6900 Ksps	0.0 dB		46.8/50.9 M	
9	730.000 MHz	256 QAM	6900 Ksps	0.0 dB		23.0/50.9 M	
10	738.000 MHz	256 QAM	6900 Ksps	0.0 dB		40.8/50.9 M	
11	746.000 MHz	256 QAM	6900 Ksps	0.0 dB		32.5/50.9 M	
12	754.000 MHz	256 QAM	6900 Ksps	0.0 dB		36.4/50.9 M	
13	762.000 MHz	256 QAM	6900 Ksps	0.0 dB		34.0/50.9 M	
14	770.000 MHz	256 QAM	6900 Ksps	0.0 dB		25.0/50.9 M	
15	778.000 MHz	256 QAM	6900 Ksps	0.0 dB		19.8/50.9 M	
16	794.000 MHz	256 QAM	6900 Ksps	0.0 dB		14.6/50.9 M	

Anyway, we should adjust the QAM Channels according to the ITU Cenelec Channel line ups, so that TV sets can easier tune by using the default channel lists:

Example starting with

Analog Kanal	Analog-frequenz in MHz (7 MHz-Raster)	Digital Kanal	Digital-frequenz in MHz (8 MHz-Raster)
~~S01~~	~~105,25~~		
S02	112,25	D114	114±4
S03	119,25	D122	122±4
S04	126,25	D130	130±4
S05	133,25		
S06	140,25	D138	138±4
S07	147,25	D146	146±4
S08	154,25	D154	154±4
S09	161,25	D162	162±4
S10	168,25	D170	170±4

Superband[30]

Analog Kanal	Analog-frequenz in MHz (7 MHz-Raster)	Digital Kanal	Digital-frequenz in MHz (8 MHz-Raster)
S11	231,25	(D234)	(234±4)
S12	238,25		
S13	245,25	(D242)	(242±4)
S14	252,25	(D250)	(250±4)
S15	259,25	(D258)	(258±4)
S16	266,25	(D266)	(266±4)
S17	273,25	(D274)	(274±4)
S18	280,25	(D282)	(282±4)
S19	287,25	(D290)	(290±4)
S20	294,25	(D298)	(298±4)

That's enough for 16 channels.

Please note:

Remultiplexing would destroy EPG data from the original source. This cost effective Receiver / multiplexer / scrambler / modulator does not support EIT remultiplexing.

Important Notes!

This manual is for use by qualified personnel only. Handling this device or system requires special electronic technical knowledge. To reduce the risk of electrical shock or damage to the equipment, do not perform any servicing other than the installation and operating instructions contained in this manual unless you are qualified to do so. This device operates in the given voltage and frequency range without requiring manual adjustment.

Do not open the top case w/o unplugged power source because serious injury or death may be the result! Inside are components under risk from electrostatic discharge. To avoid equipment damages do not touch these components or, observe the respective handling rules!

For continued protection against fire, the fuses may only be replaced by identical fuses with the same electrical specifications which are designed for the corresponding fuse positions.

IRENIS GmbH reserves the right to revise this publication and make changes in its content from time to time, whereby it shall not be obligatory for IRENIS GmbH to provide notification of such revision or change.

IRENIS GmbH provides this manual without warranty of any kind, neither implied nor expressed, this includes also any warranties regarding the merchantability and fitness for a particular purpose. IRENIS GmbH may improve this manual or make changes in the products described herein at any point of time.

Installation Notes

All types of the IRENIS-BLANKOM family are 19"devices with 1 RU height designed for installation in 19" racks. In addition to the front panel screws an internal module support is required at the rack.

Depending on the Frontend used and the operating adjustments, the RF-input port carries DC Voltage (13V /18V, max. 400 mA).

By connecting a mains cable, the device can become functional without any auxiliary appliances. The power supply units are designed for the wide range of 100-230V AC; a manual adjustment of the voltage is not necessary.

For some models the second power connector is feeding another independent power supply for internal redundancy. For a maximum of redundancy both power supplies should use different circuits.

All the outputs are decoupled from one another. Thus, the circuit does not have any effect on the functioning of the device. Connections that are not required need not to be terminated.

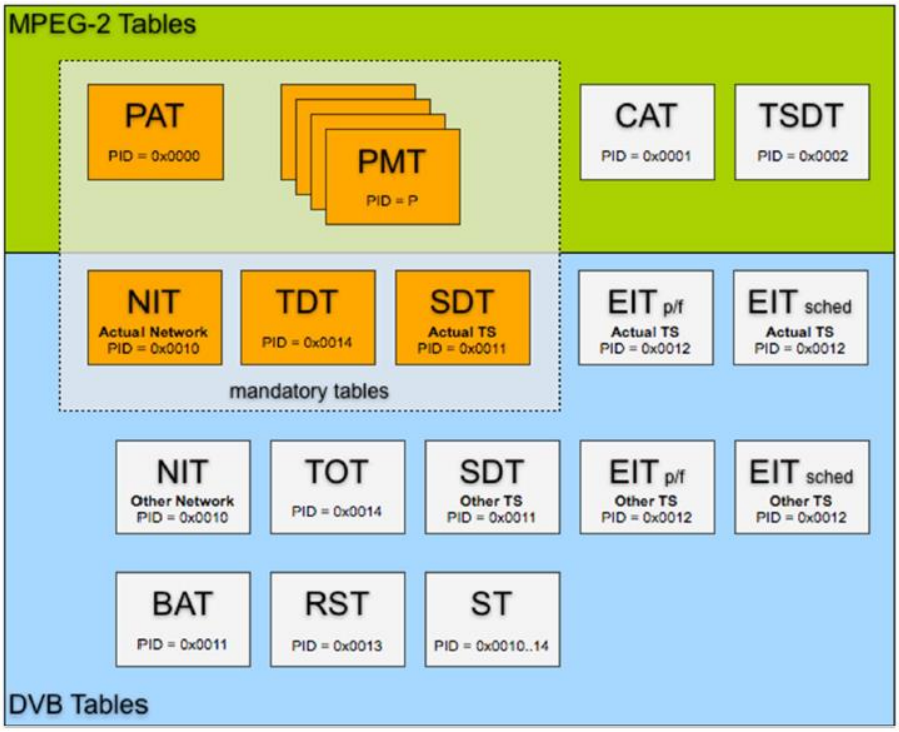
Suggestion: CAT 6E Ethernet cable for GbEthernet

Note:

IPv4 global scope sessions use multicast addresses in the range 224.2.128.0 - 224.2.255.255 with SAP Announcements being sent to 224.2.127.254 Port 9875 (note that 224.2.127.255 is used by the obsolete SAPv0 and MUST NOT be used).

IPv4 administrative scope sessions using administratively scoped IP multicast. The multicast address to be used for announcements is the highest multicast address in the relevant administrative scope zone. For example, if the scope range is 239.16.32.0 - 239.16.33.255, then 239.16.33.255 is used for SAP Announcements.

Appendix:



DVB: (ATSC is slightly different !!!)

Table 1: PID allocation for SI

Table	PID value
PAT	0x0000
CAT	0x0001
TSDT	0x0002
reserved	0x0003 to 0x000F
NIT, ST	0x0010
SDT, BAT, ST	0x0011
EIT, ST, CIT (ETSI TS 102 323 [13])	0x0012
RST, ST	0x0013
TDT, TOT, ST	0x0014
network synchronization	0x0015
RNT (ETSI TS 102 323 [13])	0x0016
reserved for future use	0x0017 to 0x001B
link-local inband signalling	0x001C
measurement	0x001D
DIT	0x001E
SIT	0x001F

Appendix A
Product Disposal

Warning! Ultimate disposal of this product should be handled according to all national laws and regulations.

製品の廃棄
この製品を廃棄処分する場合、国の関係する全ての法律・条例に従い処理する必要があります。

警告

本产品的废弃处理应根据所有国家的法律和规章进行。

警告

本產品的廢棄處理應根據所有國家的法律和規章進行。

Warnung
Die Entsorgung dieses Produkts sollte gemäß allen Bestimmungen und Gesetzen des Landes erfolgen.

¡Advertencia!
Al deshacerse por completo de este producto debe seguir todas las leyes y reglamentos nacionales.

Attention
La mise au rebut ou le recyclage de ce produit sont généralement soumis à des lois et/ou directives de respect de l'environnement. Renseignez-vous auprès de l'organisme compétent.

경고!

이 제품은 해당 국가의 관련 법규 및 규정에 따라 폐기되어야 합니다.

Waarschuwing
De uiteindelijke verwijdering van dit product dient te geschieden in overeenstemming met alle nationale wetten en reglementen.

Safety instructions

Read the safety instructions carefully before assembling or commissioning the device and ensure that you comply with them

1. Installation

- **Danger:** The device may **only** be installed and started up by competent people **(see EN 60065)**.
- **Danger:** The device and the peripheral distribution devices must be earthed properly (potential equalization) in accordance with **EN 60728-11 before Commissioning** and remain earthed even when the device is dismantled.
- **Danger:** The device may not be installed on a flammable base **(risk of fire)**.
- **Danger:** Only connect the device to a socket that is installed correctly and connected to devices that has an earth conductor (Depending on Model andUsage).
- **Danger:** Plan the assembly or installation location to ensure that children cannot play with the device and its connections. There is a risk of electric shock **(Danger of death)**.
- **Danger:** Select an assembly or installation location in which fluids or objects cannot get into the device under any circumstances (e.g. condensation, water for watering plants, etc.).
- **Danger:** Ventilation slots and refrigeration units are important function elements on the devices. If devices have refrigeration units or ventilation slots, you must ensure that they are never covered or built over. Also ensure that there is sufficient air circulation around the device. This prevents possible damage to the device and the **risk of fire due** to overheating. Ensure a minimum of **clearance of 20cm** between the device and other objects.
- **Danger:** The assembly or installation location must allow all connected cables to be laid safely. Cables and power supply cables must not be damaged or crushed by any objects. Furthermore, ensure that cables are not laid in the immediate vicinity of sources of heat (e.g. radiators, other electrical devices, fireplaces, etc.) **(Risk of fire)**, **(risk of electric shock danger of death)**
- **Danger:** In order to prevent damage to the device, as well as possible subsequent damage **(risk of fire)**, devices intended for installation on the wall are only permitted to be installed on a level surface and not **above head height**.

- **Warning:** (Only for optical transmitters and their peripheral distribution devices) Never look directly or indirectly into the laser beam. Only connect the device to the power supply once all optical lines are connected securely.
- **Warning:** The safety regulations in the relevant current standards **EN 60728-11** and **EN 60065** must be complied with.
- **Warning:** Comply with all applicable national safety regulations and standards.
- **Warning:** The device's mains plug must be easily accessible at all times.
- **Warning:** Follow all instructions in the device-specific operating manual

2. Operation

- **Danger:** The device is only permitted to be operated in dry rooms in a non-tropical climate. In damp rooms or outdoors, there is the risk of short circuits **(risk of fire)** or electric shock **(danger of death)**.
- **Danger:** Do not insert any objects through the ventilation slot. Risk of electric shock **(danger of death)**.
- **Danger:** Do not put any containers filled with liquid (e.g. vases) on the device. There is a risk of electric shock **(danger of death)** or **(risk of fire)**.
- **Danger:** No open sources of fire such as burning candles are permitted to be placed on the device **(risk of fire)**.

- **Danger:** Ensure that there is a clearance of at least **20cm** around the device. The device ventilation is not permitted to be impaired by covering the
- Ventilation openings with objects such as newspapers, tablecloths, curtains, etc. **(risk of fire)**.
- **Warning:** Follow all instructions in the device-specific operating manual.

3. Maintenance

- **Danger:** Maintenance tasks must always be carried out by competent people **(see EN 60065)**.
- **Danger:** Do not carry out servicing work during thunderstorms. There is a risk of electric shock **(danger of death)**.
- **Warning:** (Only for devices with batteries): **Risk of explosion if** the battery is replaced improperly. Only replace with the same type!
- **Warning:** Batteries must not be subjected to excessive heat such as sunlight, fire or similar **(risk of explosion)**.
- **Warning:** Only use the manufacturer's accessories or accessories with identical technical properties.
- **Warning:** (For optical transmitters and their peripheral distribution devices) unplug the mains plug before dismantling the device.

4. Repairs

- **Danger:** The device may only be opened by competent people (see EN 60065). Before opening the device, unplug the mains plug or disconnect the power supply; otherwise there is a danger of death! The device is only permitted to be connected to the power and operated when the mains adaptor cover is installed.

This also applies when you clean the device or work on the connections.

- **Danger:** Repairs on the device may only be carried out by a specialist **(see EN 60065)** observing **the applicable VDE (German Association for Electrical, Electronic & Information Technologies) guidelines**.
- **Danger:** Only use components of the same type and with identical technical properties for the repair. Otherwise, there is a risk of electric shock **(danger of death)** and **risk of fire**.
- **Warning:** (For optical transmitters and their peripheral distribution devices) unplug the mains plug before dismantling the device.

If you have any queries regarding repairs, please contact our company service: E-mail: info@blankom.de, contact: www.blankom.de

5. Sale

- **Caution:** If the device is sold, these safety instructions and the operating manual for the relevant device must be handed over to the purchaser.

6. Disposal

- **Caution:** Dispose of the device in accordance with the applicable environmental regulations.
- **Caution:** Dispose of batteries (if present) in accordance with the applicable environmental regulations.
- Cartons and all pcs. of the packaging can be sent back to us for recycling for sustainable environment protection.

Sicherheitshinweise

Sicherheitshinweise bitte vor Montage bzw. Inbetriebnahme des Gerätes sorgfältig lesen und befolgen.

Installation:

Gefahr: Das Gerät darf ausschließlich von sachverständigen Personen (siehe EN 60065), installiert und in Betrieb genommen werden.

Gefahr: Das Gerät und/oder die Verteilperipherie muß vor Inbetriebnahme gemäß EN 60728-11 vorschriftsmäßig geerdet sein (Potentialausgleich) und bleiben, auch wenn das Gerät ausgebaut wird.

Gefahr: Das Gerät darf nicht auf brennbarem Untergrund montiert werden (Brandgefahr).

Gefahr: Schließen Sie das Gerät nur an eine vorschriftsmäßig installierte Steckdose mit Schutzleiter an.

Gefahr: Planen Sie den Montage - bzw. Aufstellungsort so, daß Kinder nicht am Gerät und dessen Anschlüssen spielen können. Es droht Gefahr durch elektrischen Schlag (Lebensgefahr).

Gefahr:Wählen Sie einen Montage - bzw. Aufstellungsort, an dem unter keinen Umständen Flüssigkeiten oder Gegenstände in das Gerät gelangen können (z.B. Kondenswasser, Gießwasser etc.).

Gefahr:Lüftungsschlitze und Kühlkörper sind wichtige Funktionselemente an den Geräten. Bei Geräten, die Kühlkörper oder Lüftungsschlitze haben, muß daher unbedingt darauf geachtet werden, daß diese keinesfalls abgedeckt oder zugebaut werden. Sorgen Sie außerdem für eine großzügig bemessene Luftzirkulation um das Gerät. Damit verhindern Sie mögliche Schäden am Gerät sowie Brandgefahr durch Überhitzung. Gewährleisten Sie einen Mindestabstand von 20cm um das Gerät zu anderen Gegenständen.

Gefahr: Der Montage- bzw. Aufstellort muß eine sichere Verlegung aller angeschlossenen Kabel zulassen. Stromversorgungskabel sowie Zuführungskabel dürfen nicht durch irgendwelche Gegenstände beschädigt oder gequetscht werden. Es ist darüber hinaus unbedingt darauf zu achten, daß Kabel nicht in die direkte Nähe von Wärmequellen verlegt werden (z.B. Heizkörper, andere Elektrogeräte, Kamin etc.) (Brandgefahr), (Gefahr durch elektrischen Schlag).

Gefahr: Um sowohl Beschädigungen am Gerät als auch mögliche Folgeschäden (Brandgefahr) zu vermeiden, dürfen für Wandmontage vorgesehene Geräte nur auf einer ebenen Grundfläche montiert werden und nicht über Kopf.

Warnung: (Nur für optische Sender sowie deren Verteilperipherie) Blicken Sie auf keinen Fall direkt oder indirekt in den Laserstrahl. Schließen Sie das Gerät erst an die

Warnung: Die Sicherheitsbestimmungen der jeweils aktuellen Normen EN 60728-11 und EN 60065 sind zwingend einzuhalten.

Warnung: Befolgen Sie auch alle anwendbaren nationalen Sicherheitsvorschriften und Normen.

Warnung: Der Netzstecker des Gerätes muß jederzeit leicht erreichbar sein.

Warnung: Befolgen Sie alle Instruktionen in den gerätespezifischen Bedienungsanleitungen

Betrieb

Gefahr: Das Gerät darf nur in trockenen Räumen bei nicht tropischem Klima betrieben werden. In feuchten Räumen oder im Freien besteht die Gefahr von
Kurzschluß (Brandgefahr) oder elektrischen Schlag (Lebensgefahr).

Gefahr: Stecken Sie keine Gegenstände durch die Lüftungsschlitze. Gefahr durch elektrischen Schlag (Lebensgefahr).

Gefahr: Stellen Sie keine mit Flüssigkeit gefüllten Gefäße (wie z. B. Vasen) auf das Gerät. Es droht Gefahr durch elektrischen Schlag (Lebensgefahr) oder
(Brandgefahr).

Gefahr: Es dürfen keine offenen Brandquellen, wie z. B. brennende Kerzen, auf das Gerät gestellt werden (Brandgefahr).
Gefahr: Sorgen Sie für einen Freiraum von mindestens 20cm um das Gerät. Die Belüftung des Gerätes darf nicht durch Abdecken der Belüftungsöffnungen mit
Gegenständen wie z. B. Zeitungen, Tischdecken, Gardinen usw. behindert werden (Brandgefahr).
Warnung: Befolgen Sie alle Instruktionen in der gerätespezifischen Bedienungsanleitung.

Wartung

Gefahr: Wartungsarbeiten sind stets von sachverständigen Personen (siehe EN 60065) vorzunehmen.
Gefahr: Keine Servicearbeiten bei Gewitter. Es droht Gefahr eines elektrischen Schlags (Lebensgefahr).
Warnung: (nur für Geräte mit Batterie): Explosionsgefahr bei unsachgemäßem Auswechseln der Batterie. Ersatz nur durch den gleichen Typ!
Warnung: Batterien dürfen nicht übermäßiger Wärme wie Sonnenschein, Feuer oder dergleichen ausgesetzt werden (Explosionsgefahr).
Warnung: Verwenden Sie nur das Zubehör des Herstellers oder Zubehör mit identischen technischen Eigenschaften.
Warnung: (Bei optischen Sendern sowie deren Verteilperipherie) ziehen Sie den Netzstecker bevor das Gerät ausgebaut wird.

Reparatur

Gefahr: Das Gerät darf nur durch sachverständige Personen (siehe EN 60065) geöffnet werden. Vor Öffnen des Gerätes Netzstecker ziehen
bzw. Stromzuführung entfernen, andernfalls besteht Lebensgefahr! Das Gerät darf nur mit montierter Netzteilabdeckung an Spannung angeschlossen und betrieben werden. Dies gilt auch, wenn Sie das Gerät reinigen oder an den Anschlüssen arbeiten.
Gefahr: Reparaturen am Gerät sind ausschließlich vom Fachmann (siehe EN 60065) unter Beachtung der geltenden VDE-Richtlinien durchzuführen.
Gefahr: Verwenden Sie nur Bauteile des gleichen Typs und mit identischen technischen Eigenschaften für die Reparatur, andernfalls droht Gefahr eines elektrischen Schlags (Lebensgefahr) und Brandgefahr.
Warnung: (Bei optischen Sendern sowie deren Verteilperipherie) ziehen Sie den Netzstecker bevor das Gerät ausgebaut wird.
Bei Fragen zur Reparatur wenden Sie sich an den IRENIS-Service:
E-Mail: info@blankom.de , Kontakt: www.blankom.de

Verkauf

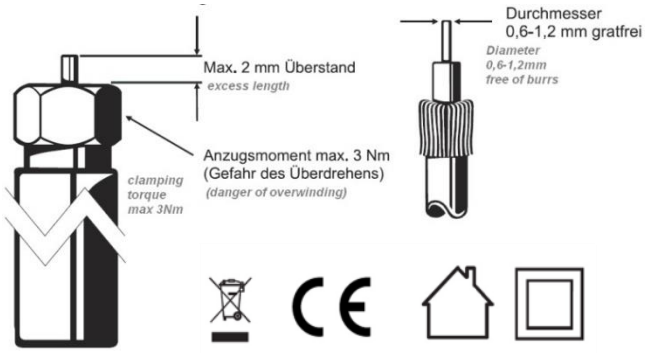
Vorsicht: Im Falle eines Verkaufs müssen diese Sicherheitshinweise und die Bedienungsanleitung des entsprechenden Geräts dem Käufer ausgehändigt werden.

Entsorgung

Vorsicht: Entsorgen Sie das Gerät entsprechend den geltenden umweltrechtlichen Bestimmungen. Elektrische und elektronische Geräte dürfen nicht in den Hausmüll!
Vorsicht: Entsorgen Sie Batterien (falls vorhanden), entsprechend den geltenden umweltrechtlichen Bestimmungen.
Verpackungen können an uns zurückgeschickt werden. Wir kümmern uns um Recycling und/oder fachgerechte Entsorgung.

Installation guide for F-connectors:

/ Installationshinweis für den F-Anschluß:



SAT: Die LNB-Anschlüsse sind meist entsprechend gekennzeichnet

The LNC –connectors at Multiswitches are almost marked as:

HH= Horizontal High-Band

HL = Horizontal Low-Band = LH

VL = Vertical Low-Band = LV

VH= Vertical High-Band = HV

Elektronische Geräte gehören nicht in den Hausmüll, sondern müssen - gemäß Richtlinie 2002/96/EG DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 27. Januar 2003 über Elektro- und Elektronik-Altgeräte fachgerecht entsorgt werden.
Bitte geben Sie dieses Gerät am Ende seiner Verwendung zur Entsorgung an den dafür vorgesehenen öffentlichen Sammelstellen ab.
Electronic equipment is not household waste - in accordance with directive 2002/96/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL dated 27th January 2003 on used electrical and electronic equipment, it must be disposed of properly.
At the end of its service life, take this unit for disposal to an appropriate official collection point

Zur Beachtung / *Important notes:*

- Auf das Netzgerät dürfen keine mit Flüssigkeit gefüllten Gegenstände gestellt werden.
- *No liquid-filled items may be placed on top of the power supply unit.*
- Das Netzgerät darf nicht Tropf- oder Spritzwasser ausgesetzt sein.
- *The power supply unit must not be exposed to dripping or splashing water.*
- Der Netzstecker muss ohne Schwierigkeiten zugänglich und benutzbar sein.
- *The mains plug must be easily accessible and operable.*
- Das Gerät kann nur durch Ziehen des Netzsteckers vom Netz getrennt werden.
- *The only reliable method of disconnecting the unit from the mains is to unplug it.*
- Bei größerem Durchmesser des Kabel- Innenleiters als 1,2 mm bzw. Grat können die Gerätebuchsen zerstört werden.
- *If the inner cable conductor diameter is greater than 1.2 mm or in case of burr, the device sockets may be destroyed.*

Bitte installieren Sie die Anschlüsse gemäß dem Aufdruck
Please install according to the sticker on the Multiswitch
Hinweis: Elektrische Installationen sollten nur durch geschultes Fachpersonal vorgenommen werden!
Note: Electrical installations should only be done by well-educated and skilled technicians!

ANNEX Channel Plan B/G DVB-C years ago 😉

CATV channel plan B/G:

Bereich Bands	Kanal Channel	Kanal-frequenzen Channel frequency (MHz)	Mitten-frequenz Middle frequency (MHz)	Bild-träger Picture carrier (MHz)	Ton-träger Sound carrier (MHz)
B I	2	47...54	50,50	48,25	53,75
	3	54...61	57,50	55,25	60,75
	4	61...68	64,50	62,25	67,75
USB	S 02	111...118	114,50	112,25	117,75
Unterer	S 03	118...125	121,50	119,25	124,75
Sonder-	S 04	125...132	128,50	126,25	131,75
kanal-	S 05	132...139	135,50	133,25	138,75
bereich	S 06	139...146	142,50	140,25	145,75
Midband	S 07	146...153	149,50	147,25	152,75
channels	S 08	153...160	156,50	154,25	159,75
	S 09	160...167	163,50	161,25	166,75
	S 10	167...174	170,50	168,25	173,75
B III	5	174...181	177,50	175,25	180,75
	6	181...188	184,50	182,25	187,75
	7	188...195	191,50	189,25	194,75
	8	195...202	198,50	196,25	201,75
	9	202...209	205,50	203 25	208,75
	10	209...216	212,50	210,25	215,75
	11	216...223	218,50	217,25	222,75
	12	223...230	226,50	224,25	229,75
OSB	S 11	230...237	233,50	231,25	236,75
Oberer	S 12	237...244	240,50	238,25	243,75
Sonder-	S 13	244...251	247,50	245,25	250,75
kanal-	S 14	251...258	254,50	252,25	257,75
bereich	S 15	258...265	261,50	259,25	264,75
Superband	S 16	265...272	268,50	266,25	271,75
channels	S 17	272...279	275,50	273,25	278,75
	S 18	279...286	282,50	280,25	285,75
	S 19	286...293	289,50	287,25	292,75
	S 20	293...300	296,50	294,25	299,75
ESB	S 21	302...310	306,00	303,25	308,75
Erweiterter	S 22	310...318	314,00	311,25	316,75
Sonder-	S 23	318...326	322,00	319,25	324,75
kanal-	S 24	326...334	330,00	327,25	332,75
bereich	S 25	334...342	338,00	335,25	340,75
Hyperband	S 26	342...350	346,00	343,25	348,75
channels	S 27	350...358	354,00	351,25	356,75
	S 28	358...366	362,00	359,25	364,75
	S 29	366...374	370,00	367,25	372,75
	S 30	374...382	378,00	375,25	380,75
	S 31	382...390	386,00	383,25	388,75
	S 32	390...398	394,00	391,25	396,75
	S 33	398...406	402,00	399,25	404,75
	S 34	406...414	410,00	407,25	412,75
	S 35	414...422	418,00	415,25	420, 75
	S 36	422...430	426,00	423,25	428,75
	S 37	430...438	434,00	431,25	436,75
	S 38	438...446	442,00	439,25	444,75
	S 39	446...454	450,00	447,25	452,75
	S 40	454...462	458,00	455,25	460,75
	S 41	462...470	466,00	463,25	468,75

Bereich Bands	Kanal Channel	Kanal-frequenzen Channel frequency (MHz)	Mitten-frequenz Middle frequency (MHz)	Bild-träger Picture carrier (MHz)	Ton-träger Sound carrier (MHz)
B IV	21	470...478	474,00	471,25	476,75
	22	478...486	482,00	479.25	484,75
	23	486...494	490,00	487,25	492,75
	24	494...502	498,00	495,25	500,75
	25	502...510	506,00	503,25	508,75
	26	510...518	514,00	511,25	516,75
	27	518...526	522,00	519,25	524,75
	28	526...534	530,00	527,25	532,75
	29	534...542	538,00	535,25	540,75
	30	542...550	546,00	543,25	548,75
	31	550...558	554,00	551,25	556,75
	32	558...566	562,00	559,25	564,75
	33	566...574	570,00	567,25	572,75
	34	574...582	578,00	575,25	580,75
	35	582...590	586,00	583,25	588,75
	36	590...598	594,00	591,25	596,75
	37	598...606	602,00	599,25	604,75
B V	38	606...614	610,00	607,25	612,75
	39	614...622	618,00	615,25	620,75
	40	622...630	626,00	623,25	628,75
	41	630...638	634,00	631,25	636,75
	42	638...646	642,00	639,25	644,75
	43	646...654	650,00	647,25	652,75
	44	654...662	658,00	655,25	660,75
	45	662...670	666,00	663,25	668,75
	46	670...678	674,00	671,26	676,75
	47	678...686	682,00	679,25	684,75
	48	686...694	690,00	687,25	692,75
	49	694...702	698,00	695,25	700,75
	50	702...710	706,00	703,25	708,75
	51	710...718	714,00	711,25	716,75
	52	718...726	722,00	719,25	724,75
	53	726...734	730,00	727,25	732,75
	54	734...742	738,00	735,25	740,75
	55	742...750	746,00	743,25	748,75
	56	750...758	754,00	751,25	756,75
	57	758...766	762,00	759,25	764,75
	58	766...774	770,00	767,25	772,75
	59	774...782	778,00	775,25	780,75
	60	782...790	786,00	783,25	788,75
	61	790...798	794,00	791,25	796,75
	62	798...806	802,00	799,25	804,75
	63	806...814	810,00	807,25	812,75
	64	814...822	818,00	815,25	820,75
	65	822...830	826,00	823,25	828,75
	66	830...838	834,00	831,25	836,75
	67	838...846	842,00	839,25	844,75
	68	846...854	850,00	847,25	852,75
	69	854...862	858,00	855,25	860,75

Appendix DB

Conversions of Power @ 75Ω / *Umrechnungstabelle* dBµV <-> dBm

dBmV	dBµV	dBm 75Ω	mV_{RMS}	mW 75Ω
8	68	-40.75	2.51	8.4E-05
9	69	-39.75	2.82	1.1E-04
10	70	-38.75	3.16	1.3E-04
11	71	-37.75	3.55	1.7E-04
12	72	-36.75	3.98	2.1E-04
13	73	-35.75	4.47	2.7E-04
14	74	-34.75	5.01	3.3E-04
15	75	-33.75	5.62	4.2E-04
16	76	-32.75	6.31	5.3E-04
17	77	-31.75	7.08	6.7E-04
18	78	-30.75	7.94	8.4E-04
19	79	-29.75	8.91	1.1E-03
20	80	-28.75	10.00	1.3E-03
21	81	-27.75	11.22	1.7E-03
22	82	-26.75	12.59	2.1E-03
23	83	-25.75	14.13	2.7E-03
24	84	-24.75	15.85	3.3E-03
25	85	-23.75	17.78	4.2E-03
26	86	-22.75	19.95	5.3E-03
27	87	-21.75	22.39	6.7E-03
28	88	-20.75	25.12	8.4E-03
29	89	-19.75	28.18	0.011
30	90	-18.75	31.62	0.013
31	91	-17.75	35.48	0.017
32	92	-16.75	39.81	0.021
33	93	-15.75	44.67	0.027
34	94	-14.75	50.12	0.033
35	95	-13.75	56.23	0.042

dBmV	dBµV	dBm 75Ω	mV_{RMS}	mW 75Ω
36	96	-12.75	63.10	0.053
37	97	-11.75	70.79	0.067
38	98	-10.75	79.43	0.084
39	99	-9.75	89.13	0.106
40	100	-8.75	100.00	0.133
41	101	-7.75	112.20	0.168
42	102	-6.75	125.89	0.211
43	103	-5.75	141.25	0.266
44	104	-4.75	158.49	0.335
45	105	-3.75	177.83	0.422
46	106	-2.75	199.53	0.531
47	107	-1.75	223.87	0.668
48	108	-0.75	251.19	0.841
49	109	0.25	281.84	1.059
50	110	1.25	316.23	1.333
51	111	2.25	354.81	1.679
52	112	3.25	398.11	2.113
53	113	4.25	446.68	2.660
54	114	5.25	501.19	3.349
55	115	6.25	562.34	4.216
56	116	7.25	630.96	5.308
57	117	8.25	707.95	6.683
58	118	9.25	794.33	8.413
59	119	10.25	891.25	10.591
60	120	11.25	1000.00	13.333
61	121	12.25	1122.02	16.786
62	122	13.25	1258.93	21.132
63	123	14.25	1412.54	26.604
64	124	15.25	1584.89	33.492
65	125	16.25	1778.28	42.164
66	126	17.25	1995.26	53.081

dBmV	dBµV	dBm 75Ω	mV_{RMS}	mW 75Ω
67	127	18.25	2238.72	66.825
68	128	19.25	2511.89	84.128

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