UC-650E+ DVB-S2 Encoder & Modulator

User Manual

SW Version: 6.11

HW version: 5.8

Web NMS version: 2.00

DIRECTORY

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About This Manual

Intended Audience

This manual is intended for end users who will operate and integrate the UC-650 Encoder Modulator. Some chapters require prerequisite knowledge in electronics and broadcasting technology.

Disclaimer

The contents of this document are subject to revision without notice due to continued progress in methodology, design and manufacturing. UPCOM 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 Outline

The UC-650E DVB-S/S2 Encoder/Modulator is an integrated multifunction device. This unit is built around a swappable encoding module (CVBS/SDI/HDMI/YPbPr) for expanded flexibility. One ASI input port is standard. Outputs signals can be sent to ASI or L-Band RF (IF optional) ports simultaneously.

This device can accept input signals from a variety of sources thanks to the available encoding module varieties. A user friendly web-based graphical user-interface allows full remote control from any web browser. Broadcasts can be securely encrypted with BISS scrambling. This device is built to broadcasting industry standards making it well suited as a high-quality and low-cost encoding and transmission option for end users.

1.2 Features

- **MPEG2, H.264 video Encoding, MP2, MP2-AAC, MP4-AAC Audio Encoding Optional**
- **HD SDI Input, pluggable and interchangeable Encoding Modules**
- **1*ASI Input**
- **Low Delay achieved (Optional Feature)**
- **Support DVB-S/S2 RF output and ASI output**
- **Output Frequency: 950-2150MHz**
- **Support BISS encryption**
- **Support for a 10MHz reference clock**
- **Support Web NMS and front panel LCD & Keyboard control**
- **Firmware Upgrades through web NMS**

1.3 Specifications

Input Interface

SDI (interchangeable with CVBS/YPbPr/S-video /HDMI… encoding modules)
1×ASI input, BNC interface

Encoding Section

Video

Encoding	MPEG2; MPEG4 AVC/H.264
Input	SDI*1
Resolution	1920*1080_60P, 1920*1080_50P, (-for MPEG4 AVC/H.264 only) 1920*1080_60i, 1920*1080_50i, 1280*720_60p, 1280*720_50P 720*480_60i, 720*576_50i
Bit rate	1.000~19.500 Mbps

Audio

Encoding	MPEG1 Layer II (MPEG2-AAC, MPEG4-AAC optional, as per order)
Sample rate	48KHz
Bit rate	64kbps, 96kbps, 128kbps, 192kbps, 256kbps, 320kbps
Encoding	MPEG1 Layer II (MPEG2-AAC, MPEG4-AAC optional, as per your order)

DVB-S/S2 Modulation Section

DVB-S QPSK: FEC 1/2,2/3,3/4,5/6,7/8
DVB-S2 QPSK: FEC 1/2,3/5,2/3,3/4,4/5,5/6,8/9,9/10
DVB-S2 8PSK FEC 3/5,2/3,3/4,5/6,8/9,9/10
RF output: 950.00-2150.00 MHz, 10Khz step IF output: 50-200MHz
Symbol rate: 0.05-20.0Msps
Roll Off: 0.35, 0.25, 0.2
Output level: -10db~-41.5db

Output

DVB-S/S2 RF output; ASI output (as a mirror of RF)

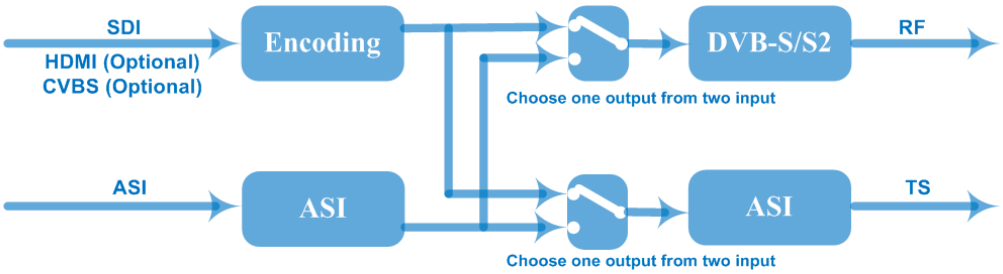
System

Local Control	LCD + control buttons
Remote Control	Web-based NMS
Language	English

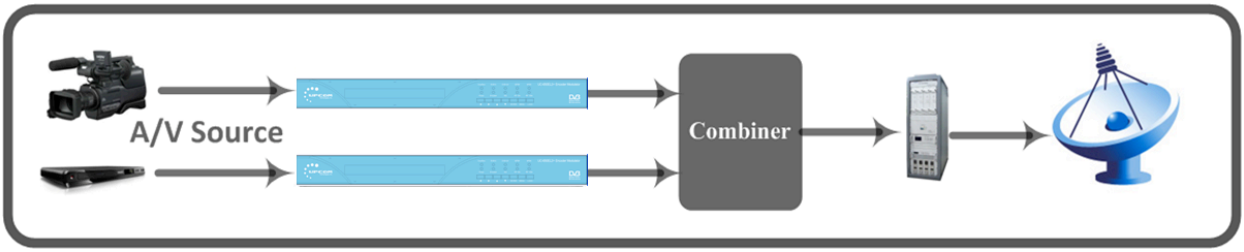
Physical Specification

Dimensions	410×460×44mm (W*L*H)
Temperature	0~45℃(operation), -20~80℃ (storage)
Weight	4kgs
Power Supply	AC 100-240V 50/60Hz

1.4 Inner Function Principle

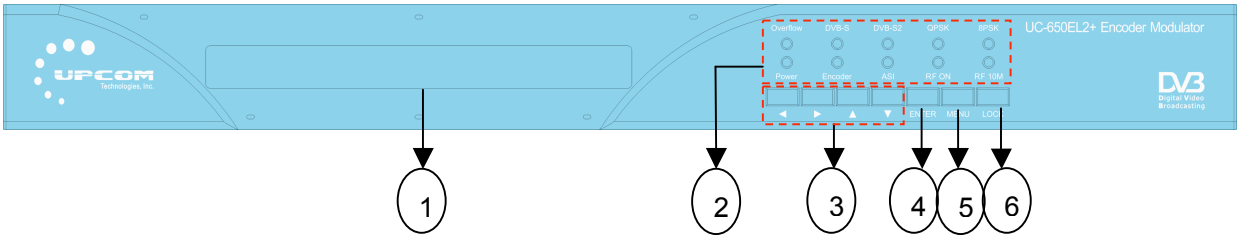


1.5 System Connection Sample



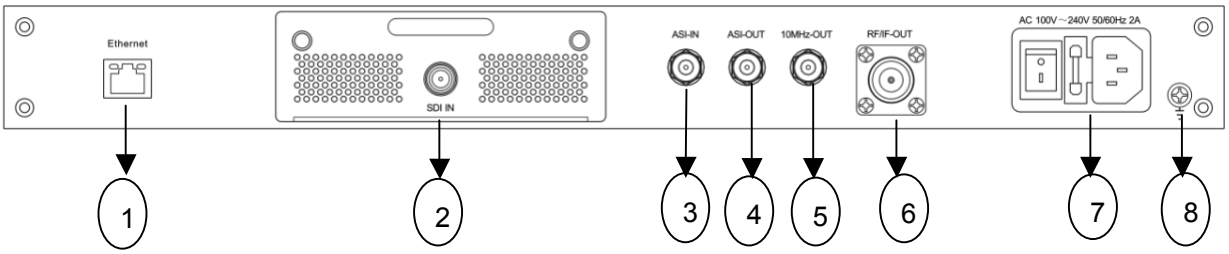
1.6 Appearance and Description

Front Panel Illustration



1	LCD Window
2	Indicators
3	Navigation Keys
4	Enter：Confirmation Key
5	Menu: Back-step Key
6	Lock: Locking Key

Rear Panel Illustration



1	Web NMS (Network Management System) interface
2	SDI Encoding Module
3	ASI input interface
4	ASI output interface

5	10MHz reference clock output interfaces
6	RF output interface
7	Power socket/switch/fuse
8	Ground pole

Chapter 2 Installation Guide

2.1 Acquisition Check

End users should check packaging contents against the following list:

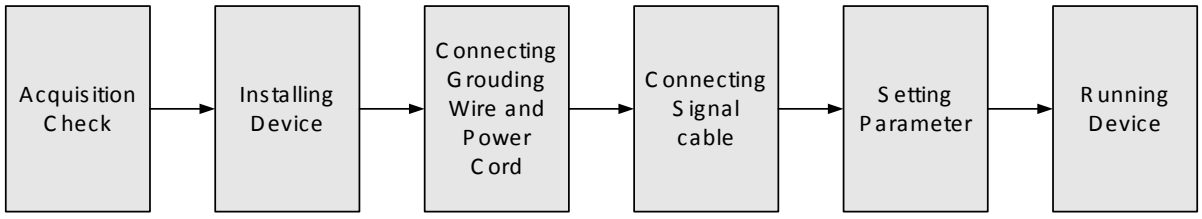
- UC-650E DVB-S2 Encoder Modulator
- SDI Cables
- Power Cord

If any item is missing or mismatched with the list above please contact the local vendor.

2.2 Installation Preparation

- Carefully checking for any physical damage during shipping.
- Preparing the correct environment for installation.
- Preparing network connection.
- Signal cables connections.

2.2.1 Device's Installation Flow Chart Illustrated as following：



2.2.2 Environment Requirement

Item	Requirement
Datacenter Environment	Ensure a minimum of 1.5M between any two mounted devices. Walls should be no closer than 0.8M.
Datacenter Floor	Electricically Isolated & 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/㎡)
Environmental Temperature	5~40□(sustainable)，0~45□(short term)， Installing air-conditioning is recommended
Relative Humidity	20%~80% sustainable　10%~90% short time
Pressure	86~105Kpa
Door & Windows	Installing rubber strips for sealing door-gaps and dual pane glasses for windows is recommended.
Fire Protection	Fire alarm system and extinguisher is required.
Power	Ensure device power, air-conditioning power and lighting power circuits are independent of each other. Device power requires DC 12V. Please carefully check all power sources before running.

2.3 Wire's Connection

- Connecting the Power Cord

  User can insert one end into power supply socket, while inserting the other end to main power source.

Caution:

Before connecting the power cord to UC-650E DVB-S2 Encoder & Modulator user should ensure power switch is set to "OFF".

2.4 Signal Cables Connection

Input and output signal connection cables are illustrated in this chapter.

2.4.1 ASI cable illustration:

2.4.2 Network cable illustration:

2.4.3 SDI cable illustration:

2.4.4 RF output cable illustration:

Chapter 3 Operation

The UC-650E DVB-S/S2 Encoder/Modulator can be operated using the front panel LCD screen and associated control buttons. This chapter will explain the menu structure:

Keyboard Function Description:

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

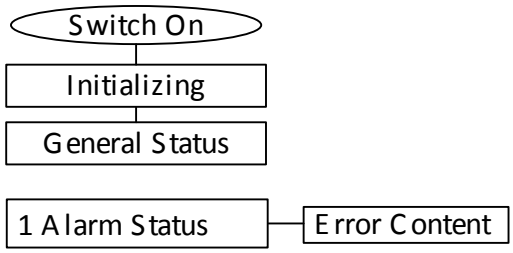
ENTER: Apply setting changes.

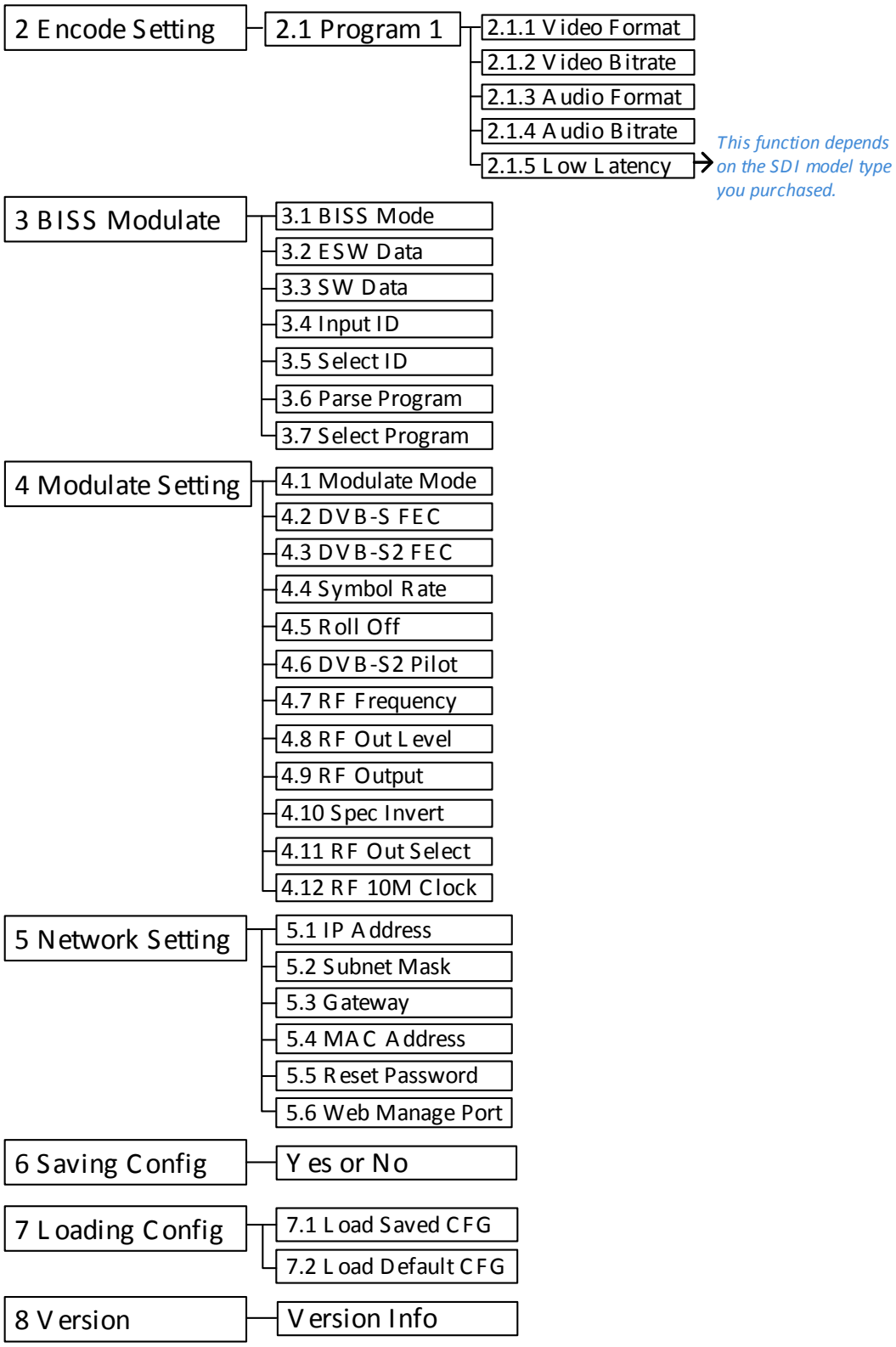
LEFT/RIGHT: Menu navigation Left/Right.

UP/DOWN: Menu navigation Up/Down.

LOCK: Locks the screen / cancels the lock state; Saves configuration to memory.

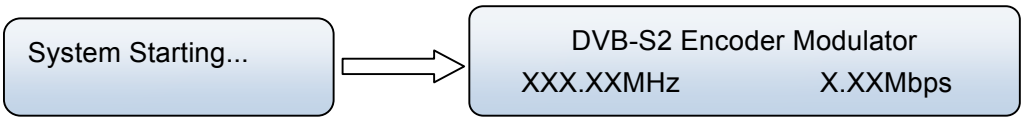
3.1 LCD Menu Tree





3.2 General Setting

After successful boot-up the device LCD will display General Status:



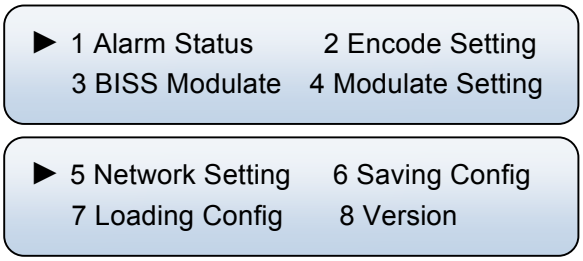
DVB-S2: Indicates the modulation standard of this device.

Encoder Modulator: Device name.

XXX.XX MHz: Indicates the current output frequency.

X.XX Mbps: Indicates the current encoding bit rate.

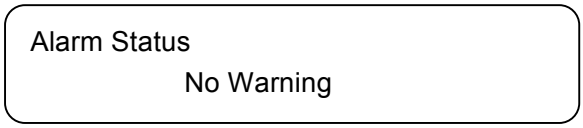
Pressing the “LOCK” key will allow the user to navigate the Main Menu:



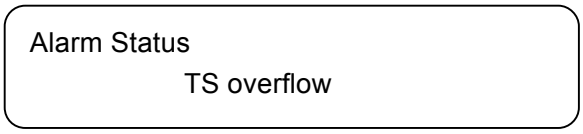
Please use the UP/DOWN/LEFT/RIGHT navigation buttons to make any desired changes within the Main Menu.

3.2.1 Alarm Status

Move the selection cursor to Menu Item 1 and press ENTER. If there are no active alarms, the LCD screen will display the following:

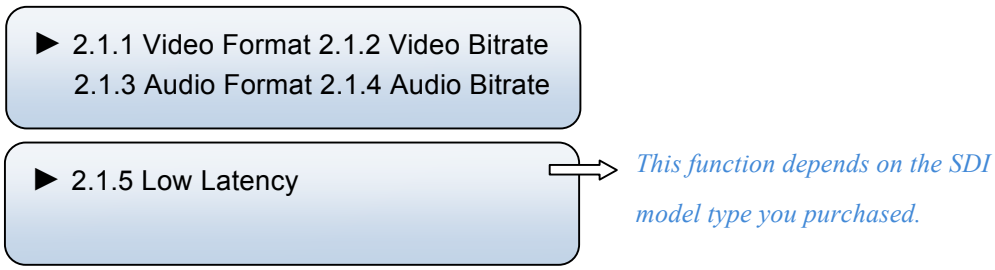


If alarms are present the LCD screen will display relevant messages. For example:

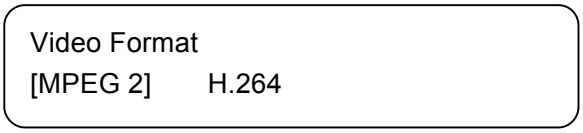


3.2.2 Encode Setting

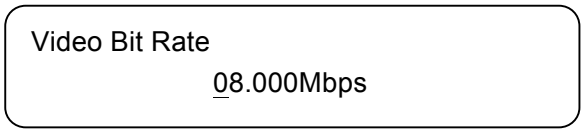
This sub-menu will allow the user to configure Video and Audio encoding parameters.



The SDI encoding module supports both MPEG2 and H.264 HD/SD video formats. Move the brackets with LEFT/RIGHT keys to specify the intended format and press ENTER to confirm.

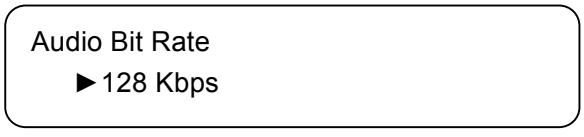


Enter sub-menu Video Bit Rate to adjust the desired bit rate by pressing LEFT/RIGHT/UP/DOWN keys and confirm new values by pressing the “LOCK” key. (Bitrate Range: 1-19.5 Mbps)

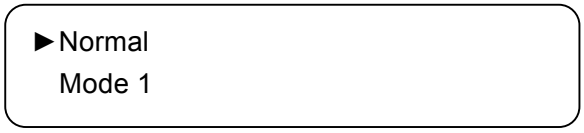


The supported Audio formats are: MPEG2, MPEG2-AAC and MPEG4-AAC. Move the brackets to specify the desired format and press “ENTER” to confirm:

Audio Bit Rate can be selected within allowed ranges: 64 /96 /128 /192 /256 /320 Kbps



“Low Latency”: to select a latency mode for the content. Move the selection cursor to specify a mode and press “ENTER” to confirm.

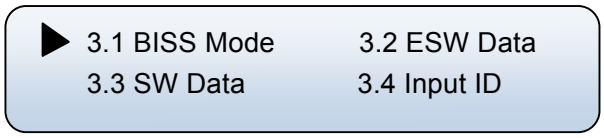


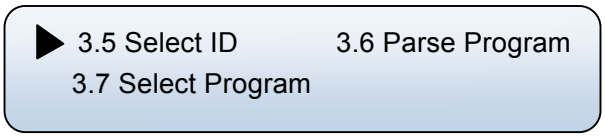
NOTE

The different combination of **Video Format**, **Video Bit-rate**, **Low Latency Mode** and **the Resolution** of signal source will have an impact on the encoding latency. Please refer to the attached **Appendix** for detailed information.

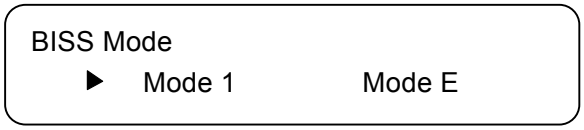
3.2.3 BISS Modulation

User can navigate to the BISS encryption settings menu by pressing the relevant front panel control buttons.





BISS Mode: UC-650E supports two BISS modes: *Mode 1* and *Mode E*.

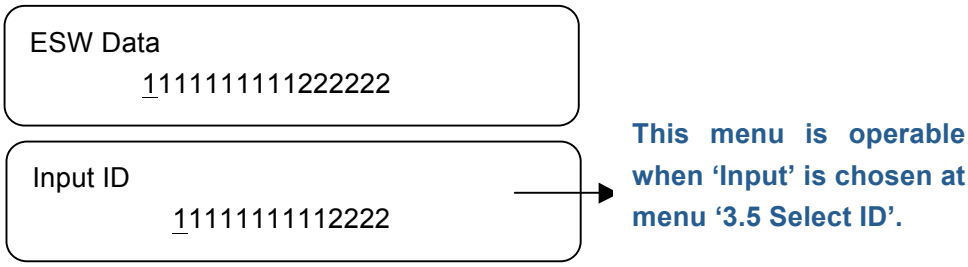


- **NOTE: If Mode 1 is chosen as the BISS mode, "3.3 SW Data" menu will be activated, while "3.2 ESW Data" and "3.4 Input ID" are locked and can't be operated. Alternatively, if Mode E is chosen as the BISS mode: "3.3 SW Data" menu will be locked and can't be operated, while "3.2 ESW Data", "3.4 Input ID" and "3.5 Select ID" are activated and available.**

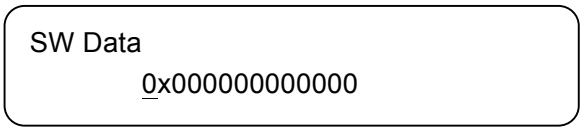
Mode 1	ESW Data	X	SW Data	√	Select ID	X	Input ID	X
Mode E	ESW Data	√	SW Data	X	Select ID (Device)	√	Input ID	X
					Select ID (Input)	√	Input ID	√

ESW Data & Input ID: Under Mode E (with 'Input' chosen in "3.5 Select ID"), the BISS

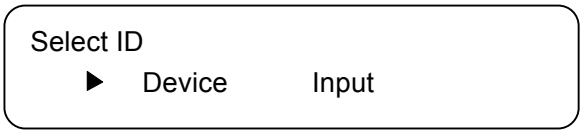
scrambler completes scrambling through **ESW** value and **Input ID**. User can input the ESW data and ID.



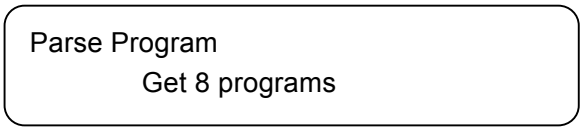
SW Data: Under Mode 1, users can input a 12-digit hexadecimal value.



Select ID: Under Mode E, users can choose the ID between *Device* and *Input*. Under 'Input', 'Input ID' will be operable.



Parse Program: This menu will display the quantity of programs selected from **ASI** input.



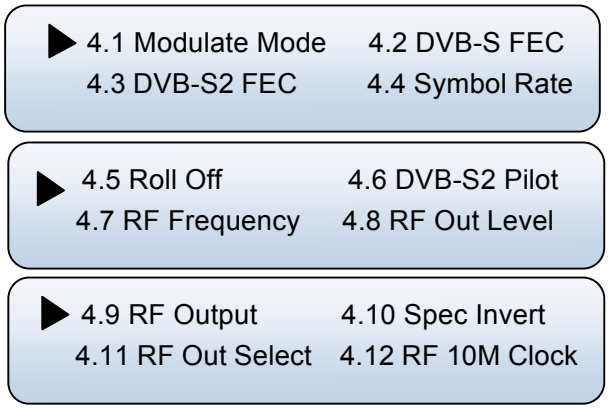
- **NOTES**: This menu will be only available if the "4.11 RF Out Select" is set as "ASI".

Select Program: Within this menu, users can decide which programs to encrypt. Press ENTER to and LEFT/RIGHT key to shift " √ " (Yes) and "X" (No).

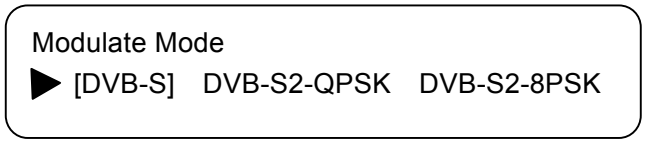
- **NOTE**: When "4.11 RF Out Select" is set as "Encoder", the program(s) displayed here are sourced from the encoding module; While "4.11 RF Out Select" is set as "ASI", the program(s) displayed here are from the ASI INPUT.

3.2.4 Modulate Setting

Selecting “4 Modulate Setting” in the main menu interface will allow users to set the modulation parameters:

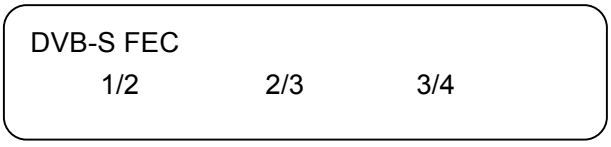


Modulate Mode: UC-650E has 3 modulating modes available: DVB-S, DVB-S2-QPSK and DVB-S2-8PSK.



DVB-S FEC (Forward Error Correction): Users can set their desired FEC ratios from within the allowed value range (1/2, 2/3, 3/4, 5/6 and 7/8).

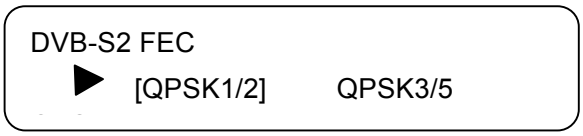
- **NOTE:** This menu will be available if *DVB-S* is selected as the modulating mode within Menu 4.1.



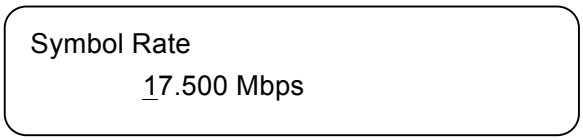
DVB-S2 FEC (Forward Error Correction): User can select one DVB-S2 FEC ratios from options provided by pressing RIGHT/LEFT key.

- **NOTE:** This menu will be available if *DVB-S2-QPSK* or *DVB-S2-8PSK* is selected as the modulation mode within menu 4.1.

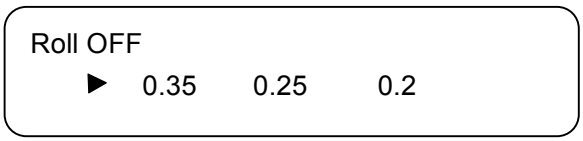
Modulating Mode	FEC Options
DVB-S2-QPSK	QPSK1/2, QPSK3/5, QPSK3/4, QPSK4/5, QPSK5/6, QPSK8/9, QPSK9/10
DVB-S2-8PSK	8PSK3/5, QPSK2/3, 8PSK3/4, 8PSK5/6, 8PSK8/9, 8PSK9/10



Symbol Rate: User can navigate to this menu to modify symbol rate (allowed range: 0.050~20.000Mbps) by pressing UP/DOWN/LEFT/RIGHT keys confirm by pressing "LOCK" key.



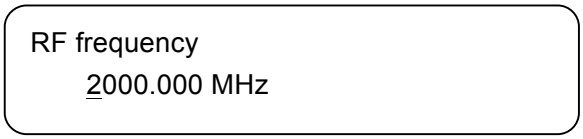
Roll Off: User can enter this menu to select roll-off factor. Different selections will affect maximum input bit-rate.



DVB-S2 Pilot: The DVB-S2 Pilot can be switched on or off through this menu.

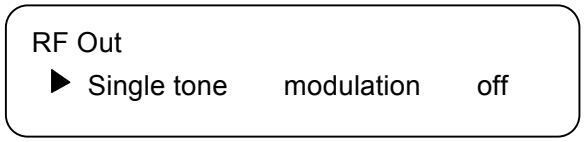
NOTE: DVB-S2-QPSK or DVB-S2-8PSK must be selected as the modulation mode within menu 4.1 to enable this option.

RF Frequency: The RF output frequency range is from 950 to 2150MHz with 1K stepping. Users then can press LEFT/RIGHT/UP/DOWN button to adjust the frequency and confirm by pressing ENTER button.



RF Output Level: The RF attenuation range is from -10db~-41.5db. After entering this setting submenu, user can shift UP/DOWN/LEFT/RIGHT key to set the output level and press ENTER to confirm.

RF Output: The RF output mode can be selected within this menu: The available modes are: single tone, modulation, and OFF.



Spec Invert: User can switch the Spectrum Invert mode between Normal and Inverted under this menu.

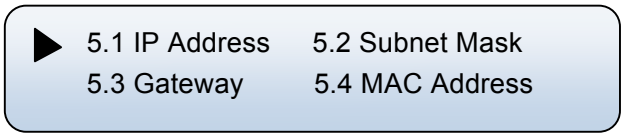
RF Out Select:

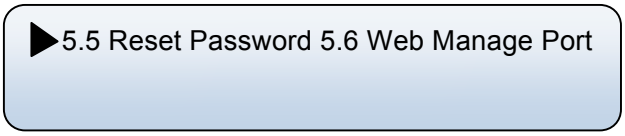
This sub-menu will allow the user to select the output program source. The source can be set to the encoding module or ASI input. It can only modulate one source at any one time.

RF 10M Clock: The RF 10M Clock (reference clock) can be switched on or off through this menu.

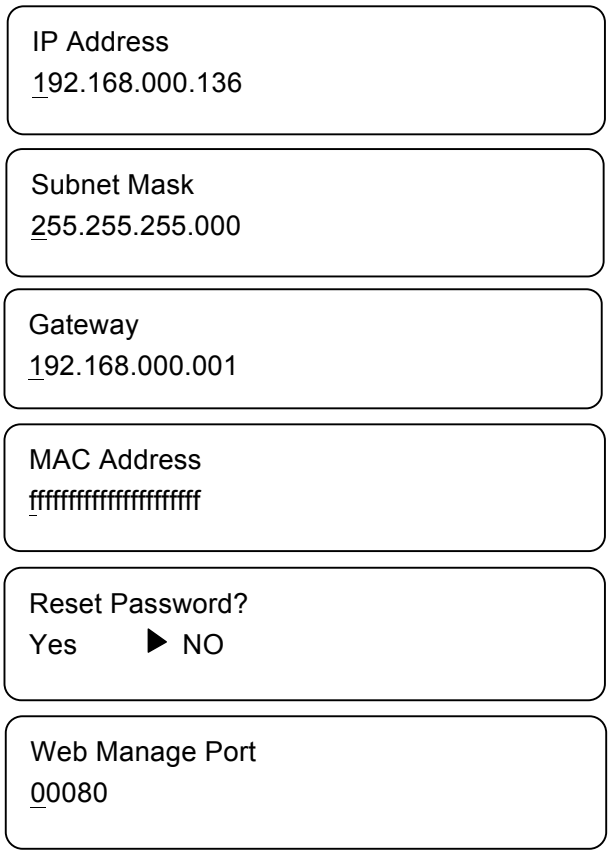
3.2.5 Network Setting

User can press “ENTER” key to navigate into the network setting and modify the parameters under its corresponding submenus.





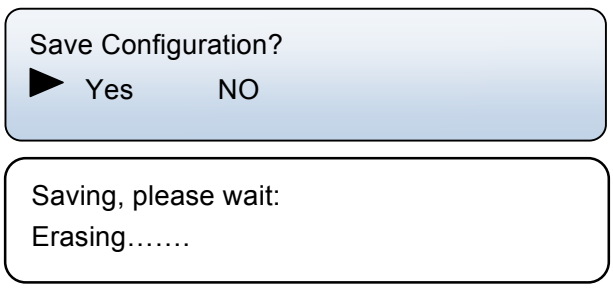
Press “UP/DOWN” to choose one item and “ENTER” & “LEFT/RIGHT” to set the desired parameters.



- **NOTE:** The default MAC address is unique.

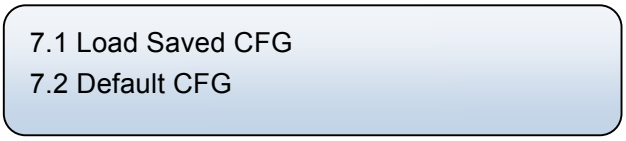
3.2.6 Saving Configuration

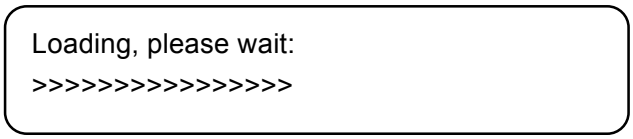
User can choose to save the currently configured parameters to memory by pressing ENTER key. The system displays following page:



3.2.7 Loading Configuration

This sub-menu will allow the user to load previously saved configurations or revert the device to factory settings.





3.2.8 Version

User can check the device's hardware and software version within this submenu:

Chapter 4 Web NMS Management

The UC-650E DVB-S2 Encoder Modulator adopts a web-based user interface. Before operating, user should ensure that the computer's IP address is different from the UC-650E's IP address; otherwise, it will cause an IP address conflict.

4.1 Login

The default IP of this device is 192.168.0.136. User can change the IP from the front panel of the device. Connect the PC and the device with an Ethernet cable, and use ping command to confirm the devices can communicate. For example, if the PC IP address is 192.168.99.252, user could change the Device IP to 192.168.99.196 to prevent conflicts. Enter the device IP in the browser address bar and press Enter.

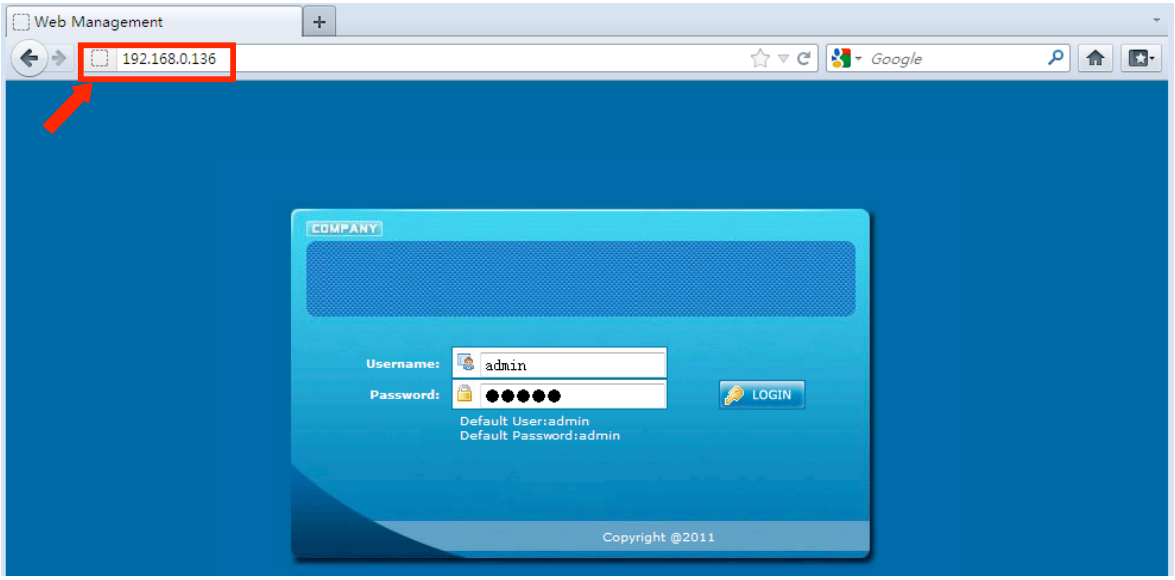


Figure 1

Input the user name and password (The default Username and Password is '**admin**') and then click 'Login' to enter the welcome interface.

4.2 Parameter Configuration

Summary→Status

Once logged in users will be given an overview of the device status.

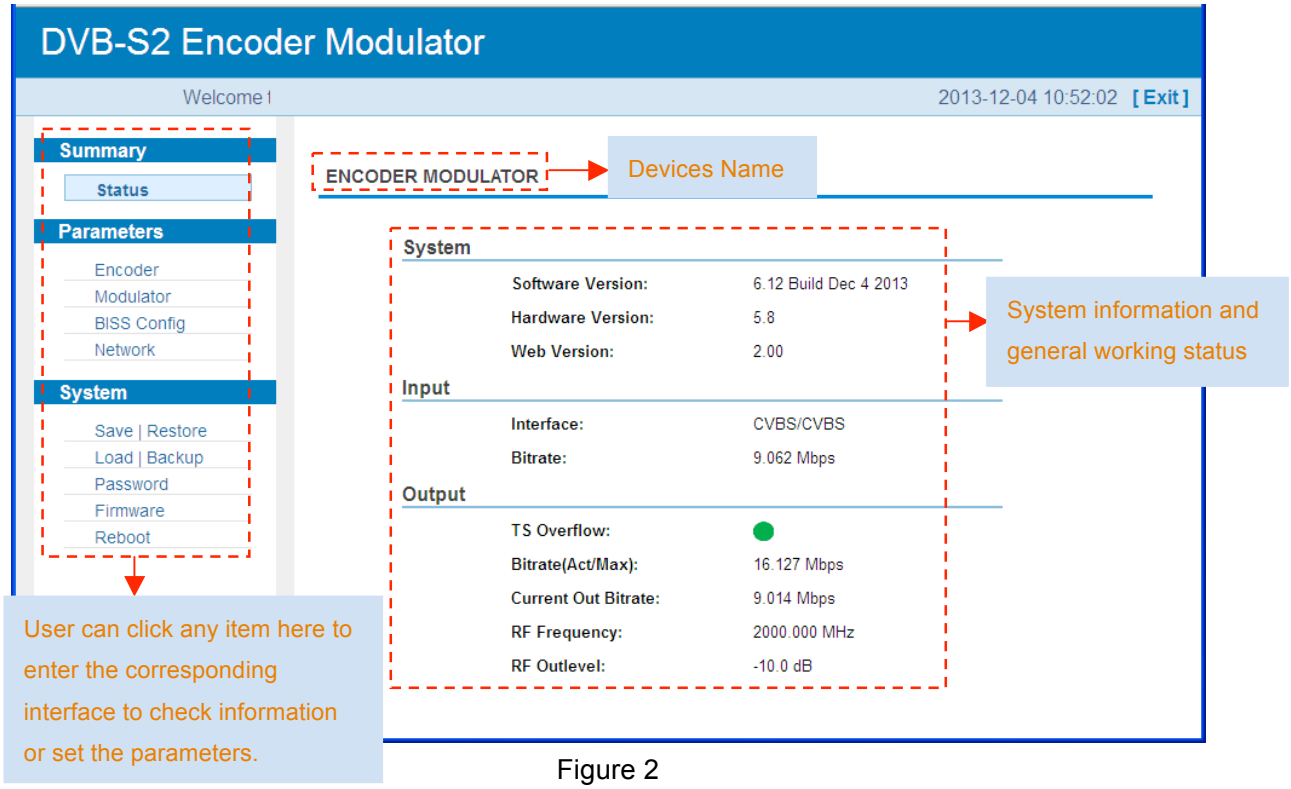


Figure 2

Parameters → Encoder

Clicking 'Encoder' in the left hand column will display program encoding information. Users can configure encoding AV parameters in this interface.

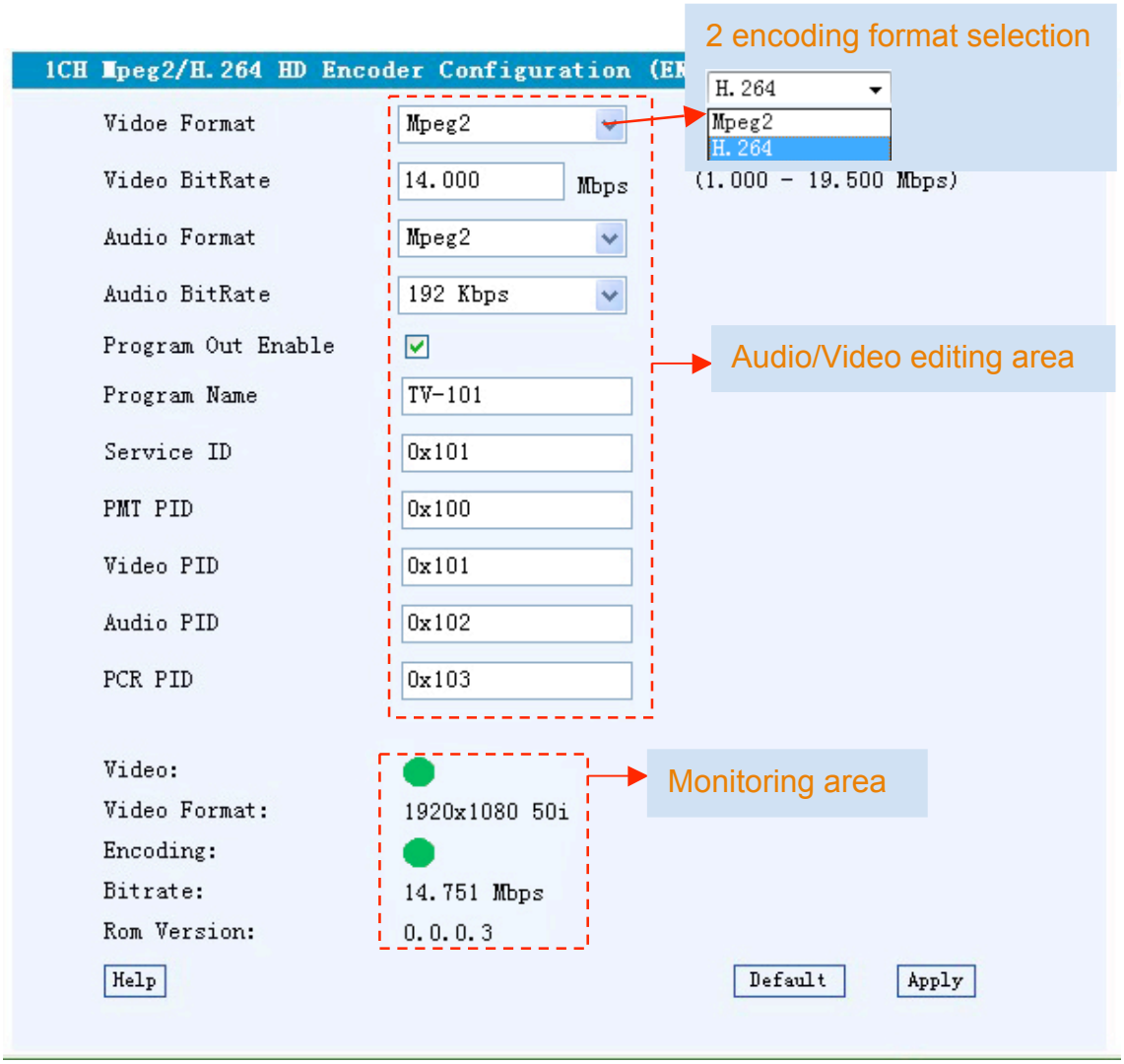


Figure 3

Help Will pop-up additional parameter information.

Default Click this button to apply the default setting of *Encoder*.

Apply Click this button to apply the modified parameters.

Parameters → Modulator

User can click '*Modulator*' in the left-hand column to navigate into the Modulation interface. More details are included in chapter **3.2.4** in this manual.

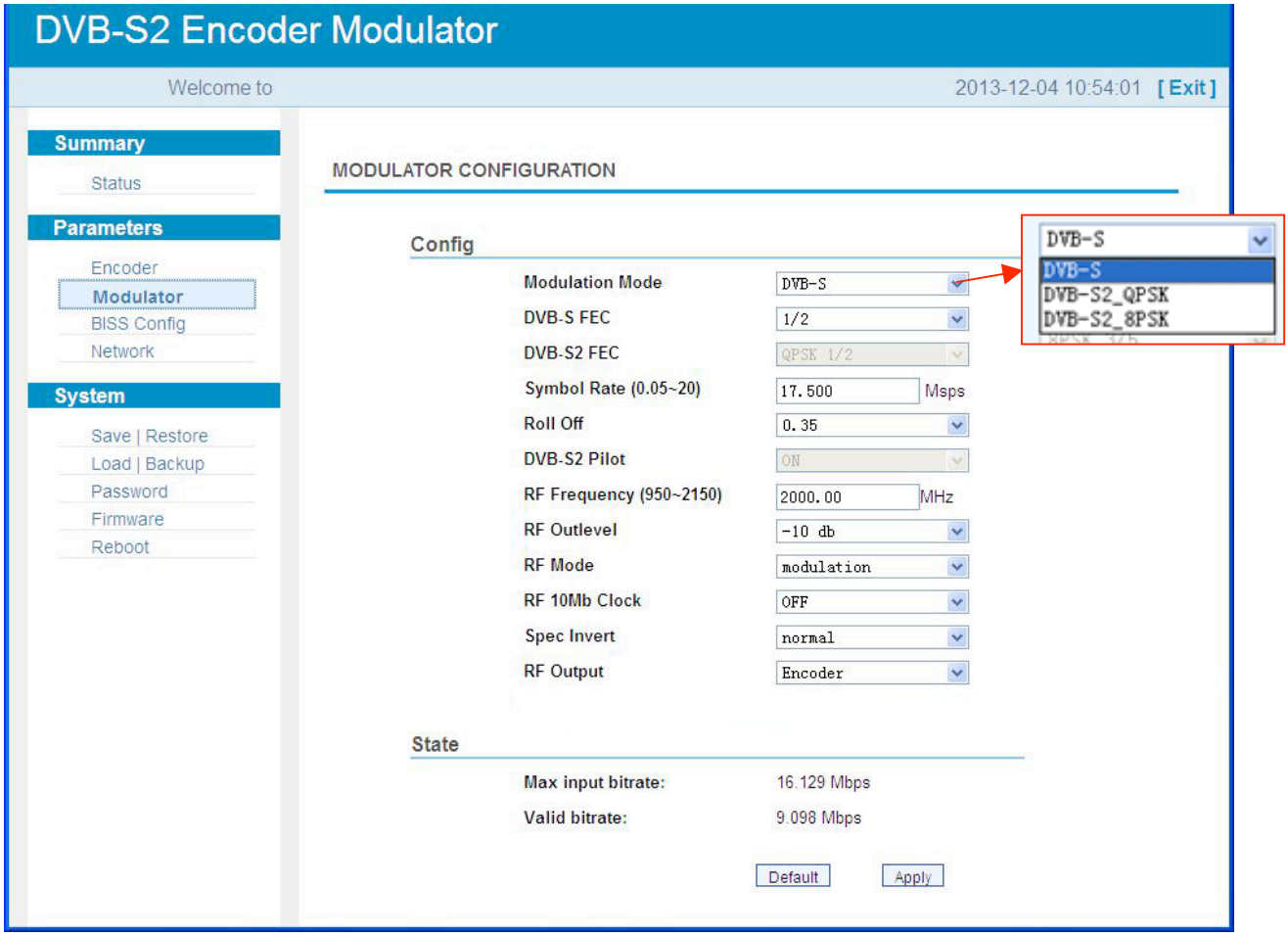


Figure 4

Modulation mode	DVB-S	Device supports DVB-S, DVB-S2 QPSK and DVB-S2 8PSK three modes.
	DVB-S2 QPSK	
	DVB-S2 8PSK	
DVB-S FEC	1/2, 2/3, 3/4, 5/6, 7/8	under DVB-S mode, it supports FEC 1/2, 2/3, 3/4, 5/6, 7/8
DVB-S2 FEC	1/2, 3/5, 2/3, 3/4, 5/6, 8/9, 9/10;	under DVB-S2 QPSK mode, it supports FEC 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10; Under DVB-S2 8PSK mode, it supports FEC 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
Symbol rate	Symbol Rate range is 0.050-20.000Msps	
Roll off	0.35/0.25/0.2 selecting	
DVB-S2 pilot	DVB-S2 pilot ON/OFF selecting	
RF requency	RF frequency is ranged from 950.00-2150.00MHz	
RF out level	RF output level ranges from -10db~-41.5db	

RF Mode	The RF out modes are: single tone, modulation, and off.
RF 10MHz Clock	Enable or Disable 10MHZ Reference
Spec Invert	Inverts the spectrum. .
RF Out	**Encoder**: to output the programs from encoding module via RF&ASI; **ASI**: to output the programs from ASI in via RF&ASI;

Parameters → BISS Config:

Click *BISS Config* in the left hand column to navigate into the BISS interface to scramble the programs sourced from encoding module or ASI port.

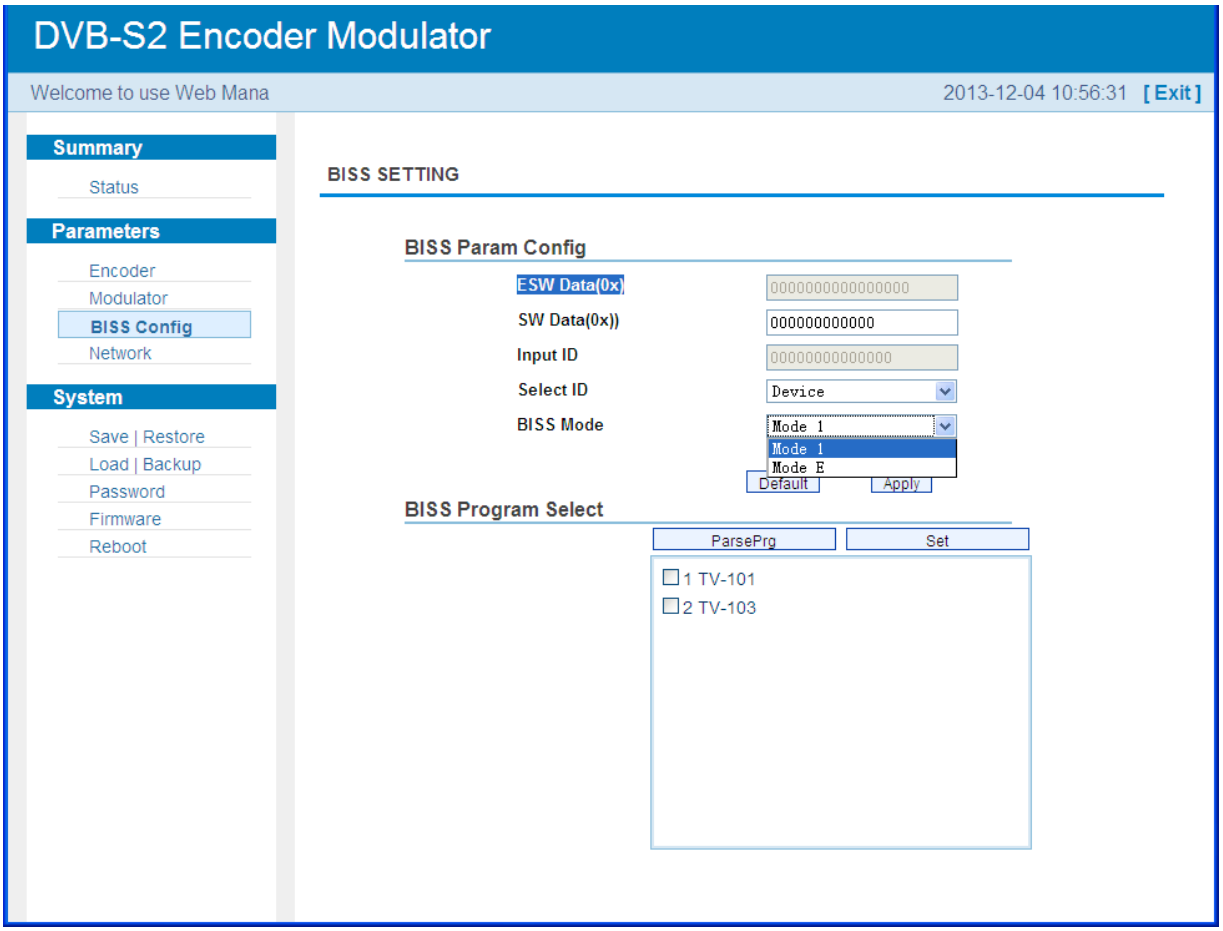


Figure 5

The BISS scrambling function application needs to be matched with BISS descrambler. The BISS scrambling supports two modes: “Mode 1” and “Mode E”. Users can select one of the two modes in the drop down list.

➢ Mode 1

Under Mode 1, the BISS scrambler applies scrambling by a fixed Control Word (CW) derived from a clear SW (Session Word). In Mode 1, a fixed 12-digit SW is inserted in the scrambler. The 64-bit CW is derived from the SW according to DVB-CAS specification.

Users can select Mode 1 in the drop-down menu, and then input the 12-digit **SW Data** (in hex). The downside device descrambler key equals **SW Data** on the BISS scrambler side.

➢ Mode E

Under Mode E, the BISS scrambler completes scrambling through **ESW Data** and **Input ID** (Input ID is operable when 'Input' is chosen under 'Select ID'.). The ESW data equals Descrambler key on the downside device side, while the input ID equals SK on IRD side.

The select ID has two options: Device and Input. If Users choose Device, the Burned Key on IRD side needs to be selected when descrambling, while if users choose Input and set Input ID, on IRD side, users do not need to select Burned Key but to input SK as per Input ID.

➢ Program Select and Modification:

User then can click 'Parse Prg' to view the input programs and modify the program names as needed. If the user need to scramble the programs, mark the corresponding boxes in front of the programs with √ and click Set to activate the setting.

➢ **Note**: When "RF Out" in 'Modulator' page is selected as "Encoder", the program(s) displayed here is from the encoding module; while "RF Out" is selected as "ASI", the program(s) displayed here is from the ASI IN.

Parameters → Network:

Click 'Network', it will display the screen as below. It displays the network information of the device where to change the device's network configuration if needed.

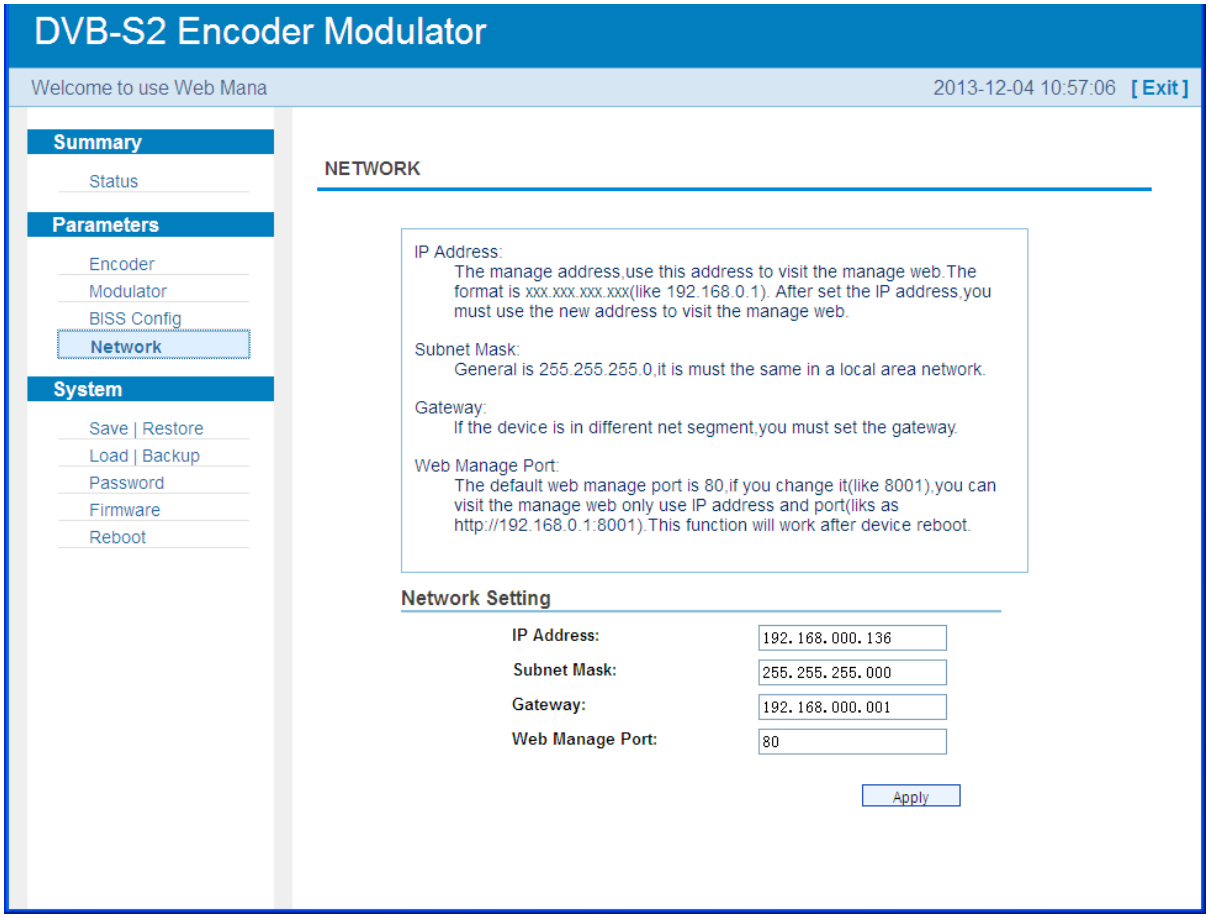


Figure 6

System → Save/Restore:

Click '*Save/Restore*' from the menu and it will display the screen as below where users can save the configuration permanently to the device. Click 'Save Configuration' button to store the data permanently to the device memory.

By using 'Restore Configuration' users can restore the latest saving configuration to the device.

By using 'Factory Set,' user can set the default factory setting.

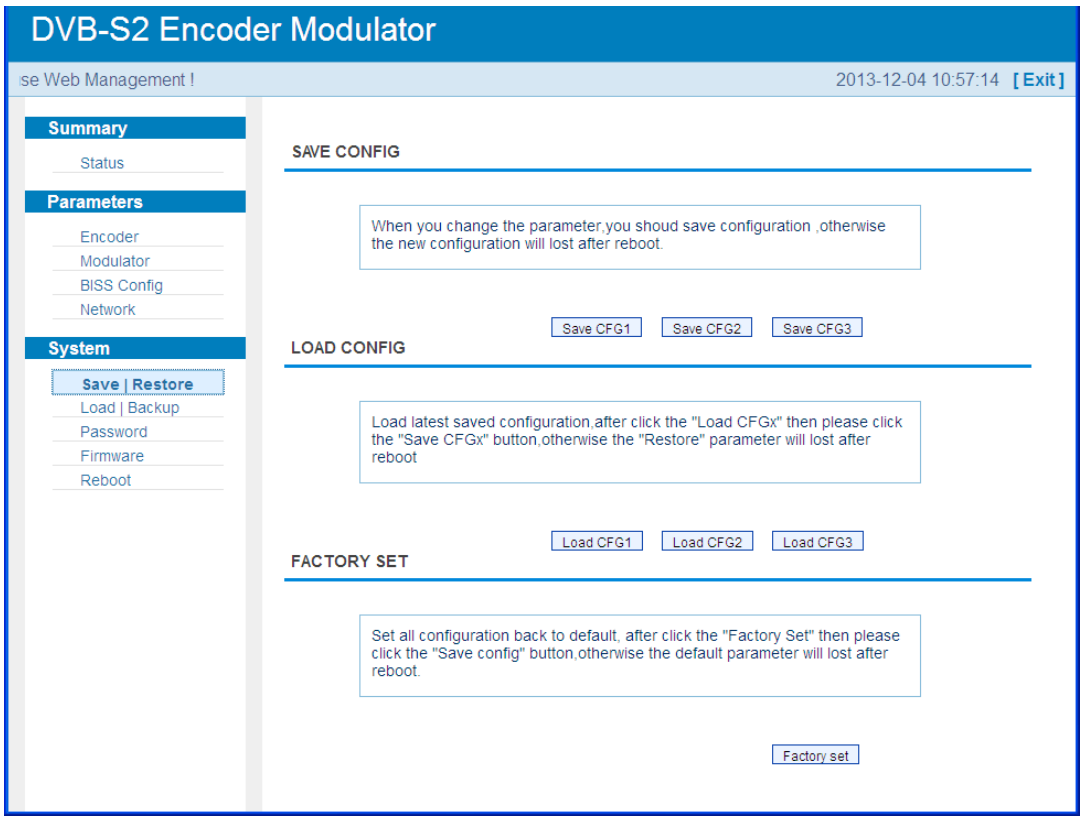


Figure 7

System → Backup/Load

Click ‘Backup/Load’ from the menu, it will display the screen as below.

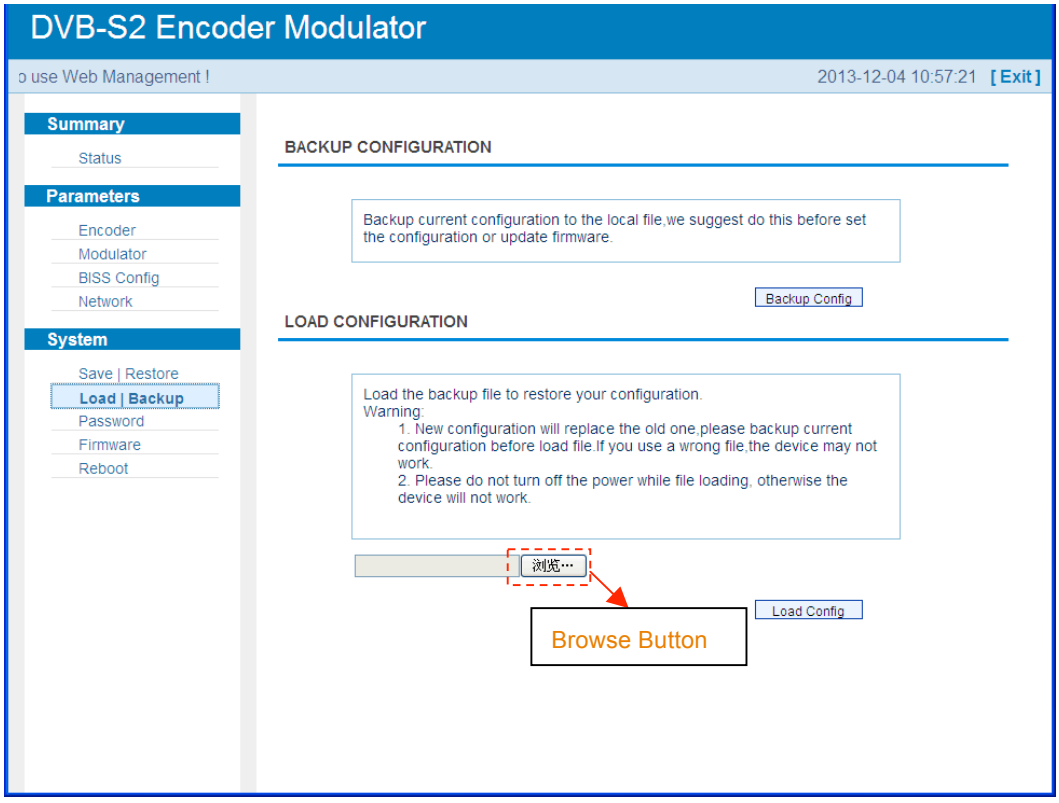


Figure 8

System → Password:

User can change the password in this interface by first entering current username and password and then entering new username and password to change.

After inputting the parameters, click ‘Apply’ to save the configuration.

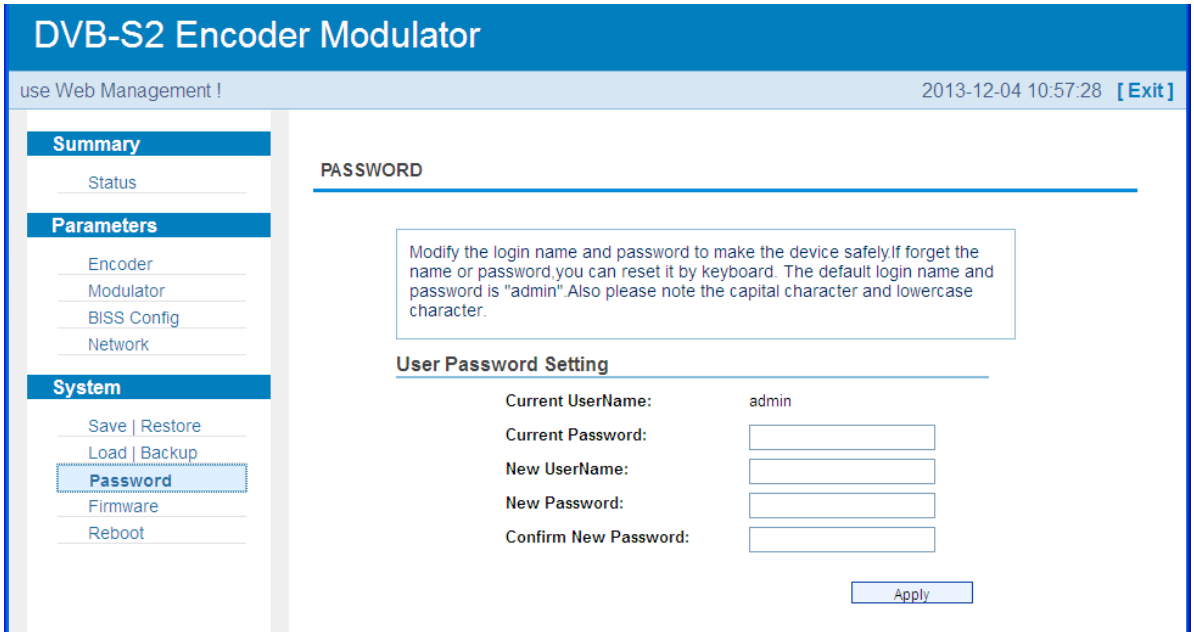


Figure 9

System → Firmware

Click ‘Firmware’ from the menu and it will display the screen as below. Here we 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 on ‘Update’ to update the device.

After updating the device we need to restart the device by using Reboot option.

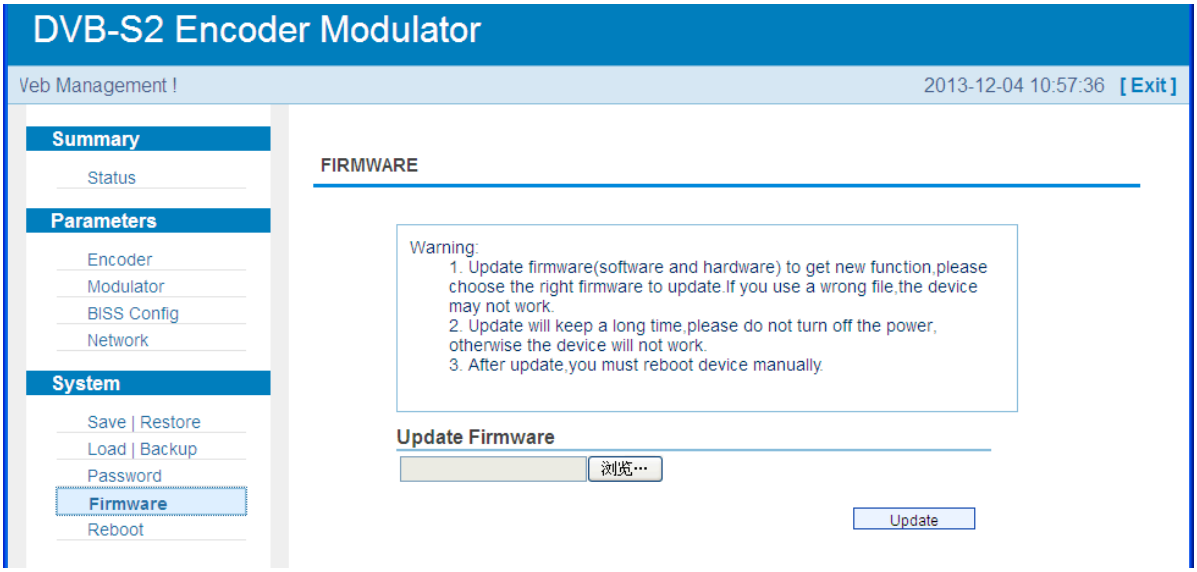


Figure 10

System → Reboot

Clicking ‘Reboot’ from the left hand menu will display the following interface. When users click ‘Reboot’ button, it will restart the device automatically.

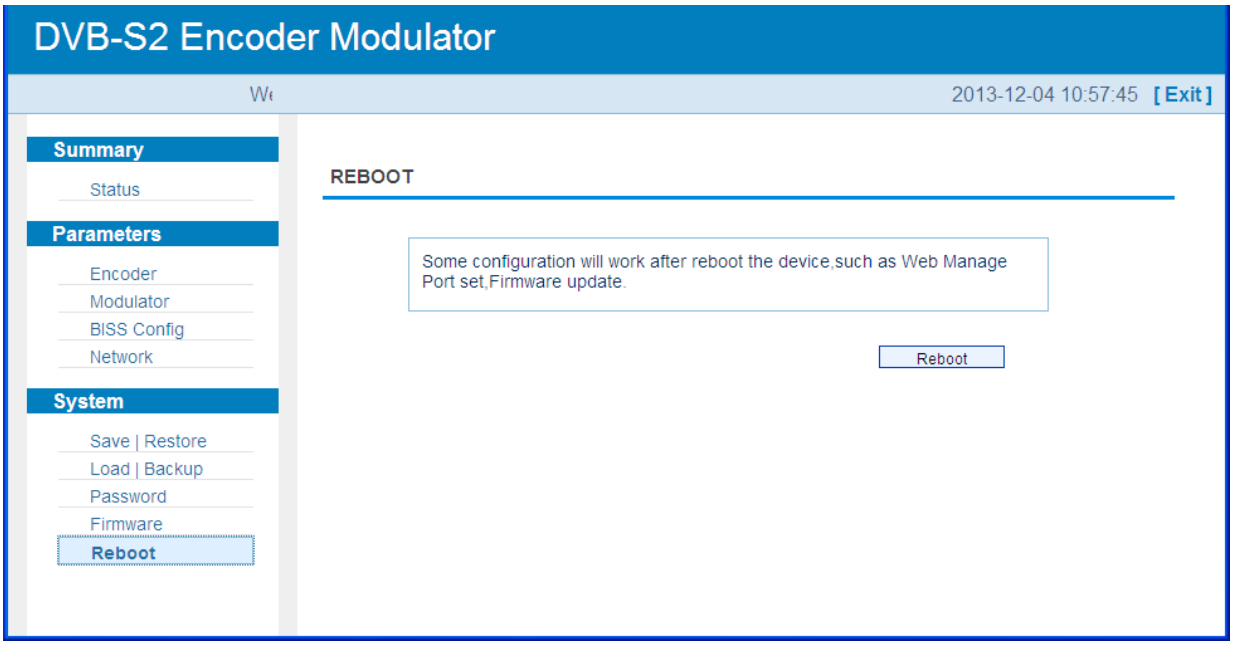


Figure 11

Chapter 5 Troubleshooting

UPCOM Technologies' ISO9001 quality assurance system has been approved by the CQC Organization to guarantee all products' quality and reliability. UPCOM products must pass testing and inspection before leaving the factory. The testing and inspection process covers all the Optical, Electronic, and Mechanical criteria. To prevent potential hazard, please strictly follow all operation instructions.

Upcom Technical support can be contacted by e-mailing support@upcom.com or calling 1-408-329-4158.

Preventative Measure

- Installing and operating the device in temperatures between 0-45 °C.
- Ensuring proper cooling airflow for the device.
- Carefully check the input AC for the proper power supply working range.
- Check all signal cables have been properly connected.
- Allow a 10-second interval between alternating power ON\OFF states.

Unplug the power cord if:

- Damaged power cord or socket.
- Any accidental liquid spillage on device.
- Any suspicion of short circuits.
- Physical damage.
- Long-term idle periods are planned.
- Performing any needed maintenance.

APPENDIX

INTERNAL TEST REPORT OF DELAY

The values of average delay cover the progress from Encoding end to Decoding end.

Decoding Terminal	Encoding Details					Average Latency (ms)
	Single Source Interface	Bit Rate	Resolution	Latency Mode	Encoding Type	
DVB-T HD STB	HDMI	14M	1080i@50	Mode 1	mpeg2	343
					H.264	375
				Mode 2	mpeg2	460
					H.264	513
			720p@50	Mode 1	mpeg2	243
					H.264	400
				Mode 2	mpeg2	405
					H.264	408
			576i@50	Mode 1	mpeg2	418
					H.264	518
				Mode 2	mpeg2	520
					H.264	593
DVB-T HD STB	SDI	14M	1080i@50	Mode 1	mpeg2	230
					H.264	310
				Mode 2	mpeg2	400
					H.264	440
			720p@50	Mode 1	mpeg2	220
					H.264	350
				Mode 2	mpeg2	300
					H.264	400
			576i@50	Mode 1	mpeg2	400
					H.264	500
				Mode 2	mpeg2	460
					H.264	570