QUESTTEL
Broadcast Systems

2 HDMI & YPbPr, CVBS to ASI, IP, Digital RF Encoder Modulator

User Manual

B-QAM-HDMI-IP-2CH

Intended Audience

This user manual has been written to help people who have to use, to integrate and to install the product. Some chapters require some prerequisite knowledge in electronics and especially in broadcast technologies and standards.

Disclaimer

The contents of this document are subject to revision without notice due to continued progress in methodology, design and manufacturing. QuestTel shall have no liability for any error or damage of any kind resulting from the use of this document.

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Chapter 1 Introduction

1.1 Product Overview

B-QAM-HDMI-IP-2CH series products are QuestTel's all-in-one devices which integrate encoding (MPEG-2, MPEG-4/AVC H.264) and modulation to convert HDMI/YPbPr /CVBS (Pr in) signals etc to digital RF output. To meet customers' various requirements, B-QAM-HDMI-IP-2CH is also equipped with 1 ASI input, and output with 2 ASI ports and 1 IP port.

The signals source could be from satellite receivers, closed-circuit television cameras, Blue-ray players, and antenna etc. Its output signals are to be received by TVs, STB and etc with corresponding standard.

QuestTel's B-QAM-HDMI-IP-2CH series products are wildly used in public places such as metro, market hall, theatre, hotels, restaurants and etc for advertising, monitoring, training and educating in company, schools, campuses, hospital… It's a good choice to offer HD channels and more.

1.2 Key features

- **MPEG2 HD & MPEG4 AVC H.264 HD video encoding**
- **DD AC3 (2.0), MPEG4-AAC, MPEG2-AAC, MPEG1 Layer II audio encoding**
- **Support DD AC3 (2.0/5.1/7.1) passthrough**
- **Support AC3 Dialog Normalization**
- **2* HDMI/YPbPr/CVBS (Pr in) channels in**
- **1*ASI in for re-mux; 1*RF in for RF mix**
- **4* DVB-C & 4 ATSC RF out in one device**
- **2 separate ASI output to mirrior MPTS or one carrier programs**
- **IP(2*SPTS & 1*MPTS) out**
- **Support CC (Closed Caption) EIA608**
- **Support Low Delay**
- **LCN (Logical Channel Number) support**
- **VCT (Virtual Channel Table) support**
- **Excellent modulation quality**
- **LCD display, Remote control and firmware**
- **Web-based NMS management; Updates via web**

1.3 Specification

Encoding Section	
Video (HDMI)	
Encoding	MPEG2; MPEG4 AVC/H.264
Interface	HDMI*2
Resolution	1920*1080_60P, 1920*1080_50P (For MPEG 4 AVC/H.264 only), 1920*1080_60i, 1920*1080_50i, 1280*720_60p, 1280*720_50P
Low Delay	Normal, Mode 1, Mode 2, Manual
Aspect Ratio	4:3; 16:9
Audio (HDMI)	
Encoding	MPEG1 Layer II; MPEG2-AAC; MPEG4-AAC; DD AC3(2.0); DD AC3 (2.0/5.1/7.1) passthrough
Interface	HDMI*2/SPDIF*2
Sample rate	48KHz
Bit rate	64/96/128/ 192/256/320kbps
Video (CVBS/YPbPr)	
Encoding	MPEG2; MPEG4 AVC/H.264
Interface	CVBS/YPbPr*2(RCA)
Resolution	CVBS: 720*576_50i, 720*480_60i YPbPr:1920*1080_60i, 1920*1080_50i; 1280*720_60p, 1280*720_50P
Audio (L/R)	
Encoding	MPEG1 Layer II; MPEG2-AAC; MPEG4-AAC; DD AC3(2.0); DD AC3 (2.0/5.1/7.1) passthrough
Interface	2*Stereo/4*mono/2*SPDIF
Sample rate	48KHz
Bit rate	64/96/128/ 192/256/320kbps

DVB-C Modulator Section			
Standard	J.83A (DVB-C), J.83B, J.83C		
MER	≥43dB		
RF frequency	36~960MHz, 1KHz step		
RF output level	-30~ -10dbm (77~97 dbμV), 0.1db step		
Symbol rate	5.000~9.000Msps adjustable		
RF Out	4*DVB-C adjacent carriers combined output		
	J.83A	**J.83B**	**J.83C**
Constellation	16/32/64/128/ 256 QAM	64/ 256 QAM	64/ 256 QAM
Bandwidth	8M	6M	6M

ATSC Modulator Section	
Standard	ATSC A/53
Constellation	8 VSB
RF output level	-30~ -10dbm (77~97 dbμV), 0.1db step
MER	≥42dB
RF frequency	36~960MHz, 1KHz step
RF Out	4*ATSC adjacent carriers combined output

System	
Local interface	LCD + control buttons
Remote management	Web NMS
Stream Out	2 separate ASI out (BNC type, 100M); IP (2* SPTS&1*MPTS) over UDP/RTP out (RJ45, 100M)
NMS interface	RJ45, 100M
Language	English

General	
Power supply	AC 100V~240V
Dimensions	333*232*44mm
Weight	2.5 kg
Operation temperature	0~45℃

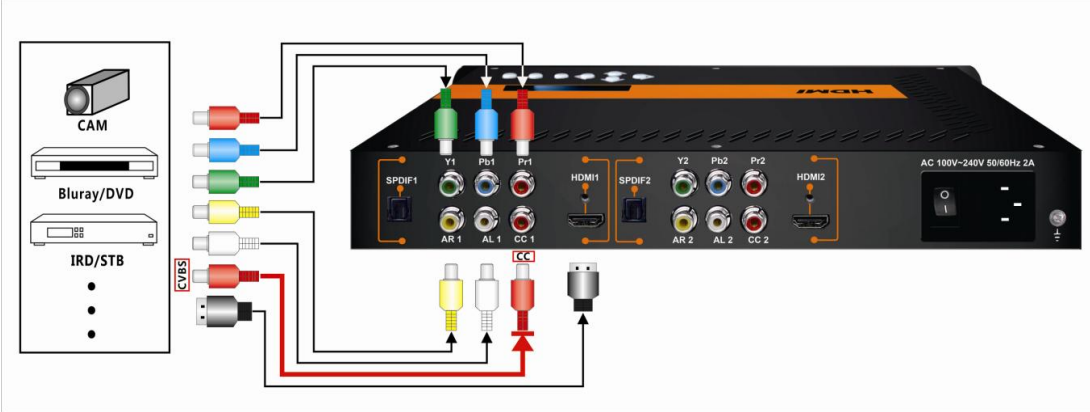
1.4 Appearance and Description

Front Panel Illustration

① RF in port
② RF out port
③ NMS port
④ Data Port
⑤ ASI Output port 1&2
⑥ ASI input port

Rear Panel Illustration

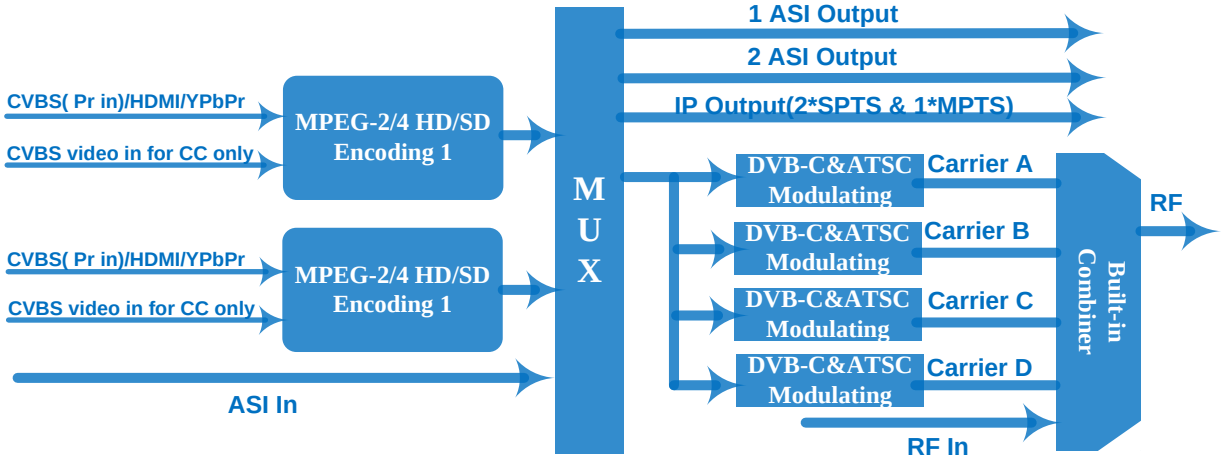
①YPbPr input port(Pr for CVBS input)
②SPDIF port
③L/R Audio input (Stereo or Mono)
④CC input port for CC only
⑤HDMI input port
⑥Power Switch
⑦ Power supply Slot



Cover Illustration

① LCD Window
② Indicator
③ Control Buttons

1.5 Principle Chart



Chapter 2 Installation Guide

This section is to explain the cautions the users must know in some case that possible injure may bring to users when it's used or installed. For this reason, please read all details here and make in mind before installing or using the product.

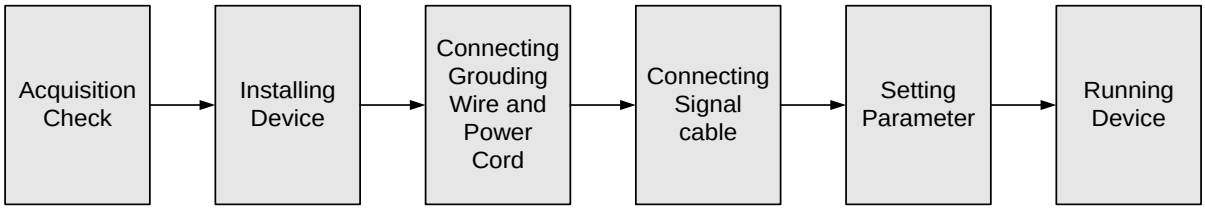
2.1 General Precautions

- ✓ Must be operated and maintained free of dust or dirty.
- ✓ The cover should be securely fastened, do not open the cover of the products when the power is on.
- ✓ After use, securely stow away all loose cables, external antenna, and others.

2.2 Power precautions

- ✓ When you connect the power source, make sure if it may cause overload.
- ✓ Avoid operating on a wet floor in the open. Make sure the extension cable is in good condition
- ✓ Make sure the power switch is off before you start to install the device

2.3 Device's Installation Flow Chart Illustrated as following



2.4 Environment Requirement

Item	Requirement
Machine Hall Space	When user installs machine frame array in one machine hall, the distance between 2 rows of machine frames should be 1.2~1.5m and the distance against wall should be no less than

	0.8m.
Machine Hall Floor	Electric Isolation, Dust Free Volume resistivity of ground anti-static material: $1X10^{7}$~$1X10^{10}\Omega$，Grounding current limiting resistance: 1MΩ (Floor bearing should be greater than 450Kg/㎡)
Environment Temperature	5~40℃(sustainable)，0~45℃(short time)， installing air-conditioning is recommended
Relative Humidity	20%~80% sustainable 10%~90% short time
Pressure	86~105KPa
Door & Window	Installing rubber strip for sealing door-gaps and dual level glasses for window
Wall	It can be covered with wallpaper, or brightness less paint.
Fire Protection	Fire alarm system and extinguisher
Power	Requiring device power, air-conditioning power and lighting power are independent to each other. Device power requires AC 110V±10%, 50/60Hz or AC 220V±10%, 50/60Hz. Please carefully check before running.

2.5 Grounding Requirement

- ✓ All function modules' good grounding is the basis of reliability and stability of devices. Also, they are the most important guarantee of lightning arresting and interference rejection. Therefore, the system must follow this rule.
- ✓ Grounding conductor must adopt copper conductor in order to reduce high frequency impedance, and the grounding wire must be as thick and short as possible.
- ✓ Users should make sure the 2 ends of grounding wire well electric conducted and be antirust.
- ✓ It is prohibited to use any other device as part of grounding electric circuit
- ✓ The area of the conduction between grounding wire and device's frame should be no less than 25 ㎡.

Chapter 3 Operation

The front panel of B-QAM-HDMI-IP-2CH Encoder Modulator is the user-operating interface and the equipment can be conveniently operated and managed by user according to the procedures displayed on the LCD:

Keyboard Function Description:

MENU: Cancel current entered value, resume previous setting; Return to previous menu.

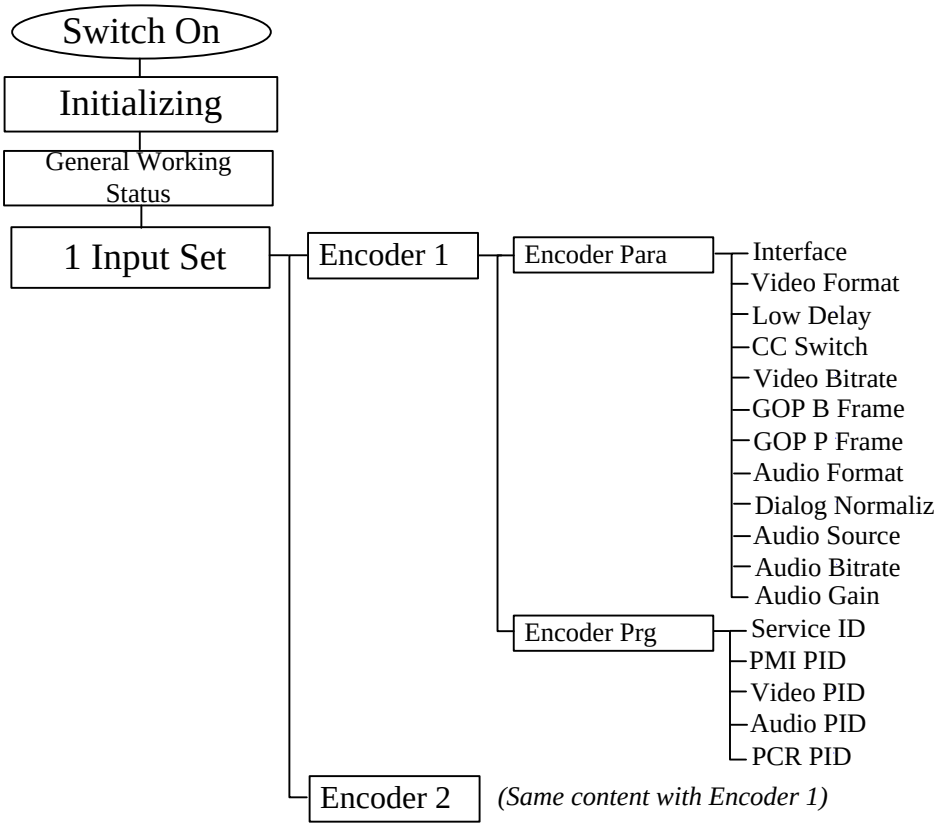
ENTER: Activate the parameters which need modifications, or confirm the change after modification.

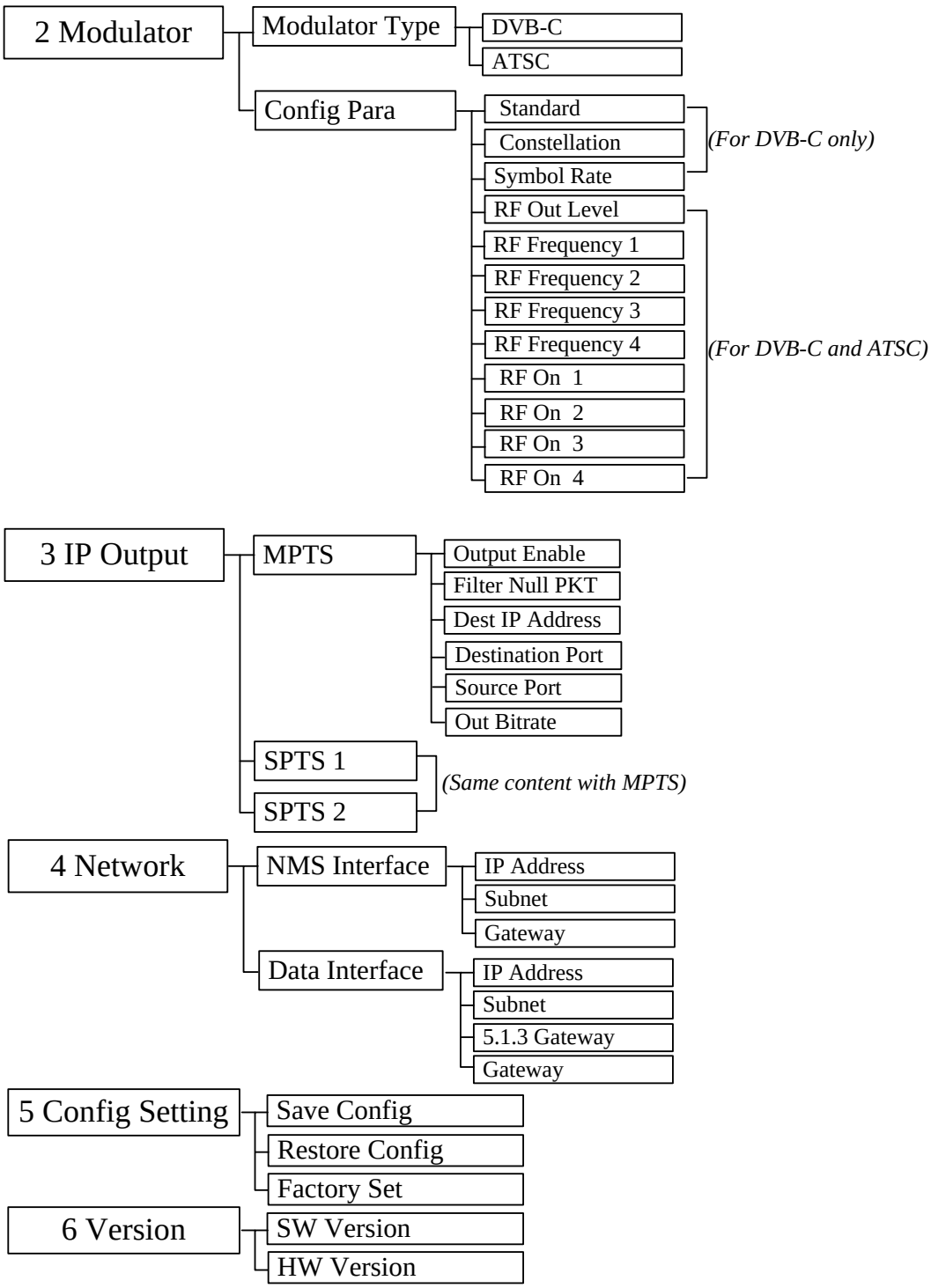
LEFT/RIGHT: Choose and set the parameters.

UP/DOWN: Modify activated parameter or paging up/down when parameter is inactivated.

LOCK: Lock the screen/cancel the lock state. After pressing the lock key, the LCD will display the current configuring state.

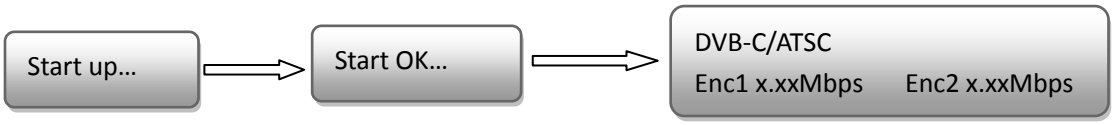
3.1 3.1 LCD Menu Structure





3.1 Initial Status

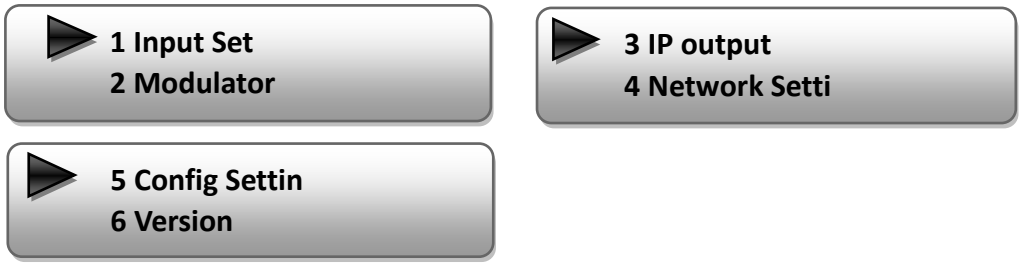
After powering on the device，it will take a few seconds to initialize the system It shows as below:



- **DVB-C/ATSC:** to indicate the current modulation standard of this device.
- **Enc1/Enc2**: to indicate the two Encoding channel
- **X.XX Mbps**: to indicate the encoding bit rate of each encoding channel respectively.

3.2 General setting for Main Menu

By pressing "Lock" key on the front panel, user can enter the main menu. The LCD will display the following pages:

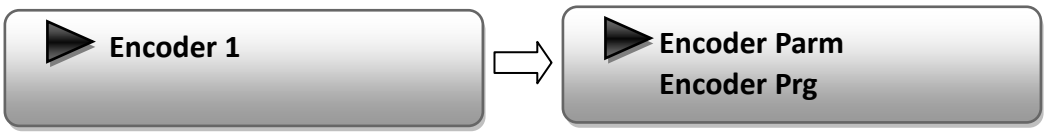


User can press UP/DOWN buttons to specify menu item, and then press ENTER to enter the submenus as below:

.2.1 Input Set

Under this submenu, the LCD will show "Encoder 1" and "Encoder 2".

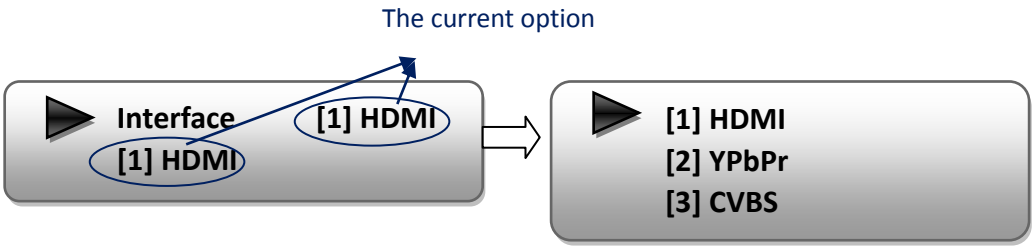
"Encoder 1" and "Encoder 2" respectively represent the two encoding channel. User could enter submenus to set the Encoder parameters.



.2.1.1 Encoder Parm

➢ **Interface**

Connect the signal source to the corresponding input channel and select the interface from the options provided in the submenu (YPbPr, HDMI, and CVBS optional). Press Enter key to confirm and the system will automatically search the signal source.



NOTE: Below explanations are applied in this entire manual.

1) When user enter this submenu, the LCD displays only one option which is the device's current option when user presses ENTER **again** to enter the operation interface.

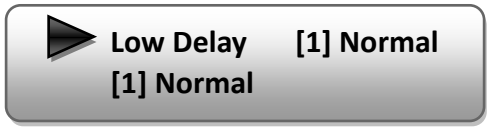
2) Press UP/DOWN buttons to specify the item , and then press Enter key to confirm

- **Video Format**

B-QAM-HDMI-IP-2CH supports both MPEG2 and MPEG4 AVC/H.264 formats. Move the triangle mark with UP/DOWN keys to specify the intended format and press ENTER to confirm.

- **Low Delay**

User can select a latency mode (Normal, Mode 1, Mode 2, and Manual optional) for the content. Move the triangle mark to specify a mode and press ENTER to confirm.



Normal: not to enable the low delay mode.

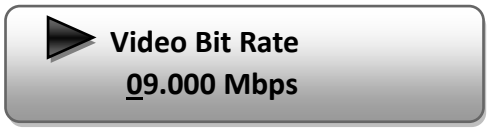
NOTE: The different combination of **Video Format**, **Video Bit-rate**, **Low Delay Mode** and **the Resolution** of signal source will have an impact on the time latency on receiving side. Please refer to the **Chapter 5** attached for detailed information.

- **CC**

CC (closed caption) can be input through "CC" port and it can be enable and disabled in this menu. Please refer to the **Chapter 5** attached for detailed information.

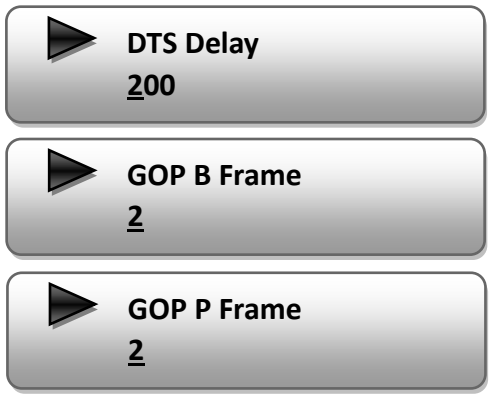
➢ **Video Bitrate**

Move the underline with LEFT/RIGHT keys and modify the value of frequency with UP/DOWN keys, and press ENTER key to save the settings.



➢ **DTS Delay/GOP B Frame/GOP P Frame**

These items are programmable when the "Low Delay" mode is set "Manual".



Mode 1: B frame=0, P frame=14, DTS=1

Mode 2: B frame=0, P frame=14, DTS=1

Manual: Under this mode, B frame (≤3), P frame (≤6) and DTS (1-500) can be customized manually.

➢ **Audio Format**

Users can choose the equipment video format among MPEG-1 Layer 2, MPEG-2 AAC, MPEG-4 AAC, AC3, AC3 Pass HDMI and AC3 Pass SPDIF in this interface. The LCD will display the following interfaces after users pressing the enter key.

➢ **Dialog Normal**

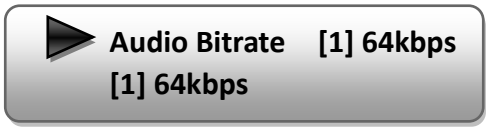
"Dialog Normal" refers to dialog normalization based on Dolby Digital AC3 audio coding. It can be customized when the audio format above is set "AC3". (Range: -31~-10 dB)

➢ **Audio Source**

B-QAM-HDMI-IP-2CH Audio Source supports Analog, HDMI, SPDIF and Auto (automatically identify audio source). Move the triangle mark with UP/DOWN keys to specify the intended format and press ENTER to confirm.

➢ **Audio Bit Rate**

User can set the input audio bit-rate by pressing the enter key to enter the main editing interface. And there are: 64Kb/s~320Kb/s. After the modification, users can press enter key again to take the modification into effect.



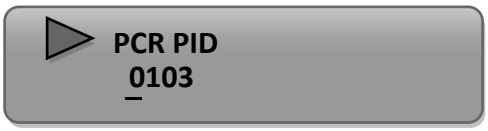
➢ **Audio Gain**

Move the underline with LEFT/RIGHT keys and modify the Audio Gain (0-400% adjustable) with UP/DOWN keys, then press ENTER key to save the settings.

2.1.2 Encoder Prg

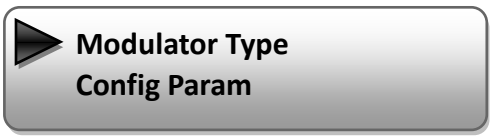
➢ **Service ID/PMT PID /Video PID /Audio PID/PCR PID Settings**

Users can set those parameters by pressing ENTER to enter these submenus. The LCD will display the following pages, and the maximum PID number cannot exceed 0x1fff.



2.2 Modulator Setting

When entering "Modulator" submenu, user can configure the modulating parameters for the 4 carrier output separately:



2.2.1 Modulator Type

B-QAM-HDMI-IP-2CH is with DVB-C and ATSC Modulating in one device and no need to upgrade new software. User can move the triangle mark with UP/DOWN keys to specify the intended Modulator Type and press ENTER to confirm, and then reboot the device to activate the modulator type.

2.2.2 Config Param

This device (DVB-C&ATSC Modulating) is with 4 carrier outputs. User can enter Config Param to set the modulating parameters.

User can enter Config Param to set the modulating parameters.

- **Standard (For DVB-C Modulating only)**

There are three possible options provided for selecting **Standard**: J.83A (DVB-C), J.83B, J.83C when the display shows them, user just need swift UP and DOWN key to choose.

- **Constellation (For DVB-C Modulating only)**

Three different constellations: J.83A (DVB-C), J.83B, J.83C will show on the LCD window when Constellation been entered.

J.83A (DVB-C) contains 16QAM, 32QAM, 64QAM, 128QAM, and 256QAM;

J.83B contains 64QAM, 256QAM;

J.83C contains 64QAM, 256QAM.

16QAM: Quadrature Amplitude Modulation is 16

32 QAM: Quadrature Amplitude Modulation is 32

64QAM: Quadrature Amplitude Modulation is 64

128QAM: Quadrature Amplitude Modulation is 128

256QAM: Quadrature Amplitude Modulation is 256

Setting method is just the same. When the display shows them, user just need swift UP/DOWN key to choose and repressing "ENTER" for confirm.

- **Symbol Rate (For DVB-C Modulating only)**

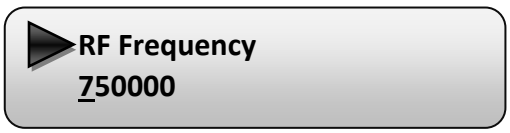
The symbol rate range of both J.83A (DVB-C) & J.83C is 5Msps to 9Msps and J.83B is fixed and cannot be changed.

- **RF level (For DVB-C and ATSC Modulating)**

The RF attenuation range is from -30~-10dbm (81~97dbμV) with 0.1db step. After entering this setting submenu, user can shift UP/DOWN/LEFT/RIGHT key to set the output level and press ENTER to confirm.

- **RF Frequency 1/2/3/4(For DVB-C and ATSC Modulating)**

B-QAM-HDMI-IP-2CH (DVB-C Modulating) is with 4 carrier outputs. The RF output frequency range is from 36 to 960MHz with 1K stepping. After entering the RF frequency setting submenu, users the can press LEFT, RIGHT, UP, and DOWN buttons to adjust the frequency and confirm by press ENTER button.



- **RF On 1/2/3/4(For DVB-C and ATSC Modulating)**

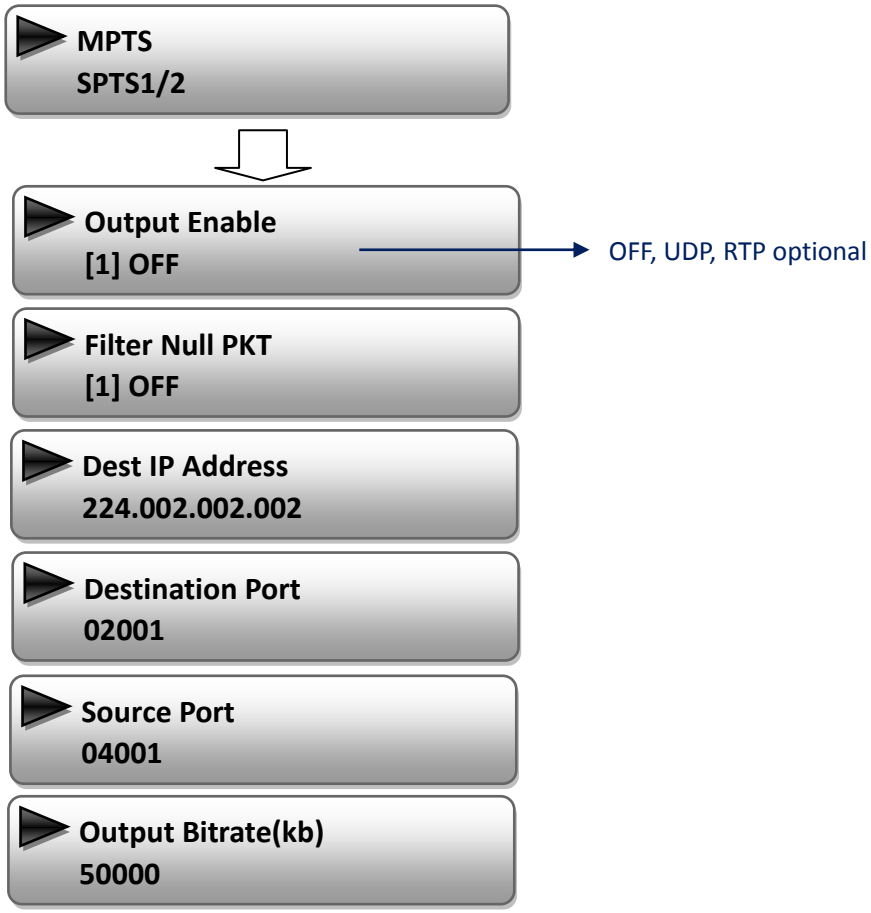
This interface is to decide whether to enable the RF (4 carriers) output or not.

OFF: to disable programs to output through carrier.

ON: to enable programs to output through carrier.

2.3 IP Output

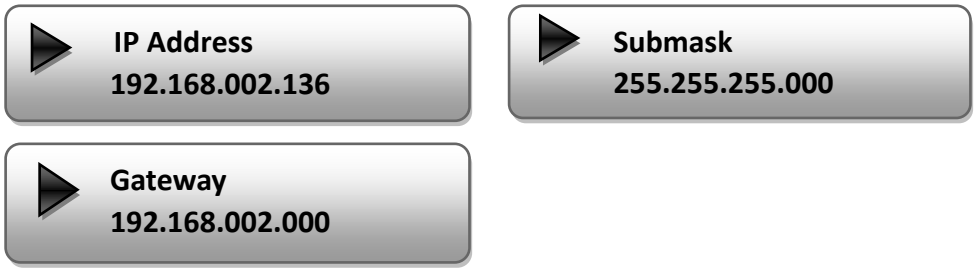
"IP output" is for configuring the 1 MPTS and 2 SPTS output respectively.



2.4 Network

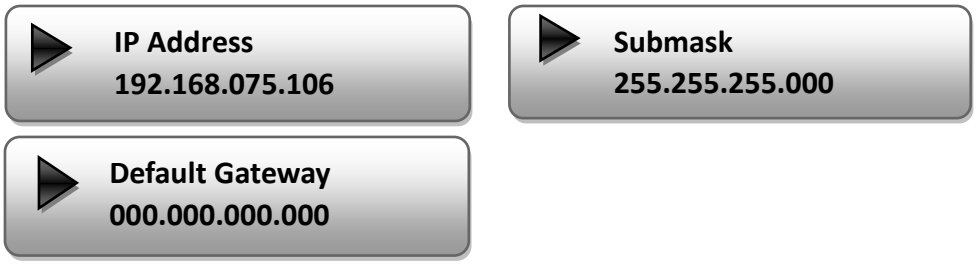
Network contains "NMS Interface" and "Data Interface".

"NMS Interface" is for setting the network parameters for the connection between the device and PC.



"Data Interface" is for configuring the 2 SPTS and 1 MPTS output. SPTS is for carrying the 2

encoded programs respectively, while MPTS is for carrying the muxed programs.



2.5 Configuration Setting

It contains 3 submenus where users can save/load configurations.

2.6 Version

User can check the software version and hardware version of this equipment under this submenu.

Chapter 4 WEB NMS operation

User not only can use front buttons for setting configuration, but also can control and set the configuration in computer by connecting the device to web NMS Port. User should ensure that the computer's IP address is different from the B-QAM-HDMI-IP-2CH's IP address; otherwise, it would cause IP conflict.

4.1 login

The default IP of this device is 192.168.2.136. We can modify the IP through the front panel.

Connect the pc and the device with net cable, and use ping command to confirm they are on the same network segment.

I.G. the PC IP address is 192.168.99.252, we then change the device IP to 192.168.99.xxx (xxx can be 0 to 255 except 252 to avoid IP conflict).

Use web browser to connect the device with PC by inputting the Encoder & Modulator's IP address in the browser's address bar and press Enter.

It will display the Login interface as Figure-1. Input the Username and Password (Both the default Username and Password are "admin".) and then click "LOGIN" to start the device setting.

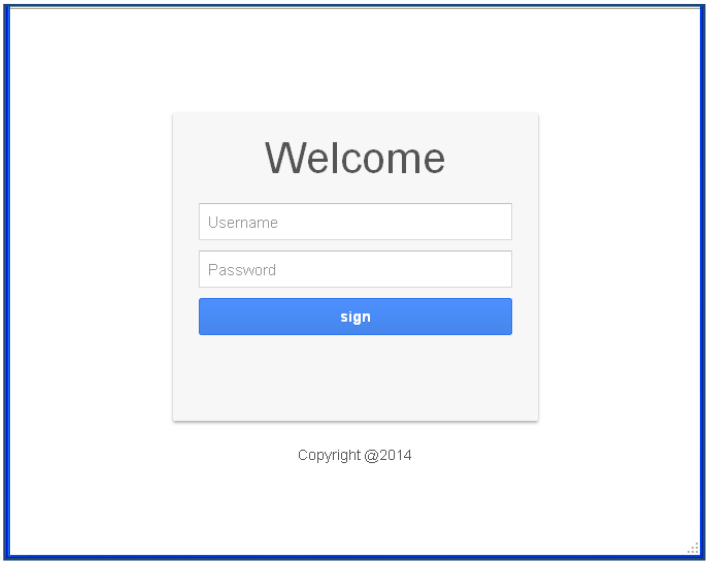


Figure-1

4.2 Operation

System

When we confirm the login, it displays the SYSTEM INFORMATION interface as Figure-2 where user can view the system information.

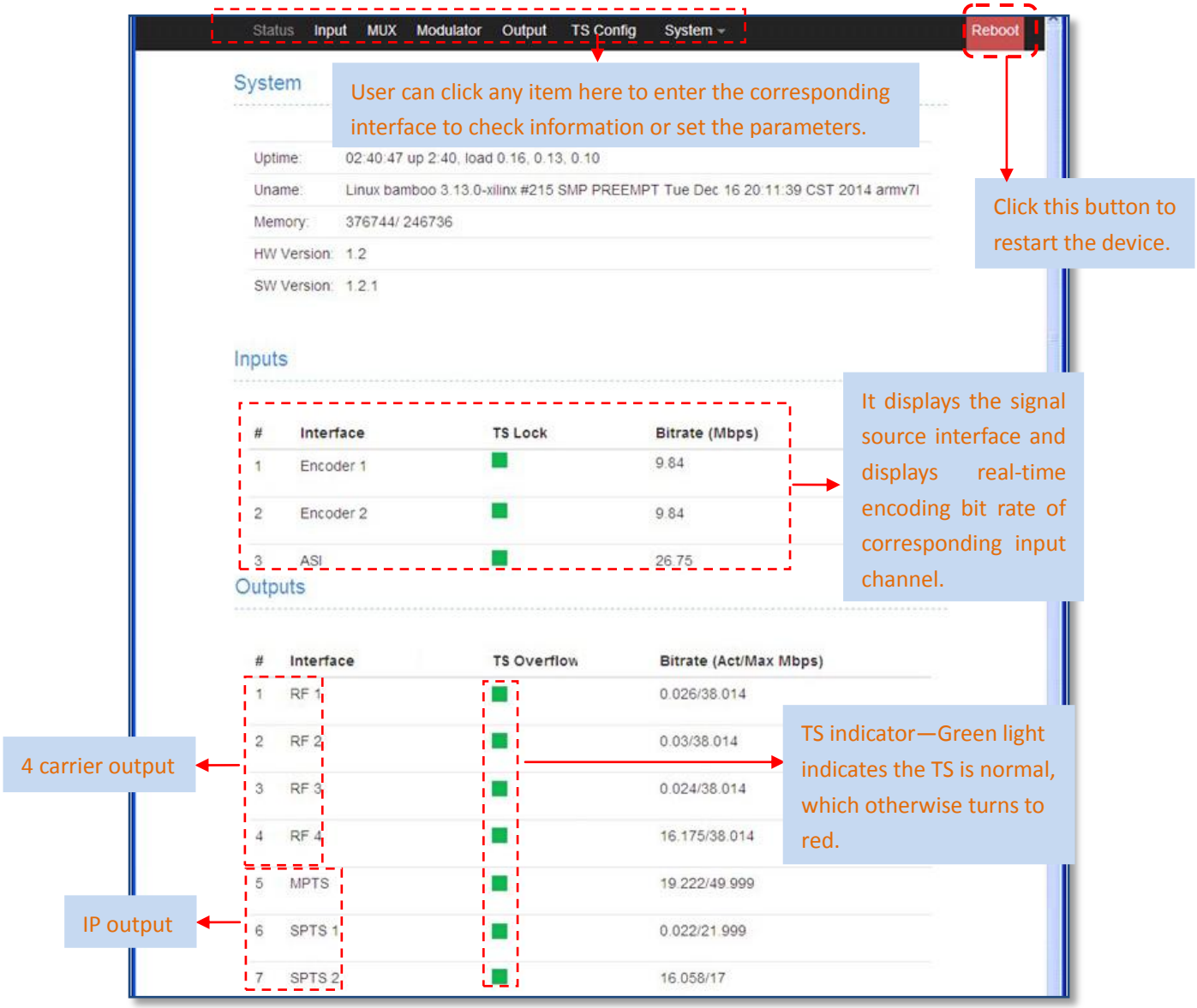


Figure-2

Input

From the menu on top side of the webpage, clicking “Input”, it displays the information of the encoding channel as below.

Encoder Param

Clicking "Encoder Param" it displays the information of the Video and Audio encoding parameters as Figure-3. User can set the Video and Audio parameters.

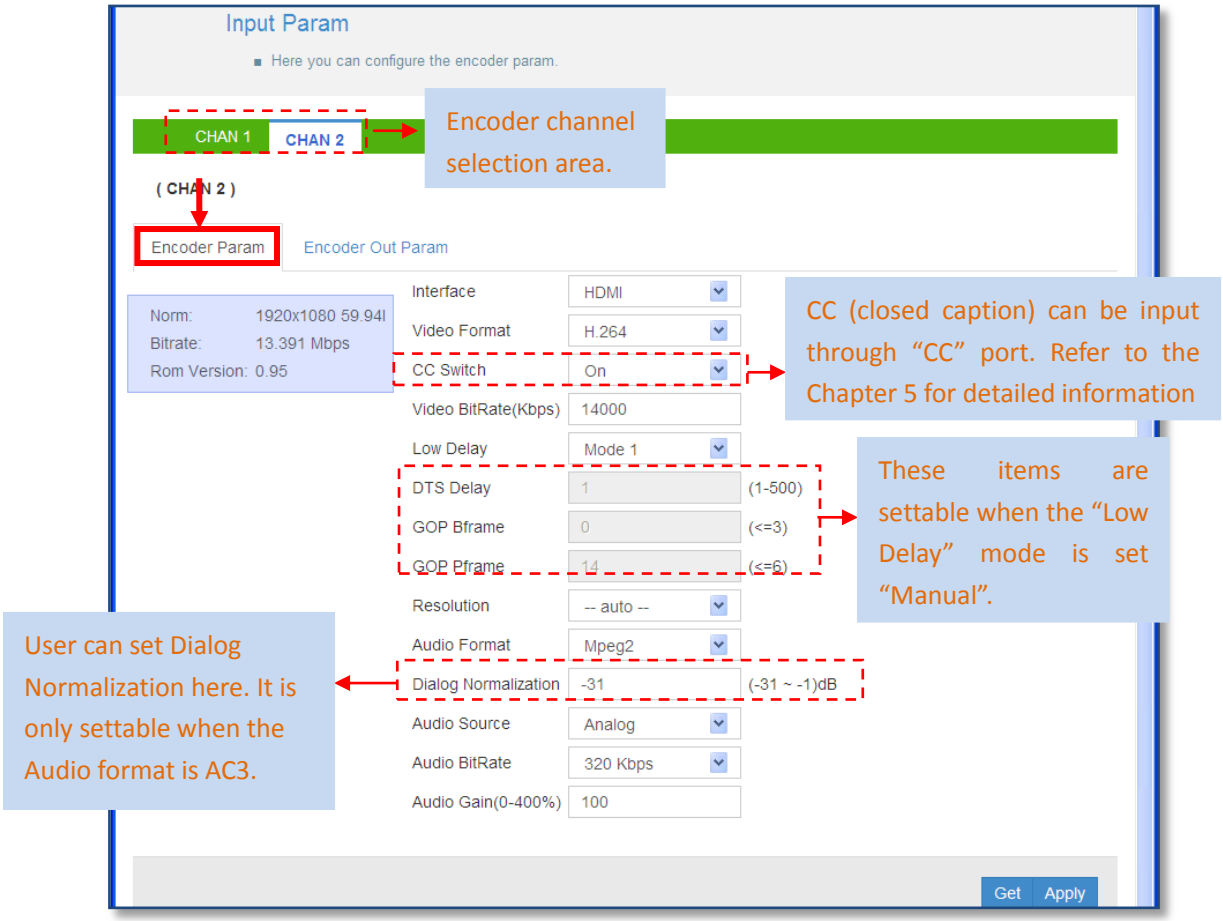


Figure-3

"Low Delay": Normal: not to enable the low delay mode.

Mode 1: B frame=0, P frame=14, DTS=1

Mode 2: B frame=2, P frame=4, DTS=1

Manual: Under this mode, B frame (⩽3), P frame (⩽6) and DTS (1-500) can be customized manually.

NOTE: The different combination of **Video Format**, **Video Bit-rate**, **Low Delay Mode** and **the Resolution** of signal source will have an impact on the time latency on receiving side. Please refer to the **Chapter 5** attached for detailed information.

Encoder out Param

Clicking "Encoder out Param", User can set the encoded program output parameters.

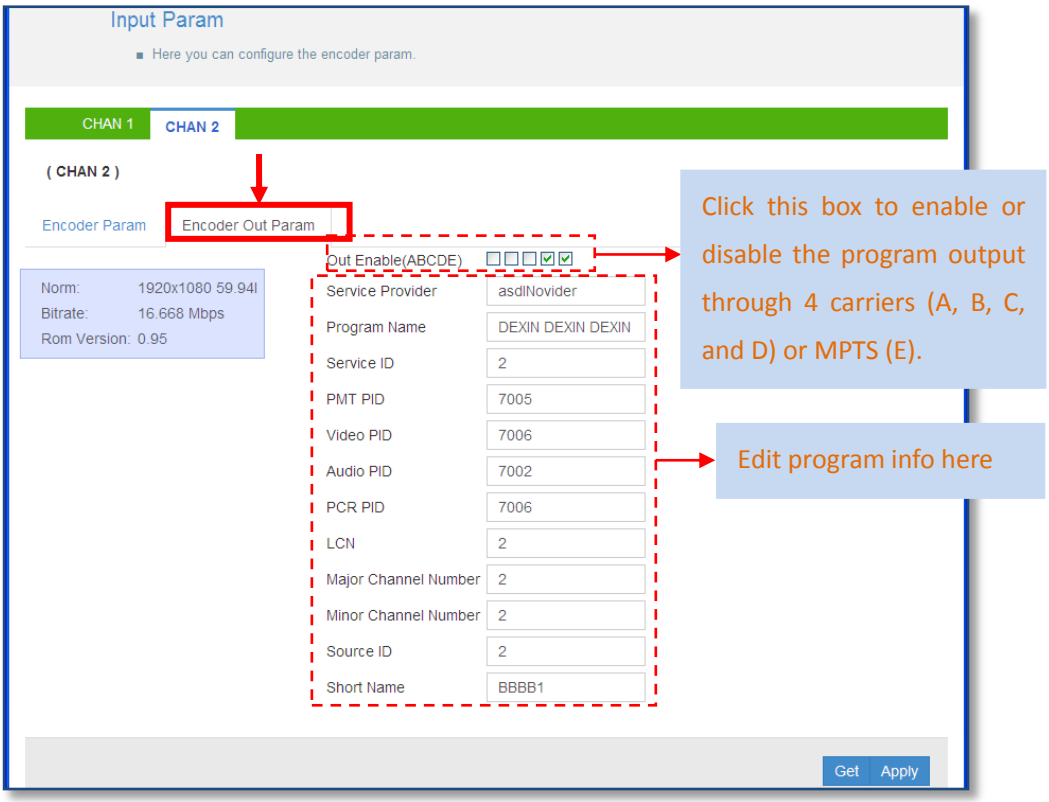


Figure-4

Mux

Click "Mux", it will display ASI input program information as Figure-5. User can parse and multiplex out programs through 4 carriers or MPTS in this interface.

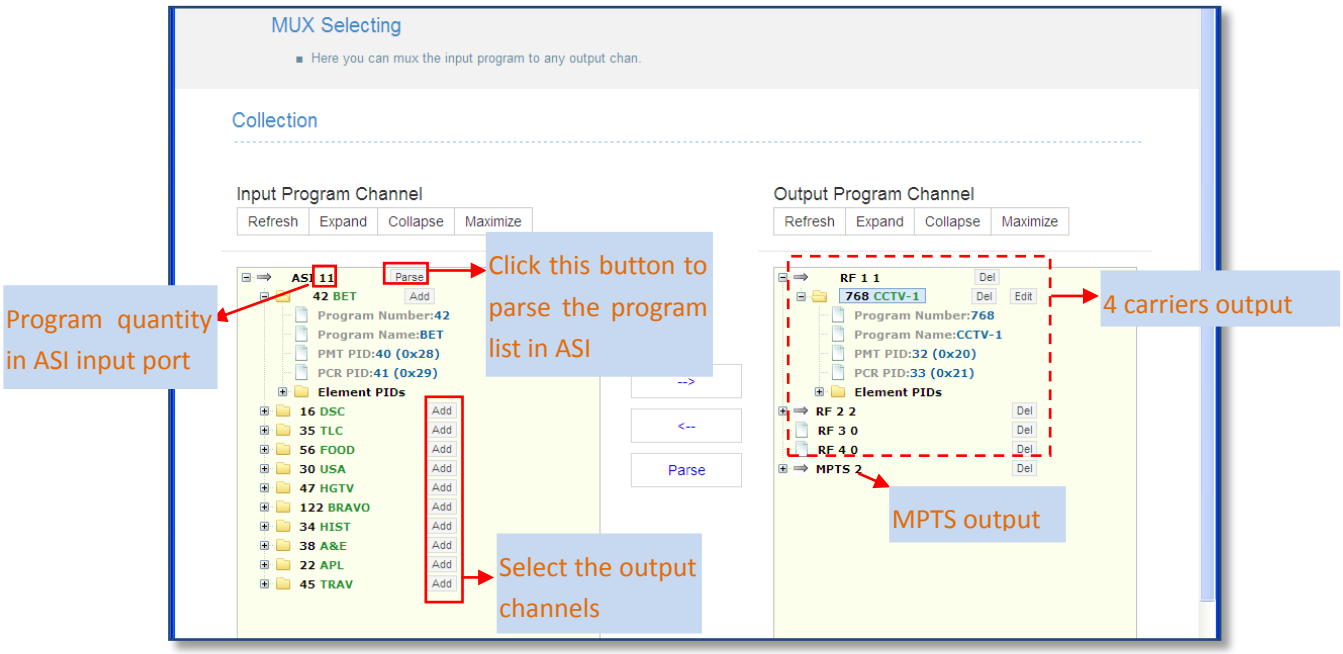


Figure-5

Refresh Expand Collapse Maximize Click those buttons to refresh/expand/collapse/Maximize the ASI input programs or RF, MPTS out programs

--> Select one input program first and click this button to transfer the selected program to the right box to output.

<- Similarly, user can cancel the multiplexed programs from the right box.

Parse Click this button to parse the program list in each input channel.

Program Modification:

The multiplexed program information can be modified by clicking the program in the 'output' area. For example, first select the target a program in the 'output' area, then clicking Edit it triggers a dialog box (Figure 6) where users can input new information.

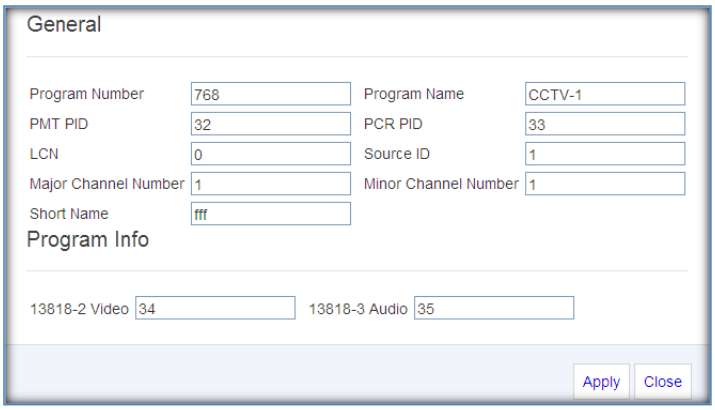


Figure-6

Input new data and click 'Apply' button at last to confirm the modification.

Modulator Setting

The B-QAM-HDMI-IP-2CH supports DVB-C and ATSC Modulating in one device and no need to upgrade new software. User can use front buttons to set the intended Modulator Type. Please refer to **Chapter 3 (2.2.1 Modulator Setting)** for detailed information**.**

DVB-C Modulating

When user chooses DVB-C as Modulator Type, enter in "Modulator" and it will display the Modulator Configuration screen as Figure-7 where can set DVB-C modulation parameters.

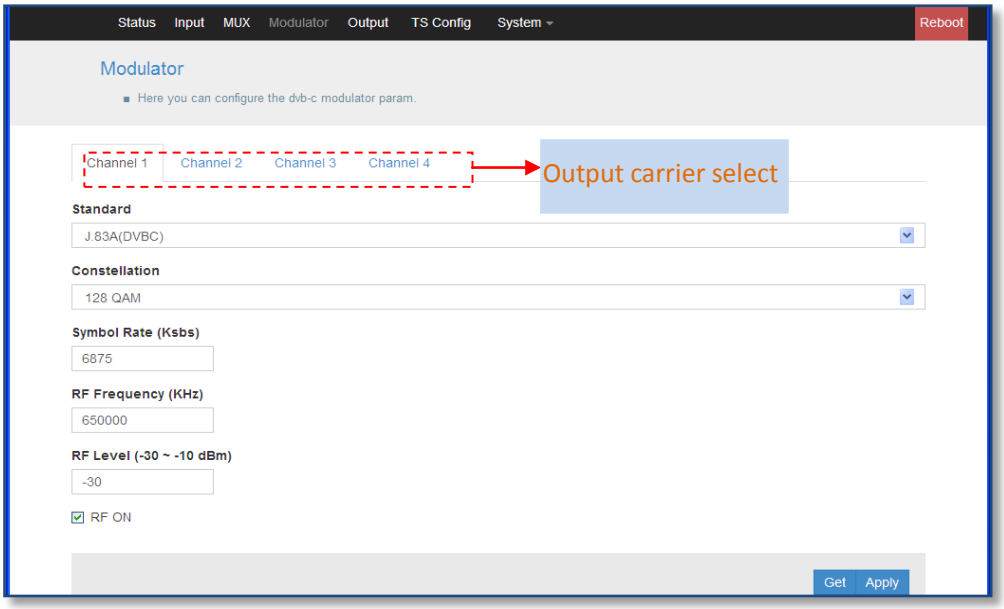
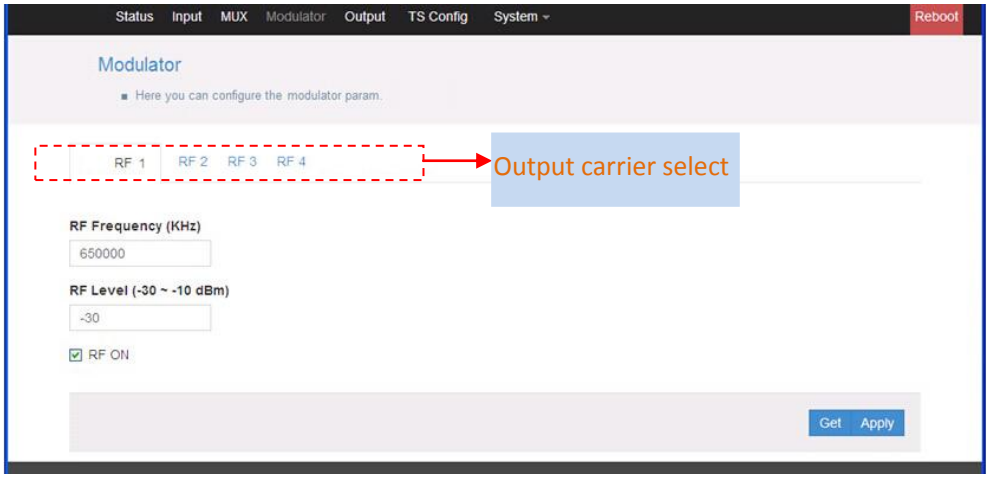


Figure-7

After setting all the parameters, click "Apply" Apply to save the Modulator Configuration.

ATSC Modulating

When user chooses ATSC as Modulator Type, enter in "Modulator" and it will display the Modulator Configuration screen as below where to set ATSC modulation parameters.



Output Parameters

Click "Output" from the top menu, it is for configuring the IP and ASI output respectively.

Output Setting

Enter in "Output Setting" and it will display the screen as Figure-8 where user can set the 1 MPTS and 2 SPTS parameters separately.

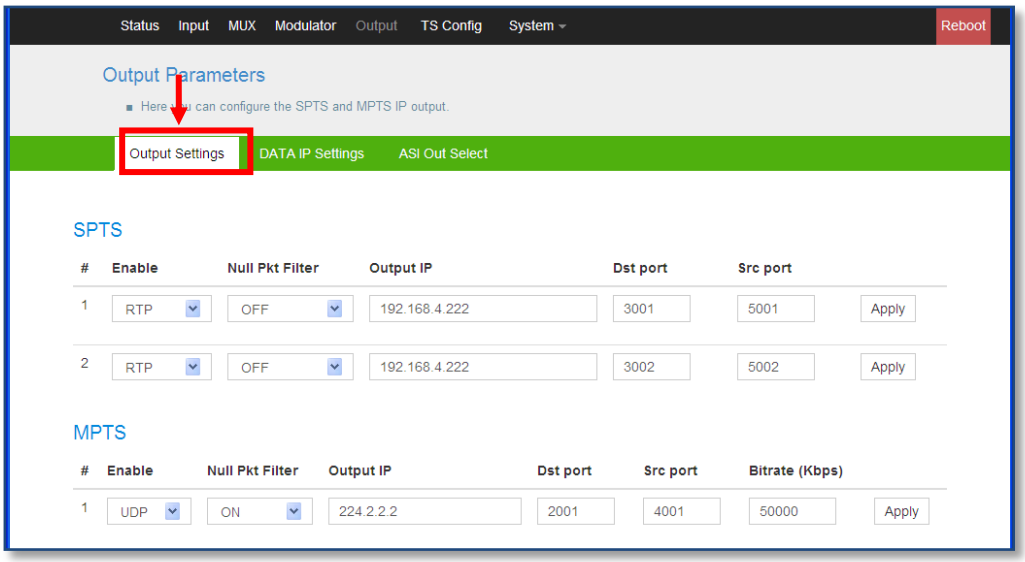


Figure-8

Data IP Setting

Data IP Setting is for setting the Data parameters for the device. (Figure-9)

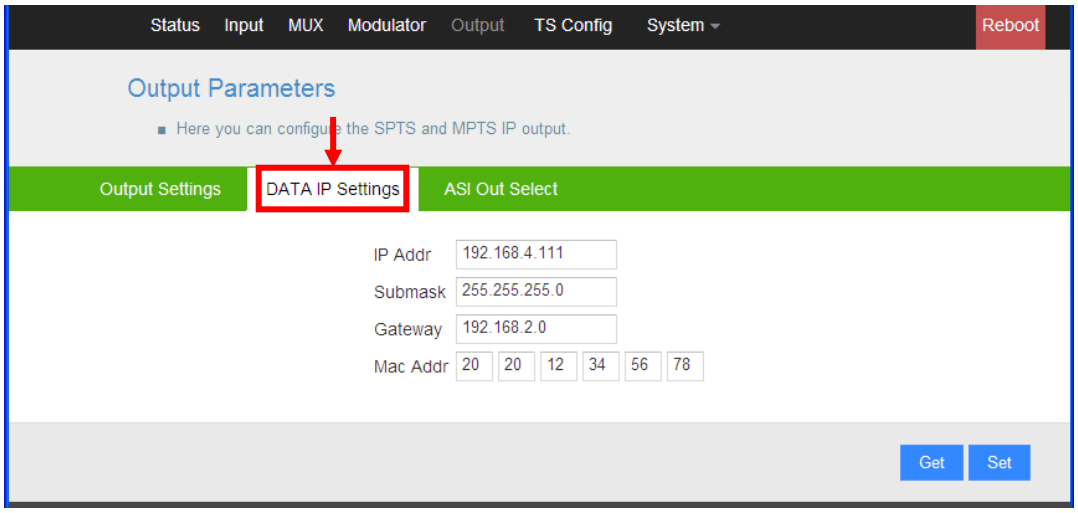


Figure-9

ASI Out Select

Clicking “ASI Output select” from the menu, it will display the interface as Figure-10 where to choose TS to output from ASI.

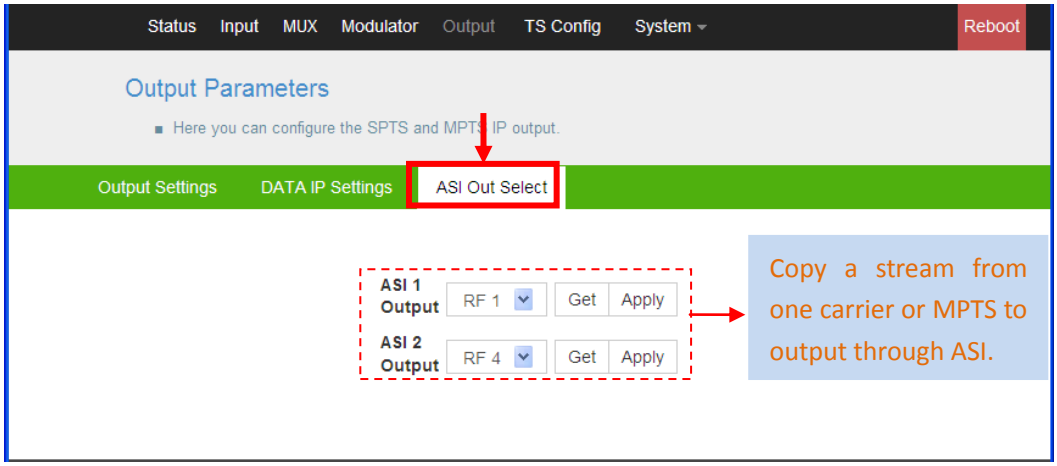


Figure-10

TS Config

Enter this interface to configure the TS ID, Original Network ID, NIT and VCT for the 4 carriers and ASI MPTS output.

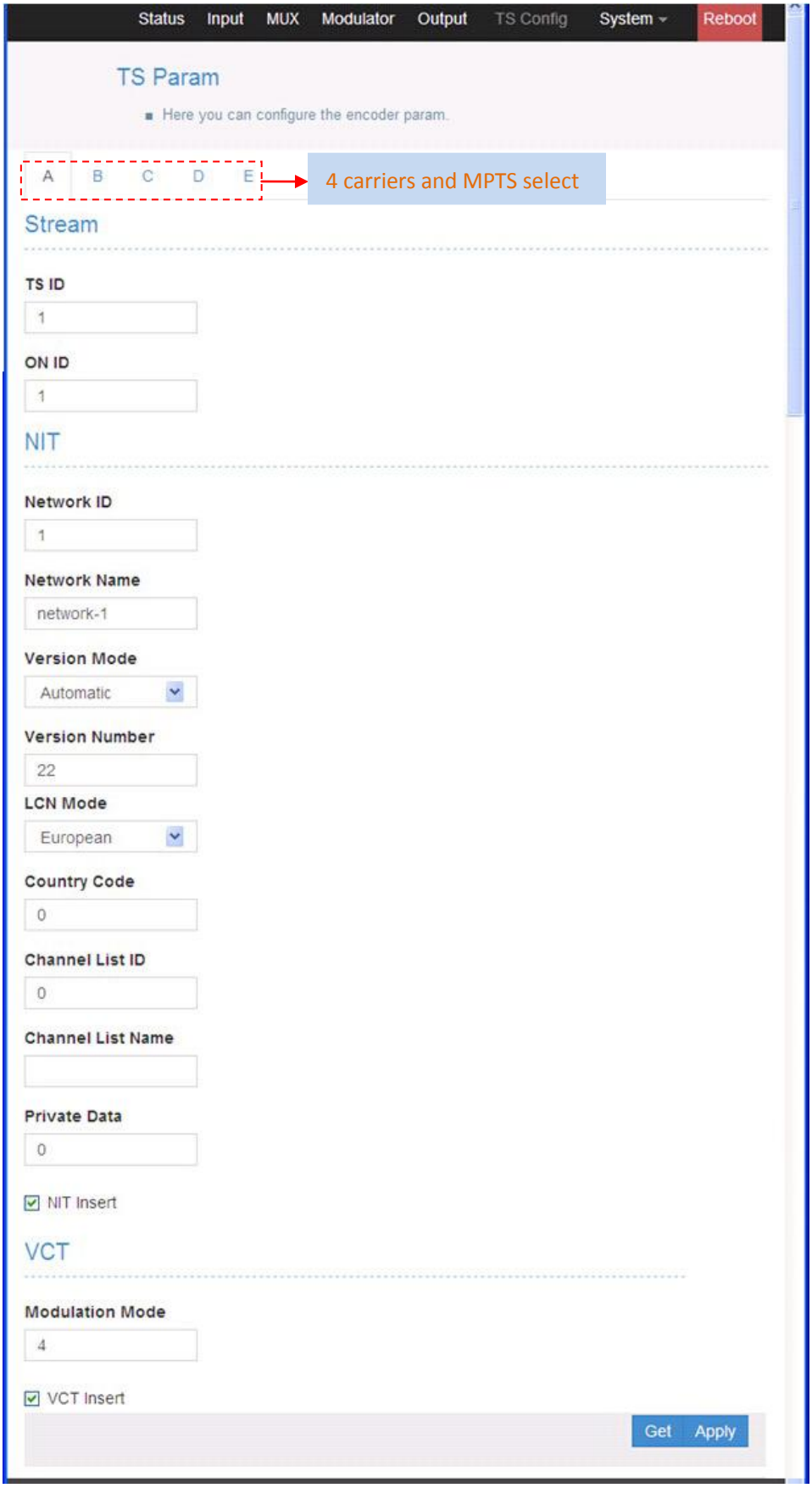

Status
Input
MUX
Modulator
Output
TS Config
System
Reboot
TS Param
Here you can configure the encoder param.
A
B
C
D
E
4 carriers and MPTS select
Stream
TS ID
1
ON ID
1
NIT
Network ID
1
Network Name
network-1
Version Mode
Automatic
Version Number
22
LCN Mode
European
Country Code
0
Channel List ID
0
Channel List Name
Private Data
0
NIT Insert
VCT
Modulation Mode
4
VCT Insert
Get
Apply

Figure-11

System→Save load

Clicking "Save load" from the menu, it will display the screen as Figure-12 where can save the configuration permanently to the device. Click "Save Configuration", for store the data permanently to the device.

By using "Restore Configuration" user can restore the latest saved configuration to the device.

By using "Factory Set" user can import the default factory configuration.

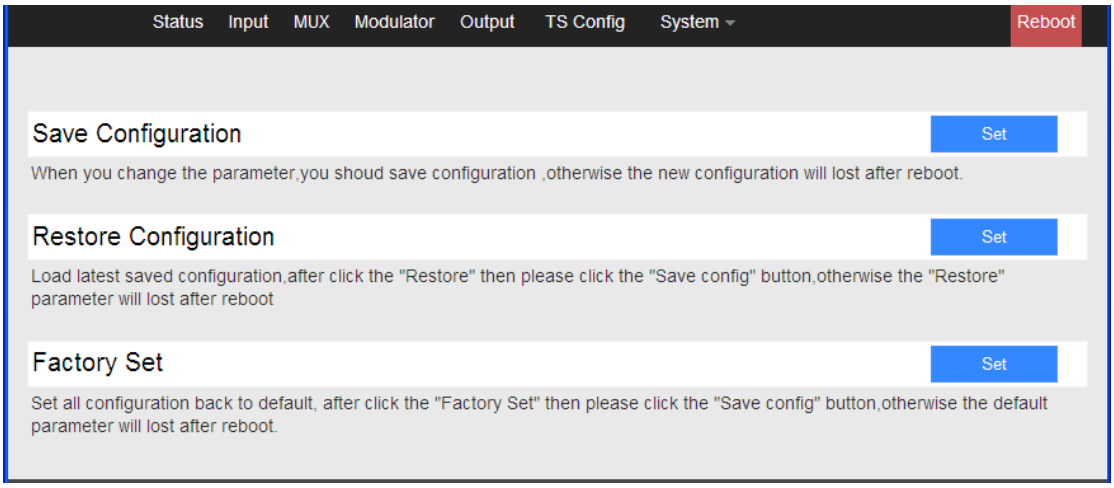


Figure-12

System→Network

When user clicks "Network", it will display the screen as Figure-13. It displays the network information of the device. Here user can change the device network configuration as needed.

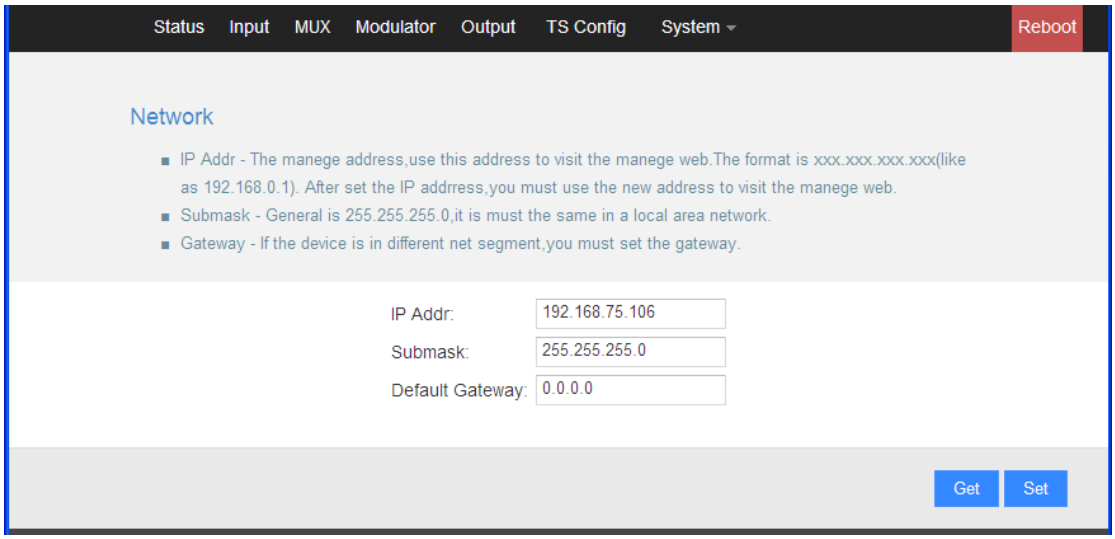


Figure-13

System→Change Password

When user clicks "Password", it will display the password screen as Figure-14. Here user can change the Username and Password for login to the device.

After putting the current and new Username and Password, click "Set" to save the configuration.

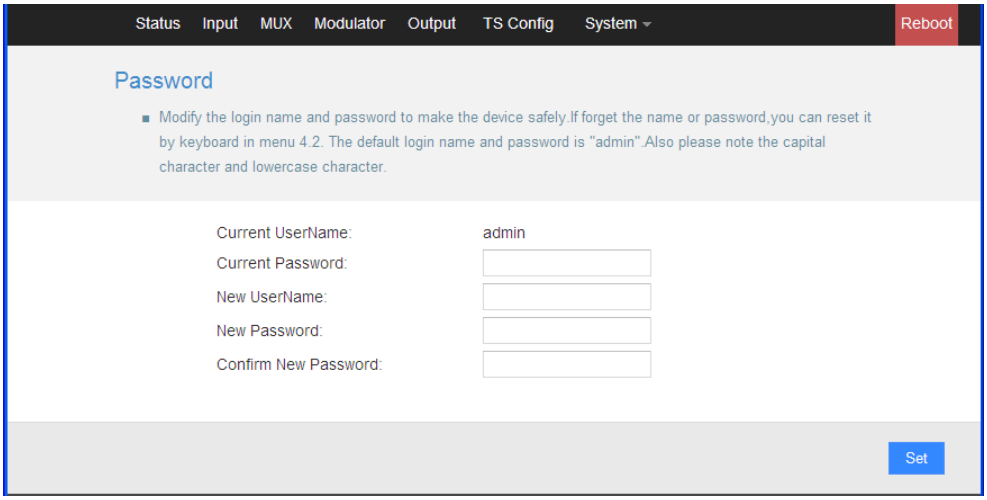


Figure-14

System→Firmware

Click "Firmware" from the menu it will display the screen as Figure-15. Here user can update the device by using the update file.

Click "Browse" to find the path of the device update file for this device then click "Update" to update the device.

After updating the device, user needs to restart the device by using Reboot option.

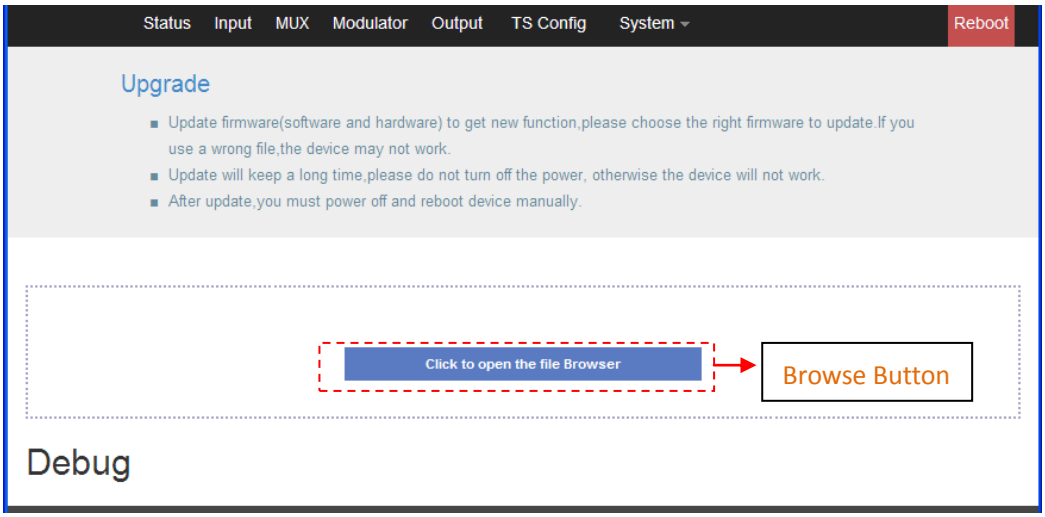


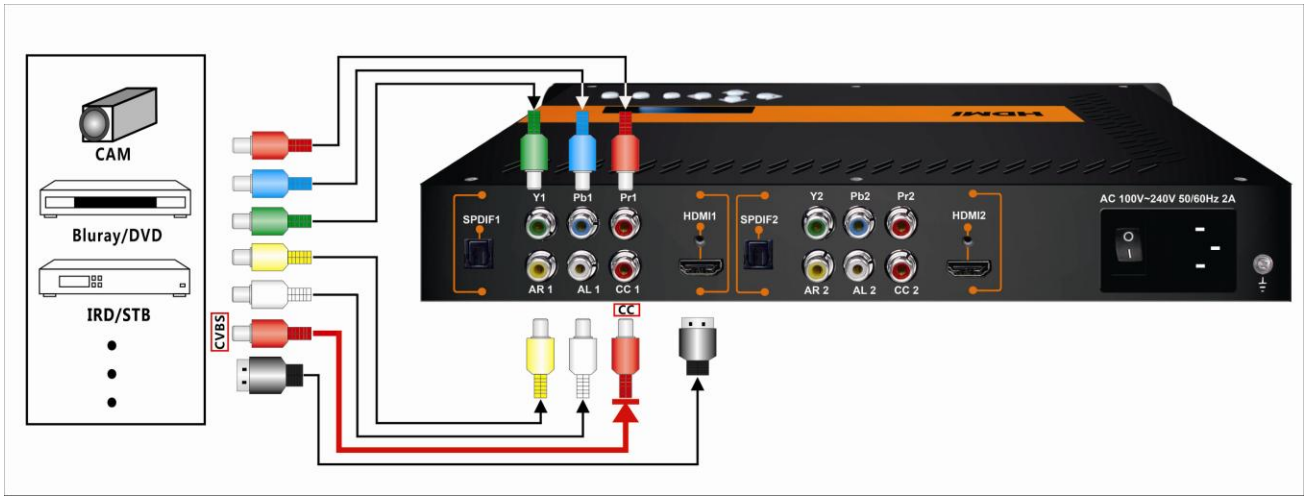
Figure-15

Chapter 5 Operation of Closed Caption (CC)

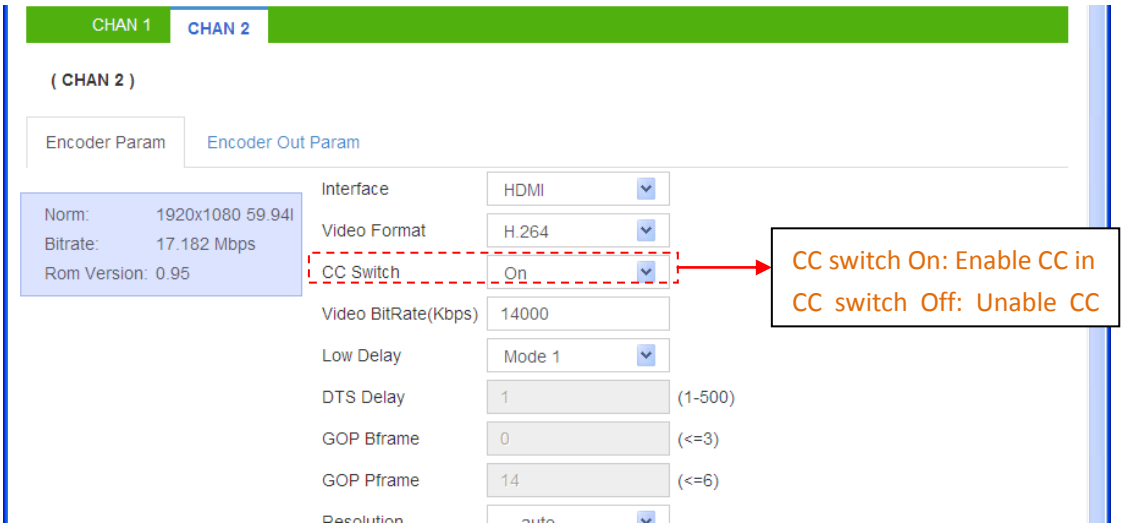
Closed Caption, hereinafter referred to as the CC.

CC is from CVBS source output from IRD or STB etc. Connecting the CVBS cable to the CC port at the rear panel (as shown in below image), CC can be mixed with A/V inputs to generate programs with CC.

CC wiring diagram



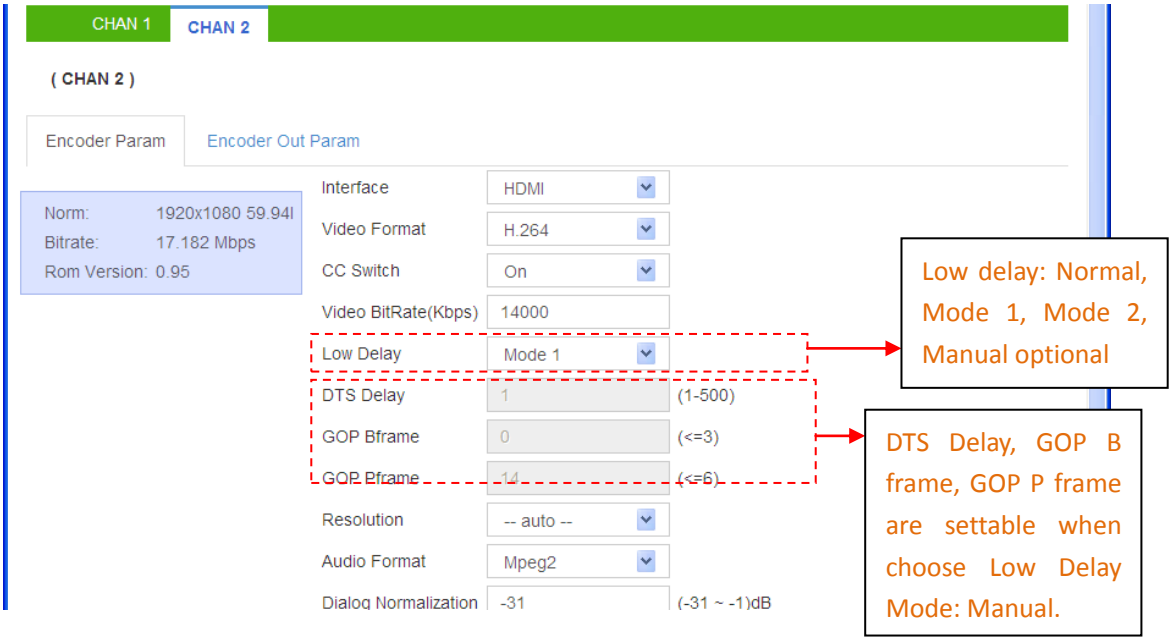
CC switch in Web based NMS



Chapter 6 Low Delay Setting

B-QAM-HDMI-IP-2CH can achieve a signal low delay from encoding to STB decoding side. User can enable the low delay function in the web-server NMS interface as shown below:

Click “Encoder Param” of “Channel 1” or “Channel 2” to set a low delay mode for each channel:



There are 4 low delay modes:

1. **Normal**: to disable the low delay function.
2. **Mode 1/Mode 2/Manual**: to activate the low delay function.

The delay duration is based on the different combination of **Video Format**, **Video Bit-rate**, **Low delay Mode** and **the Resolution** of signal source, which combine together to have a comprehensive impact on the delay. Please refer to the below table for reference.

- **NOTE:** The delay duration will also be impacted as the decoding performance of the STB side change. Users need to apply a well-performed STB or other decoding terminals to achieve a low delay

Internal Test Report of Time Delay

The values cover the progress from Encoding → Decoding

Decoding Terminal	Encoding Details					Average Delay (ms)
	Single Source	Bit Rate Mode	Resolution	Low Delay	Encoding Type	

	Interface			Mode		
DVB-C HD STB	HDMI	VBR	1080i@50	Mode 1	mpeg2	300
					H.264	335
				Mode 2	mpeg2	407.5
					H.264	492.5
			720p@50	Mode 1	mpeg2	230
					H.264	285
				Mode 2	mpeg2	382.5
					H.264	395
DVB-C HD STB	YPbPr	VBR	1080i@50	Mode 1	mpeg2	282.5
					H.264	395
				Mode 2	mpeg2	397.5
					H.264	450
			720p@50	Mode 1	mpeg2	267.5
					H.264	255
				Mode 2	mpeg2	385
					H.264	422.5
DVB-C HD STB	CVBS	VBR	576i@50	Mode 1	mpeg2	450
					H.264	570
				Mode 2	mpeg2	510
					H.264	620

Decoding Terminal	Encoding Details					Average Delay (ms)
	Single Source Interface	Bit Rate Mode	Resolution	Low Delay Mode	Encoding Type	
ATSC HD STB	HDMI	VBR	1080i@50	Mode 1	mpeg2	300
					H.264	335
				Mode 2	mpeg2	407.5
					H.264	492.5
			720p@50	Mode 1	mpeg2	230
					H.264	285
				Mode 2	mpeg2	382.5
					H.264	395
ATSC HD STB	YPbPr	VBR	1080i@50	Mode 1	mpeg2	282.5
					H.264	395
				Mode 2	mpeg2	397.5
					H.264	450
			720p@50	Mode 1	mpeg2	267.5
					H.264	255
				Mode 2	mpeg2	385
					H.264	422.5
ATSC-T HD STB	CVBS	VBR	576i@50	Mode 1	mpeg2	470
					H.264	515
				Mode 2	mpeg2	540
					H.264	570
			480i@60	Mode 1	mpeg2	460
					H.264	500
				Mode 2	mpeg2	510
					H.264	550

Chapter 7 Troubleshooting

Prevention Measure

- Installing the device at the place in which environment temperature between 0 to 45 ℃
- Making sure good ventilation for the heat-sink on the rear panel and other heat-sink bores if necessary
- Checking the input AC within the power supply working range and the connection is correct before switching on device
- Checking the RF output level varies within tolerant range if it is necessary
- Checking all signal cables have been properly connected
- Frequently switching on/off device is prohibited; the interval between every switching on/off must greater than 10 seconds.

Conditions need to unplug power cord

- Power cord or socket damaged.
- Any liquid flowed into device.
- Any stuff causes circuit short
- Device in damp environment
- Device was suffered from physical damage
- Longtime idle.
- After switching on and restoring to factory setting, device still cannot work properly.
- Maintenance needed

Chapter 8 Television Frequency/Channels

Air Channels			
Ch.	Frequency		
	Start	Center	End
VHF			
C00	45	48.5	52
C01	56	59.5	63
C02	63	66.5	70
C03	85	88.5	92
C04	94	97.5	101
C05	101	104.5	108
C5A	137	140.5	144
C06	174	177.5	181
C07	181	184.5	188
C08	188	191.5	195
C09	195	198.5	202
C9A	202	205.5	209
C10	209	212.5	216
C11	216	219.5	223
C12	223	226.5	230
UHF			
C20	470	473.5	477
C21	477	480.5	484
C22	484	487.5	491
C23	491	494.5	498
C24	498	501.5	505
C25	505	508.5	512
C26	512	515.5	519
C27	519	522.5	526
C28	526	529.5	533
C29	533	536.5	540
C30	540	543.5	547
C31	547	550.5	554
C32	554	557.5	561
C33	561	564.5	568
C34	568	571.5	575
C35	575	578.5	582
C36	582	585.5	589
C37	589	592.5	596

Air Channels			
Ch.	Frequency		
	Start	Center	End
C38	596	599.5	603
C39	603	606.5	610
C40	610	613.5	617
C41	617	620.5	624
C42	624	627.5	631
C43	631	634.5	638
C44	638	641.5	645
C45	645	648.5	652
C46	652	655.5	659
C47	659	662.5	666
C48	666	669.5	673
C49	673	676.5	680
C50	680	683.5	687
C51	687	690.5	694
C52	694	697.5	701
C53	701	704.5	708
C54	708	711.5	715
C55	715	718.5	722
C56	722	725.5	729
C57	729	732.5	736
C58	736	739.5	743
C59	743	746.5	750
C60	750	753.5	757
C61	757	760.5	764
C62	764	767.5	771
C63	771	774.5	778
C64	778	781.5	785
C65	785	788.5	792
C66	792	795.5	799
C67	799	802.5	806
C68	806	809.5	813
C69	813	816.5	820
C70	820	823.5	827
C71	827	830.5	834
C72	834	837.5	841
C73	841	844.5	848
C74	848	851.5	855
C75	855	858.5	862

Modulation Constellation	FEC	6MHz Bandwidth				7MHz Bandwidth				8MHz Bandwidth			
		Guard Interval				Guard Interval				Guard Interval			
		1/4	1/8	1/16	1/32	1/4	1/8	1/16	1/32	1/4	1/8	1/16	1/32
QPSK	1/2	**The weak ability of error-correcting and anti-interference in this area**											6.03
	2/3				6.03	5.80	6.45	6.83	7.03	6.64	7.37	7.81	8.04
	3/4		6.22	6.58	6.78	6.53	7.25	7.68	7.91	7.46	8.29	8.78	9.05
	5/6	6.22	6.91	7.31	7.54	7.25	8.06	8.53	8.79	8.29	9.22	9.76	10.05
	7/8	6.53	7.25	7.68	7.91	7.62	8.46	8.96	9.23	8.71	9.68	10.25	10.56
16QAM	1/2	7.46	8.29	8.78	9.04	8.70	9.67	10.24	10.55	9.95	11.06	11.71	12.06
	2/3	9.95	11.05	11.70	12.06	11.61	12.90	13.66	14.07	13.27	14.75	15.61	16.09
	3/4	11.19	12.44	13.17	13.57	13.06	14.51	15.36	15.83	14.93	16.59	17.56	18.10
	5/6	12.44	13.82	14.63	15.08	14.51	16.12	17.07	17.59	16.59	18.43	19.52	20.11
	7/8	13.06	14.51	15.36	15.83	15.24	16.93	17.93	18.47	17.42	19.35	20.49	21.11
64QAM	1/2	11.19	12.44	13.17	13.57	13.06	14.51	15.36	15.83	14.93	16.59	17.56	18.10
	2/3	14.92	16.58	17.56	18.09	17.41	19.35	20.49	21.11	19.91	22.12	23.42	24.13
	3/4	16.79	18.66	19.76	20.35	19.59	21.77	23.05	23.75	22.39	24.88	26.35	27.14
	5/6	18.66	20.73	21.95	22.62	21.77	24.19	25.61	26.39	24.88	27.65	29.27	30.16
	7/8	19.59	21.77	23.05	23.75	22.86	25.40	26.89	27.71	26.13	29.03	30.74	31.67

Safety Instructions

Read before operating equipment.

1. Cleaning - Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
2. Power Sources - Use supplied or equivalent UL/CSA approved low voltage DC plug-in transformer.
3. Outdoor Antenna Grounding - If you connect an outside antenna or cable system to the product, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges. Section 810 of the National Electrical Code, ANSI/NFPA No. 70, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.
4. Lightning - Avoid installation or reconfiguration of wiring during lightning activity.
5. Power Lines - Do not locate an outside antenna system near overhead power lines or other electric light or power circuits or where it can fall into such power lines or circuits. When installing an outside antenna system, refrain from touching such power lines or circuits, as contact with them might be fatal.
6. Overloading - Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.
7. Object and Liquid Entry - Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short out parts, resulting in a fire or electric shock. Never spill liquid of any kind on the product.
8. Servicing - Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.
9. Damage Requiring Service - Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
- When the power supply cord or plug is damaged.
- If liquid spills or objects fall into the product.
- If the product is exposed to rain or water.
- If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions. An improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
- If the video product is dropped or the cabinet is damaged.
- When the video product exhibits a distinct change in performance, this indicates a need for service.