FUTV4658 HD/SD Encoder & Modulator

HDMI/YPbPr/S-Video/AV to DVB-T Digital RF

--- Home Use

User Manual

Thank you for choosing our encoder modulator.

Please read this manual carefully to install, use and maintain the encoder modulator in the best conditions of

performance. Keep this manual for future reference.

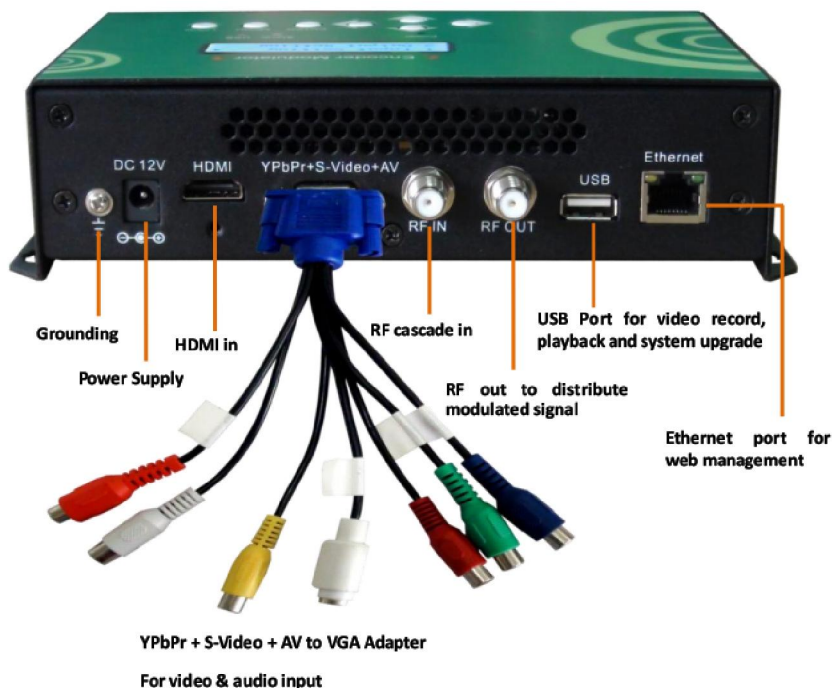# Directory

CHAPTER 1 Product Introductions
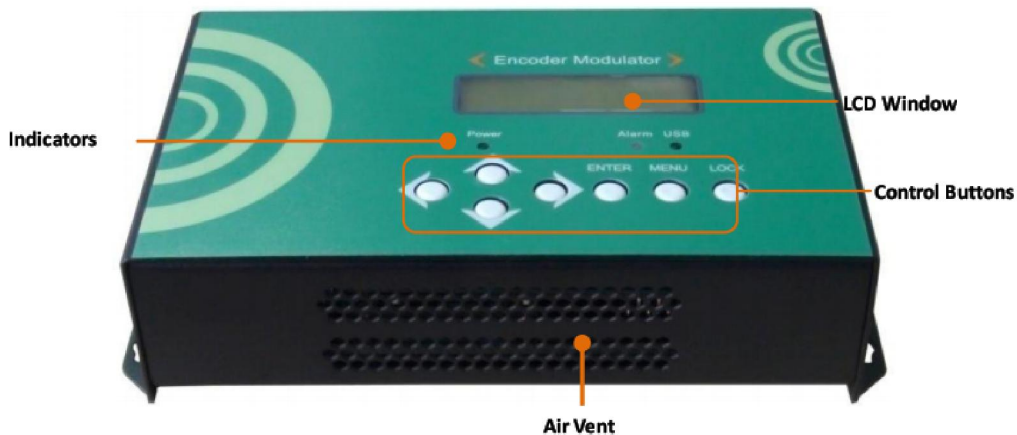
General Description

FUTV4658 series encoder & modulator is FMUSER's consumer electronics which allow audio/video signal input in TV distributions with applications in home entertainment, surveillance control, hotel Digital Signage, shops etc. It is an all-in-one device integrating MPEG-4 AVC/H.264 encoding and modulating to convert audio/video signals into DVB-T RF out.

The USB port is designed to record encoded video (TS) and save it in ts files in the USB Keys or Hard Disks, and then the ts files can be playback through the USB port. The ts files can be also generated on a computer with FMUSER's TS Creator.exe program.

The signals source could be from satellite receivers, closed-circuit television cameras, Blue-ray players, antenna and a USB key or Hard Disk etc. Its output signal is to be received by TV sets or STBs etc.

Grounding

Power Supply

HDMI in

RF cascade in

RF out to distribute modulated signal

USB Port for video record, playback and system upgrade

Ethernet port for web management

YPbPr + S-Video + AV to VGA Adapter

For video & audio input

System Connection Chart
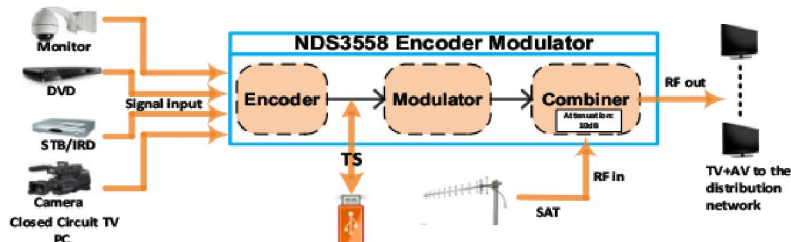
Technical Specifications

Encoding Section		
HDMI		
Video	Encoding	MPEG-4 AVC/H.264
	H.264 Profile	High profile, main profile
	H.264 Level	Level 3.0/3.1/ 3.2/ 4.0/4.1/4.2
	Interface	HDMI*1
	Resolution	1920*1080_60P, 1920*1080_50P; 1920*1080_60i, 1920*1080_50i; 1280*720_60p, 1280*720_50P
	Bit rate	0.500~19.500 Mbps
Audio	Encoding	MPEG1 Layer II, MPEG2-AAC, MPEG4-AAC
	Sample rate	48KHz
	Bit rate	**MPEG1 Layer II:** 64 , 96,128, 192, 256, 320, 384kbps
		MPEG2-AAC: 128, 192, 256, 320, 384kbps
		MPEG4-AAC: 64, 96,128, 192, 256kbps
YPbPr/CVBS/S-Video (with an adapter to VGA)		

2

Video	Encoding	MPEG-4 AVC/H.264	
	Interface	CVBS *1, YPbPr*1, S-Video*1	
	Resolution	**CVBS & S-Video:** 720x576_50i (PAL); 720x480_60i (NTSC) **YPbPr:**1920*1080_60i, 1920*1080_50i; 1280*720_60p, 1280*720_50P	
	Bit rate	0.500~19.500 Mbps	
Audio	Encoding	MPEG1 Layer II, MPEG2-AAC, MPEG4-AAC	
	Interface	1*Stereo /2*mono	
	Sample rate	48KHz	
	Bit rate	**MPEG1 Layer II:** 64, 96,128, 192, 256, 320, 384kbps **MPEG2-AAC:** 128, 192, 256, 320, 384kbps **MPEG4-AAC:** 64, 96,128, 192, 256kbps	

DVB-T Modulator Section

Standard	DVB-T COFDM
Bandwidth	6M, 7M, 8M
Constellation	QPSK, 16QAM, 64QAM,
Code rate	1/2, 2/3, 3/4, 5/6, 7/8.
Guard Interval	1/32, 1/16, 1/8, 1/4
Transmission Mode:	2K, 8K
MER	42dB
RF frequency	30~1000MHz, 1KHz step
RF output level	-16~ -36dBm (71~91dbμV), 0.1db step

System

Management	Local control: LCD + control buttons Remote control: web NMS
Language	English
LCN Insert	support
RF Combine in ATT	10dB
Upgrade	USB/Web-server

General

Power supply	DC 12V
Dimensions	183*110*45mm
Weight	< 1kg
Operation temperature	0~45

CHAPTER 2 Safety Instruction and Installations

Safety Instructions

WARNING: Hot plug is not allowed since it may cause system halted.

To prevent fire or electrical shock, do not expose the device to rain or moisture.

The encoder modulator is powered with a voltage of 12V DC. The power supply voltage must not exceed the recommended voltage, which otherwise may cause irreparable damage to the device and the invalidation of the warranty. Therefore:

l Do not replace power supply with a voltage greater than 12V DC.

l Do not connect the device to the power if the power cord is damaged.

l Do not plug the device into mains supply until all cables have been connected correctly.

l Do not cut the cord.

Avoid placing the device next to central heating components and in areas of high

humidity.

Do not cover the device with elements that obstruct the ventilation slots.

If the encoder modulator has been kept in cold conditions for a long time, keep it in a warm room minimum 2 hours before plugging into the mains.

Mount the device in vertical position with the connectors located on the top side.

When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original part. Unauthorized substitutes may result in fire, electric shock or other hazards.

Safety check- Upon completion of any service or repairs to this device, ask the service technician to perform safety checks to determine that the device is in proper condition.

Installations

RISK OF damage to the unit

Mechanically handling the unit may result in damage. Do not connect the unit to the power supply before or during assembly. Connect the unit as below instructed.
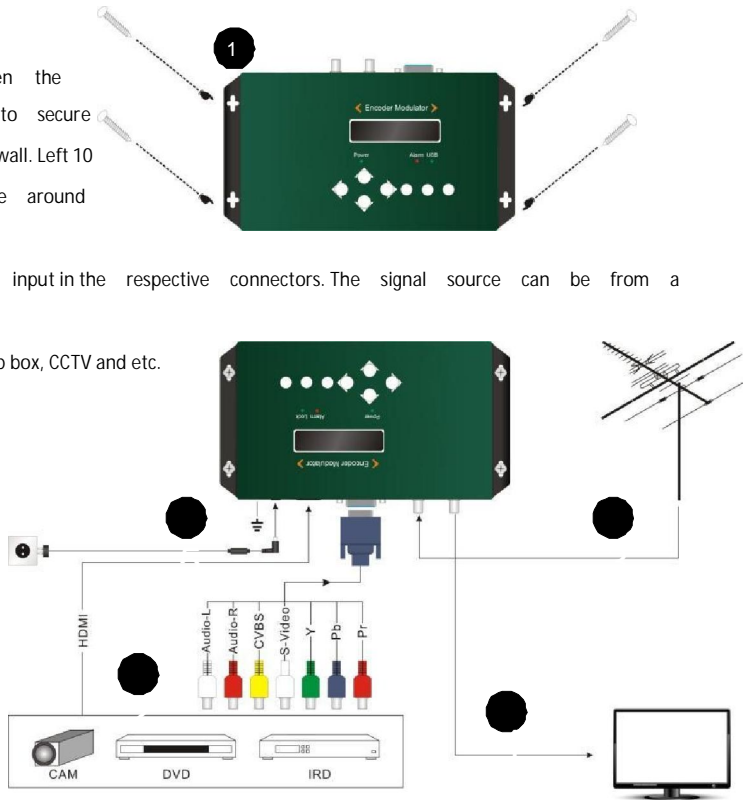
! NO HOT PLUG!

1. Mount and tighten the screws and plugs to secure the unit to the wall. Left 10 cm of free space around from each unit.

2. Connect the signal input in the respective connectors. The signal source can be from a surveillance

   monitor, DVD, set-top box, CCTV and etc.

3. Optionally, connect the loop-through RF input coaxial cable.

4. Connect cable to RF output to STB/TV.

5. Power supply connection: a) Connect the earth cable; b) Connect the power plug to the unit mains connector; c) Connect the power plug to the mains socket.

Cascade Installation

FUTV4658 unit has 1 TV signal to RF output encoded as DVB-T Digital TV signal.

Several FUTV4658 units can be cascaded in order to increase the capacity. The maximum capacity of a series of N units is 1xN incorporated TV signals. To cascade 2 or more units, connect the RF output of the preceding unit to the TV input (loop-through) of the next unit (see right illustration)
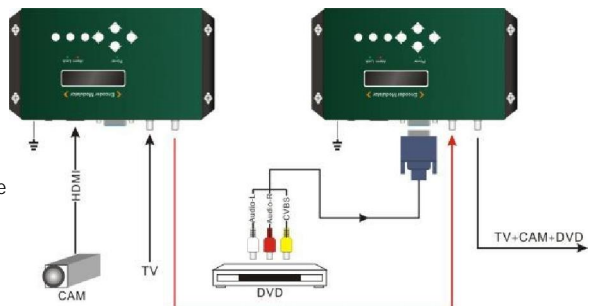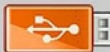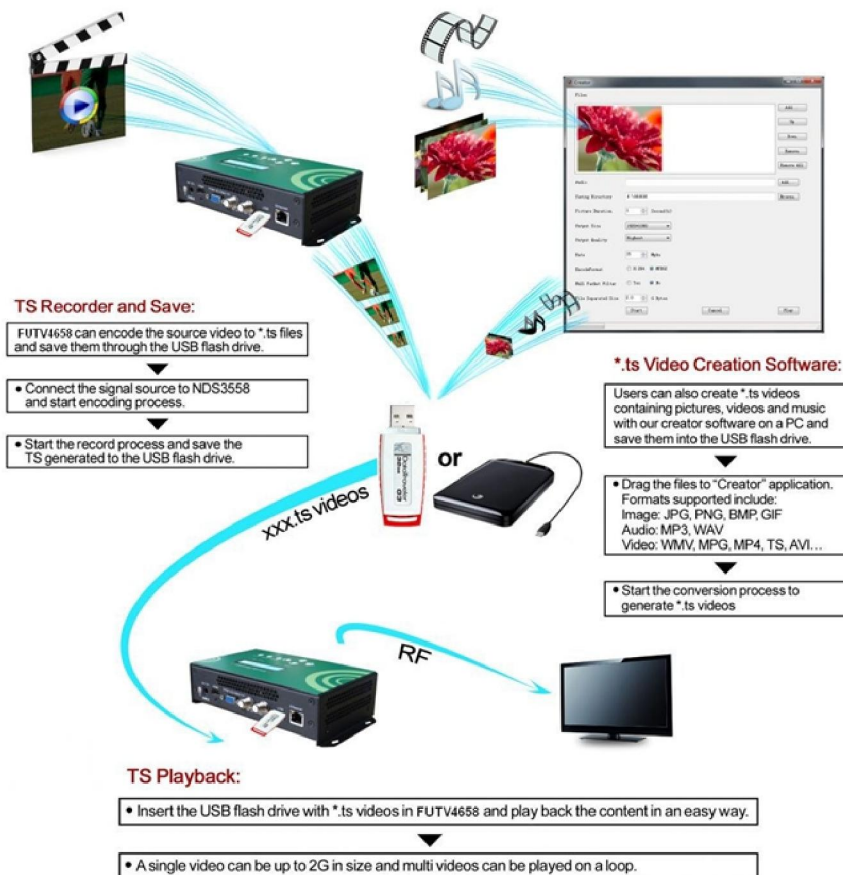
TS Creator.exe Download link:

http://pan.baidu.com/share/link?shareid=2908902623&uk=4230600371

Download path: English　Tool　TS Creator xxx.rar

Chapter 3 Operations of TS Creator Software

FUTV4658 encoder modulator has a function to create TS videos with the software supplied with the product. Users can create *.ts files containing images, videos and audios in a simple and intuitive way, and play them on a television through FUTV4658's USB port.

File format supported include:

Image: JPG, PNG, BMP, GIF **/Video**: MP4, WMV, AVI, MPG, TS, MKV **/Audio**: MP3, WAV

Installation

1. Download our "TS Creator" software package on your PC to get the installer and its auxiliary routine.

2. Occasionally, if your PC hasn't installed "Net Frame 2.0" yet, double-click "NetFx20SP2_x86.exe" until complete the installation.

3. Double-click "Setup.exe" application to install the "Creator" and generate a desktop shortcut.

Operations of "Creator"

Double-click the "Creator" shortcut icon, it will trigger an operation interface like below:
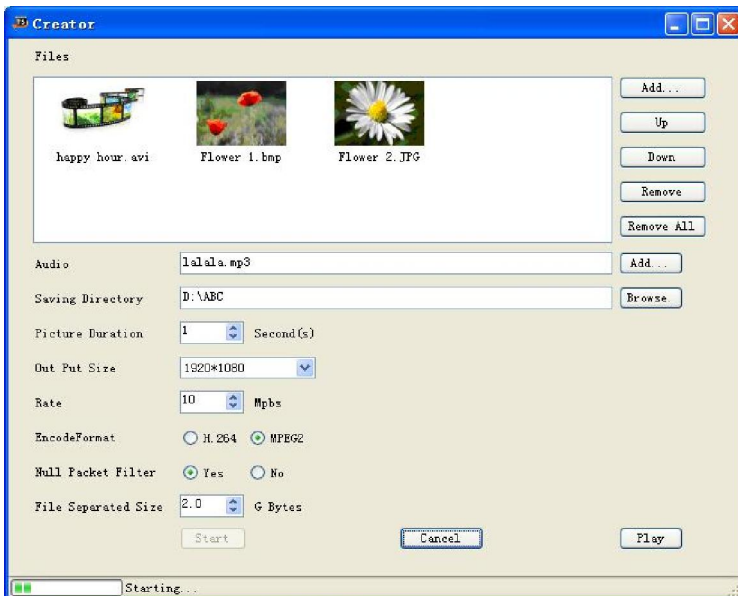
Add...	→ Click to add Images and videos
Up	
Down	Click to adjust the order of Images/videos
Remove	
Remove All	Click to delete the Images/videos

Audio   `lalala.mp3`   **Add...**

Click to add audios

Saving Directory   `D:\ABC`   **Browse.**

Click to set a save path for the TS video to be created.

Picture Duration   `1`   Second(s)   To set time duration for every picture when playing the video

Out Put Size   `1920*1080`   To set the resolution for the output video

Rate   `10`   Mpbs   The video is transformed based on VBR (Variable Bit Rate). The number set here represents the **highest bit rate** for the output video and bit rate will varies under the number.

EncodeFormat   ○ H.264   ⊙ MPEG2   Users can select a encode format here according to the standard of receiving terminal.

Null Packet Filter   ⊙ Yes   ○ No   Users can filter the null packet to boost the video's effect bit rate.

File Separated Size   `2.0`   G Bytes   A single video can be maximum 2.0 GB in size. (FUTV4658 cannot play a video bigger than 2GB.)

After setting all the parameters, click **Start** to start the transformation. Click "OK" when it prompts "The operation completed normally."

Cancel Click this button to stop the transformation **before** the operation completed.
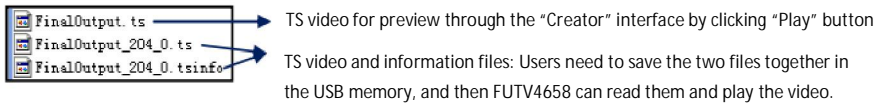
Play After finishing the transform operation, users can click this button to play the generated TS video.
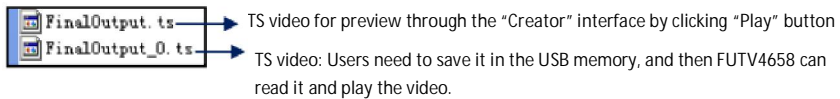
8

File Management

After finishing the transformation, users can find out the videos files generated according the Saving Directory. For example, we save the video in "D:\ABC" so we can find it in Disk

D\Folder ABC.

Management:

1. Three files will be generated if the Null Packet has been filtered.

FinalOutput.ts ————→ TS video for preview through the "Creator" interface by clicking "Play" button

FinalOutput_204_0.ts ————
FinalOutput_204_0.tsinfo ————→ TS video and information files: Users need to save the two files together in the USB memory, and then FUTV4658 can read them and play the video.

2. Two files will be generated if the Null Packet has **not** been filtered.

FinalOutput.ts ————→ TS video for preview through the "Creator" interface by clicking "Play" button

FinalOutput_0.ts ————→ TS video: Users need to save it in the USB memory, and then FUTV4658 can read it and play the video.

Remarks:

l   All the file names are automatically generated.

l   Rename the files before creating a new video to avoid covering the previous files.

l   If you rename "FinalOutput-204-0.ts" or "FinalOutput-204-0.tsinfo", always keep the names the same (Extension excluded) and then FUTV4658 can read them and play the video.

CHAPTER 4 Devices Operations and Management

FUTV4658 is controlled and managed through the key board and LCD display.

LCD Display – It presents the selected menu and the parameter settings. The backlight in the display is on when the power is applied.

LED Indicators – These lights indicate the working status

l   Power: It lights on when the power supply is connected.

l   Alarm: It lights on when the there is error, such as the signal source loss.

l   USB: It lights on when the USB device is properly connected and blocks out when the USB device get removed.

Left/Right/Up/Down buttons – Use these buttons to turn the screen pages, shift the target items by moving the triangle, or change the parameter settings in the program mode.

Enter – Use this button to enter a submenu or save a new setting after adjustment; press it to start adjusting the value of certain items when the corresponding underline flash with Up and Down buttons;
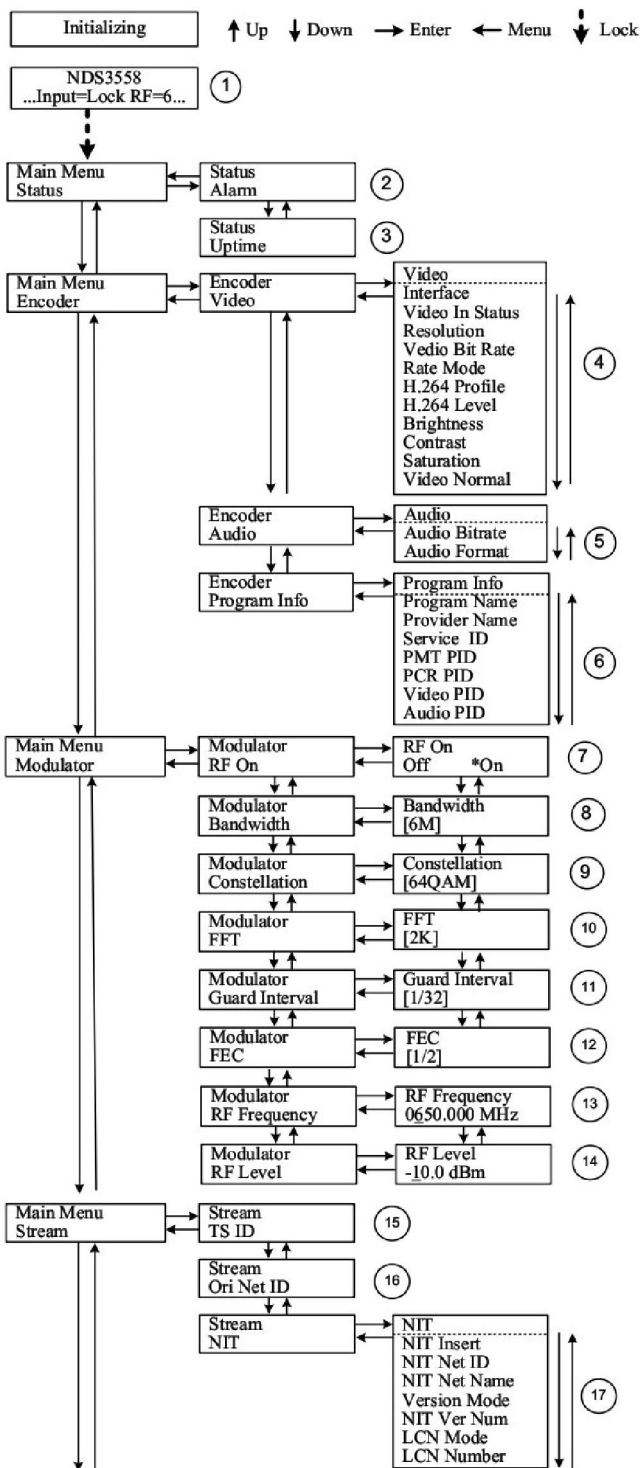
Hue	Enter	Hue	◄►	Hue		Hue
1		+001		+001		+002

Press it to activate the hidden selections and change the setting with   Up and Down (or Left and Right) buttons.

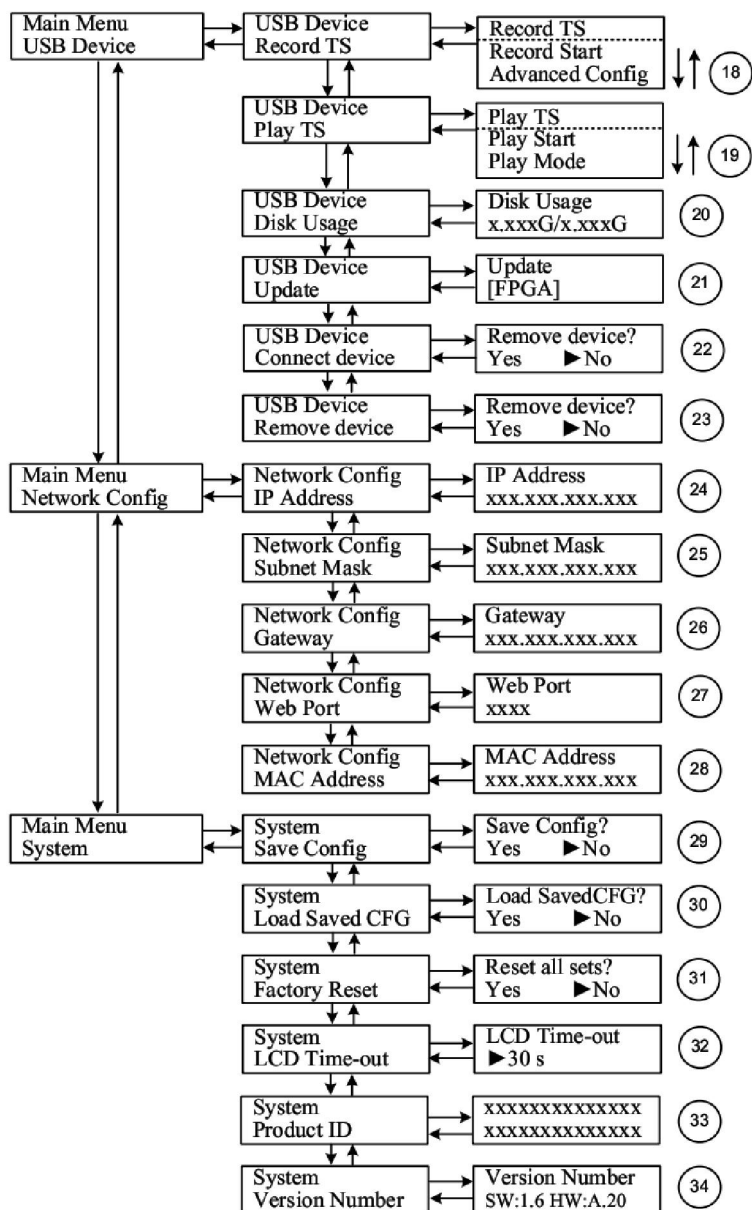| Constellation	Enter	Constellation	◄►	Constellation	Enter	Constellation
64QAM		[64QAM]		[128QAM]		128QAM

Menu – Press this button to step back

Lock – Locking the screen / cancelling the lock state, and entering the main menu after the initialization of the device. After pressing lock key, the system will question the users to save present setting or not. If not, the LCD will display the current configuration state.

When the power is connected, the LCD will start to initialize the program. The LCD menu goes as below chart.

| Initializing | ↑ Up | ↓ Down | → Enter | ← Menu | ↓ Lock |

NDS3558
...Input=Lock RF=6... ①

Main Menu
Status → Status
Alarm ②

Status
Uptime ③

Main Menu
Encoder → Encoder
Video → Video
Interface
Video In Status
Resolution
Vedio Bit Rate
Rate Mode
H.264 Profile
H.264 Level
Brightness
Contrast
Saturation
Video Normal ④

Encoder
Audio → Audio
Audio Bitrate
Audio Format ⑤

Encoder
Program Info → Program Info
Program Name
Provider Name
Service ID
PMT PID
PCR PID
Video PID
Audio PID ⑥

Main Menu
Modulator → Modulator
RF On → RF On
Off   *On ⑦

Modulator
Bandwidth → Bandwidth
[6M] ⑧

Modulator
Constellation → Constellation
[64QAM] ⑨

Modulator
FFT → FFT
[2K] ⑩

Modulator
Guard Interval → Guard Interval
[1/32] ⑪

Modulator
FEC → FEC
[1/2] ⑫

Modulator
RF Frequency → RF Frequency
0650.000 MHz ⑬

Modulator
RF Level → RF Level
-10.0 dBm ⑭

Main Menu
Stream → Stream
TS ID ⑮

Stream
Ori Net ID ⑯

Stream
NIT → NIT
NIT Insert
NIT Net ID
NIT Net Name
Version Mode
NIT Ver Num
LCN Mode
LCN Number ⑰

Main Menu USB Device	USB Device Record TS	Record TS Record Start Advanced Config	↓↑ (18)
	USB Device Play TS	Play TS Play Start Play Mode	↓↑ (19)
	USB Device Disk Usage	Disk Usage x.xxxG/x.xxxG	(20)
	USB Device Update	Update [FPGA]	(21)
	USB Device Connect device	Remove device? Yes ►No	(22)
	USB Device Remove device	Remove device? Yes ►No	(23)
Main Menu Network Config	Network Config IP Address	IP Address xxx.xxx.xxx.xxx	(24)
	Network Config Subnet Mask	Subnet Mask xxx.xxx.xxx.xxx	(25)
	Network Config Gateway	Gateway xxx.xxx.xxx.xxx	(26)
	Network Config Web Port	Web Port xxxx	(27)
	Network Config MAC Address	MAC Address xxx.xxx.xxx.xxx	(28)
Main Menu System	System Save Config	Save Config? Yes ►No	(29)
	System Load Saved CFG	Load SavedCFG? Yes ►No	(30)
	System Factory Reset	Reset all sets? Yes ►No	(31)
	System LCD Time-out	LCD Time-out ►30 s	(32)
	System Product ID	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	(33)
	System Version Number	Version Number SW:1.6 HW:A.20	(34)

1) FUTV4658: Model number; Input=Lock: Signal has been collected.

2) Alarm Status: For example, if the signal cable disconnected, it will display *Video 1 Not Lock* under this menu.

3) Uptime: It displays the working time duration of the device. It times upon power on.

4) Video Parameters: User can enter the items respectively to set video parameters.

Interface: select a right interface type from the options provided. The device then can automatically search the signal and starts to encode. ***Resolution***: signal source resolution, read-only. ***Video Bit rate***: adjust in range of 1.000~19.000 Mbps. ***Rate Mode***: this unit user can choose CBR or VBR. User can also adjust values of rest items (H.264 profile, H.264 level, Brightness: 0-128 & Contrast: 0-255 & Saturation: 0-128; Hue: -128 - +127)

5) Audio Bit rate: Select audio bit rate from the options provided. Different audio format has different bit-rate range. See specification table for details.

Audio Format: Select audio format among MPEG2, MPEG2-AAC and MPEG4-AAC.

6) Program Information: User can enter the sub-menus to edit the *Program Name, Provider Name, Service ID,* and PIDs of *PMT, PCR, Video* and *Audio*.

7) RF On: User can choose to turn on or turn off the RF under this menu.

8) Bandwidth: Choose between 6M, 7M and 8M.

9) Constellation: DVB-T modulator contains 3 constellation modes: 64 QAM, QPSK and 16 QAM.

10) FFT (Transmission Mode): Select between 2K and 8K.

11) Guard Interval: Select among 1/32, 1/16, 1/8 and 1/4.

12) FEC: It refers to Forward Error Correction rate. It contains 1/2, 2/3, 3/4, 5/6 and 7/8.

Ø **NOTE**: The different combination of bandwidth, constellation, guard interval and code rate (FEC) will form a different output code rate. Please refer to appendix table 2.

13) RF Frequency: Adjust it at range of 30 to 999 MHz. Set it according your regional situation or inquire your local services.

14) RF Level: Adjust it at range of -16~ -36dBm.

15) TSID: (Transport Stream ID) User can view or adjust after enter this menu.

16) ONID: (Original Network ID)-User can view or adjust after enter this menu.

17) NIT: (Network Information Table) NIT table is a very important table for describing the network and TS. User can enter the submenus displayed and edit the values or select modes.

18) – 23) Please refer to *Chapter 5* for details.

24) IP Address: To configure IP address here.

25) Subnet Mask: To configure subnet mask here.

26) Gateway: To configure gateway here.

27) Web Port: To configure web port here.

28) MAC Address: To view MAC address here.

29) Save Config: *Yes/No*-to save/give up the adjustment of setting.

30) Load Saved CFG: *Yes/No*-to load/ not to load the saved configuration.

31) Reset all sets: *Yes/No*-choose/not choose the factory's default configuration.

32) LCD Time out: A time limit that LCD will light off. Choose among 5s, 10s, 45s, 60s, 90s and 120s (seconds).

33) Product ID: User can view the serial number of this device. It is read-only and unique

34) Version: It displays the version information of this device.

Chapter 5 Operations of Record TS and Play TS through USB Disk

The FUTV4658 encoder modulator has functions of:

1. *.ts Video Creation

See Chapter 3.

2. TS Record and Save

Record mode select

| Main Menu USB Device | → | USB Device Record TS | → | Record TS Record Start | → | Single File Segment File Loop Record | → | Start Record | ↑ | Stop Record |

Record TS Advanced Config → Advanced Config File name File size Data Mode
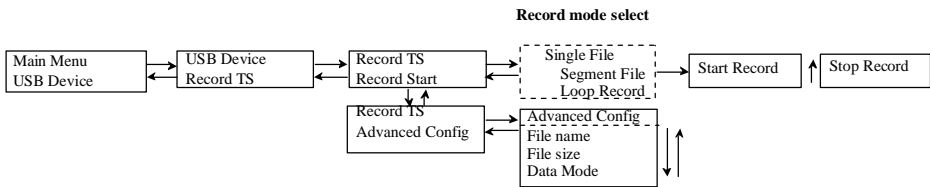
1) Connect the signal source, enter "Record Start" and then choose one record mode to start recording the encoded TS. And, press UP key and then Enter key to stop recording.

There are 3 record modes provided:

l "Single file": For example, when the file size is set as 1000M and the *.ts is recorded up to 1000M, it automatically stops recording TS.

l "Segment file": For example, when the file size is set as 1000M and the *.ts is recorded up to 1000M, it automatically saves the files and continues to record TS and save it to next file until the USB memory is full.

l "Loop record": It automatically saves the files and continues to record TS and save it to next file. When the USB memory is full, it replaces the previous file.

2) Advanced Config:

File Name: Users can enter this menu to edit name for the *.ts files to be recorded. For example, if users name it "Record-", it will give name to the saved *.ts files "Record-001.ts", "Record-002.ts" "Record-00N.ts".

File Size: users can set the file size for the *.ts to be recorded. A single file can be maximum 2047M in size.

Data Mode: There are 3 data modes:

l   Mode 1 (The ts files will be saved in 188-byte packages with null packet embedded.);

l   Mode 2 (The ts files will be saved in 188-byte packages with null packet filtered.

However, such ts files   cannot be normally played with FUTV4658, but can be   played on PC with some media player such as VLC.);

l   Mode 3 (The ts files will be saved in 204-byte packages with null packet filtered.).

3.   TS Playback
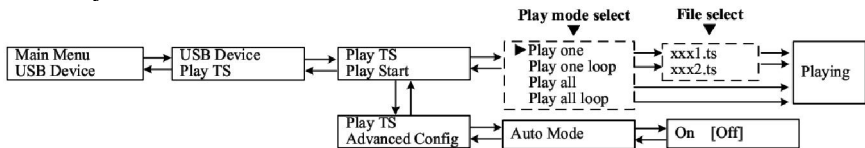
1)   Play Start:

User can select a play mode for the *.ts files as needed before playing the *.ts file and specify a video under 'Play one' / 'Play one loop' mode and press "Enter" button to start play. While under 'Play all' / 'Play all loop' mode, it automatically plays files from first to end.

2)   Advanced Config:

Auto Mode is for saving the play mode for the device. When the auto mode is enabled,

the   device   will   automatically apply the   play mode   set before   the   power cut off and

output ts files stored in the USB device through RF. While the auto mode is off, FUTV4658

will play the encoded TS through RF when the power is connected.

4.   Disk Usage
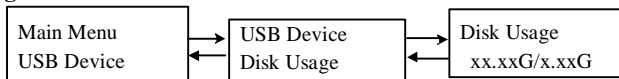
Users can enter this menu to view the USB disk's capacity left.

5.   Update
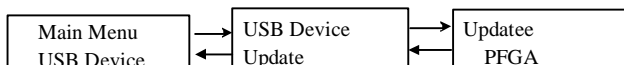
Choose one item to be updated   and press Enter to confirm. Keep the update file stored in the USB device in *.dxf format.

6.   Connect Device

```
┌─────────────────┐      ┌──────────────────┐
│ Main Menu       │─────→│ USB Device       │
│ USB Device      │←─────│ Connect device   │
└─────────────────┘      └──────────────────┘
```
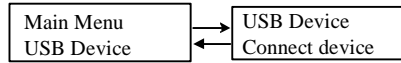
Press Enter key to re-connect the USB disk.

7.   Remove Device

```
┌─────────────────┐      ┌──────────────────┐
│ Main Menu       │─────→│ USB Device       │
│ USB Device      │←─────│ Remove device    │
└─────────────────┘      └──────────────────┘
```
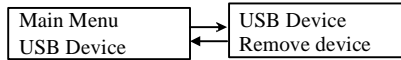
Press   Enter key to   safely remove   the   USB disk. FUTV4658 will   then   automatically   resume
encoding process and playing the program input from the encoder module.

Chapter 6 Operations of Web-server

In addition to using front buttons to control the encoder modulator and USB device, users can also perform the same operation in an easier way with the web Brower in the PC (Personal Computer).

Login

The default IP address of this device is 192.168.0.136. (We can modify the IP through the Front panel.)

Connect the PC and the encoder modulator with a 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 1 to 254 except 252 to avoid IP conflict).

Use web browser to connect the device with PC by inputting the device'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.
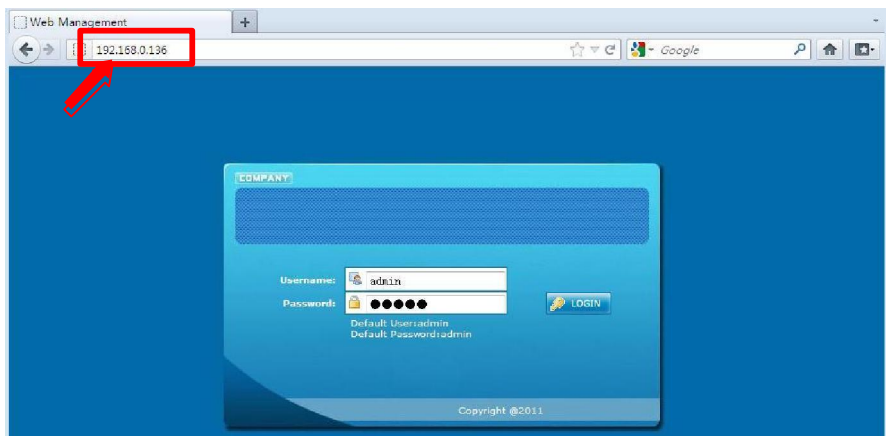
Figure-1

Operation

Summary:

When we confirm the login, it displays the WELCOME interface as Figure-2 where users can have an overview of the device's system information and working status.
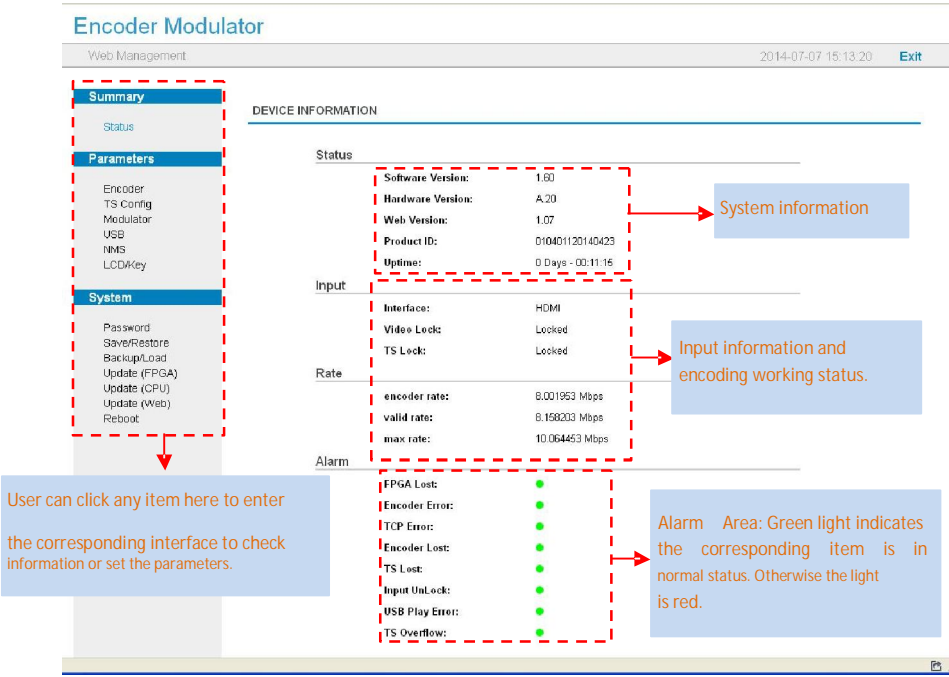
Figure-2

Parameters   Encoder:

From the menu on left side of the webpage, clicking "Encoder", it displays the interface

where users can configure the encoding parameters for the input video/audio. (Figure-3)

Figure-3

Parameters   TS Config:

From the menu on left side of the webpage, clicking "TS Config", it displays the interface where users can configure the parameters for the transport stream as prompt. (Figure-4)

Figure-4

Parameters   Modulator:

From the menu on left side of the webpage, clicking "Modulator", it displays the interface where users can configure the modulating parameters for the RF output. (Figure-5)
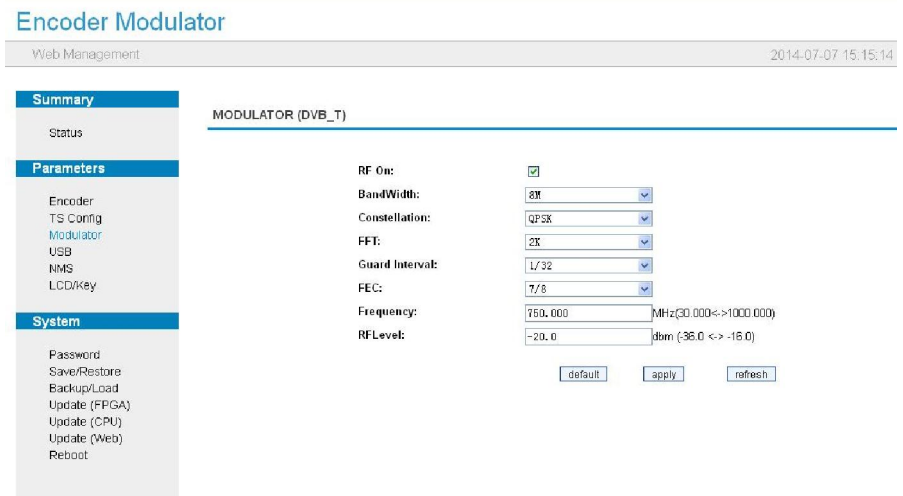
Figure-5

Parameters   USB:

From the menu on left side of the webpage, clicking "USB", it displays the interface where users can operate USB device. (Figure-6)

- **NOTE**: It is necessary to connect USB device and signal source and activate encoding to operate TS recording.
- **NOTE**: It is necessary to connect USB device when operate TS playing.

Figure-6

Detailed Explanation:

There are 3 record modes provided: s

l   "Single file": For example, when the file size is set as 1000M and the *.ts is recorded up to 1000M, it automatically stops recording TS.

l   "Segment file": For example, when the file size is set as 1000M and the *.ts is recorded up to 1000M, it automatically saves the files and continues to record TS and save it to next file until the USB memory is full.

l   "Loop record": It automatically saves the files and continues to record TS and save it to next file. When the USB memory is full, it replaces the previous file.

Advanced Config:

File Name: Users can enter this menu to edit name for the *.ts files to be recorded. For example, if users name it "Record-", it will give name to the saved *.ts files "Record-001.ts", "Record-002.ts"   "Record-00N.ts".

File Size: users can set the file size for the *.ts to be recorded. A single file can be maximum 2047M in size.

Data Mode: There are 3 data modes:

l   Mode 1 (The ts files will be saved in 188-byte packages with null packet embedded.);

- l Mode 2 (The ts files will be saved in 188-byte packages with null packet filtered. However, such ts files cannot be normally played with FUTV4658, but can be played on PC with some media player such as VLC.);
- l Mode 3 (The ts files will be saved in 204-byte packages with null packet filtered.).

Playing Auto Mode:

Auto Mode is for saving the play mode for the device. When the auto mode is enabled, the device will automatically apply the play mode set before the power cut off and output ts files stored in the USB device through RF. While the auto mode is off, FUTV4658 will play the encoded TS through RF when the power is connected.

Parameters   NMS:

From the menu on left side of the webpage, clicking "NMS", it displays the interface where users set the network configuration for the device. (Figure-7)

Figure-7

Parameters   LCD/Key:

From the menu on left side of the webpage, clicking "LCD/Key", it displays the interface where users can set the time out for the LCD. (Figure-8)

Figure-8
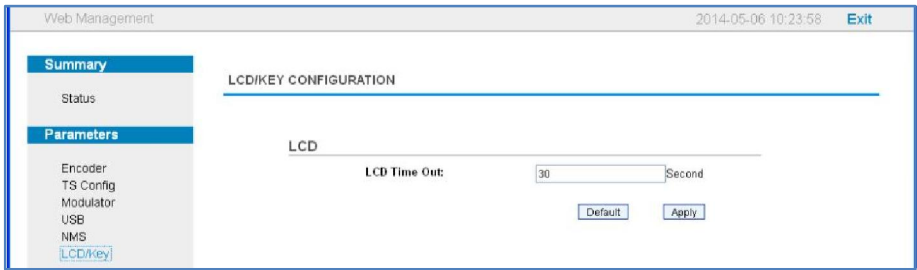
System　　　Password:

From the menu on left side of the webpage, clicking "Password", it will display the screen as Figure-9 where to set the login account and password for the web NMS. (Figure-9)

Figure-9

System　　　Save/Restore:

From the menu on left side of the webpage, clicking "Save/Restore", it will display the screen as Figure-10 where to save or restore your configurations.

Figure-10

System   Backup/Load:

From the menu on left side of the webpage, clicking "Backup/Load", it will display the screen as Figure-11 where to backup or load your configurations.

Figure-11

System   Update (FPGA)/(CPU)/(Web):

From the menu on left side of the webpage, clicking "Update", it will display the screen as

Figure-12-14 where to update the corresponding part for the device.
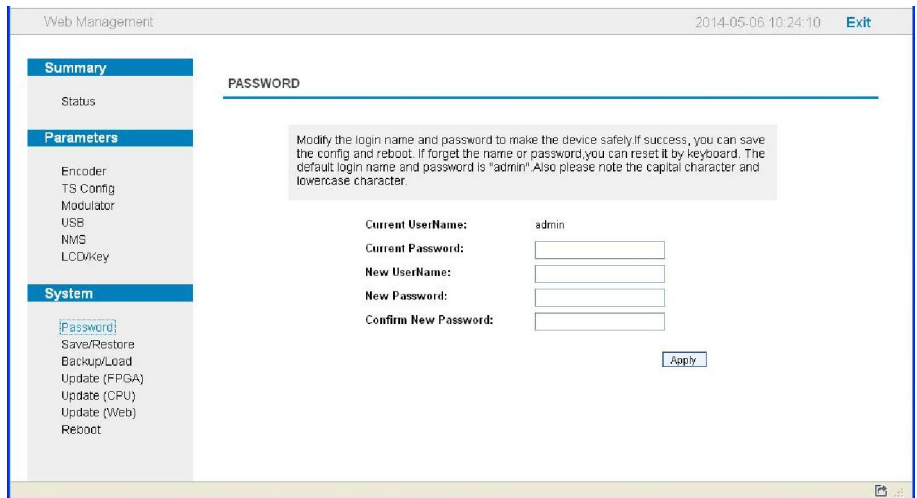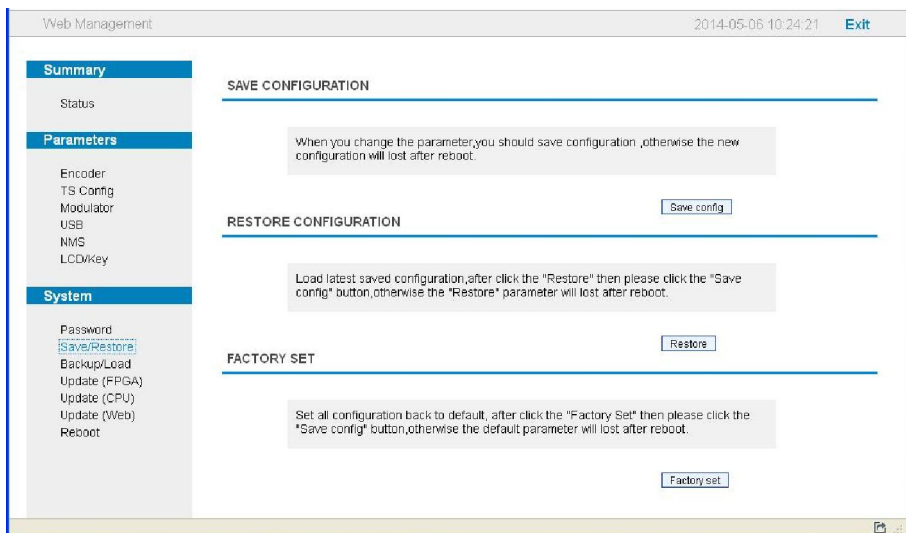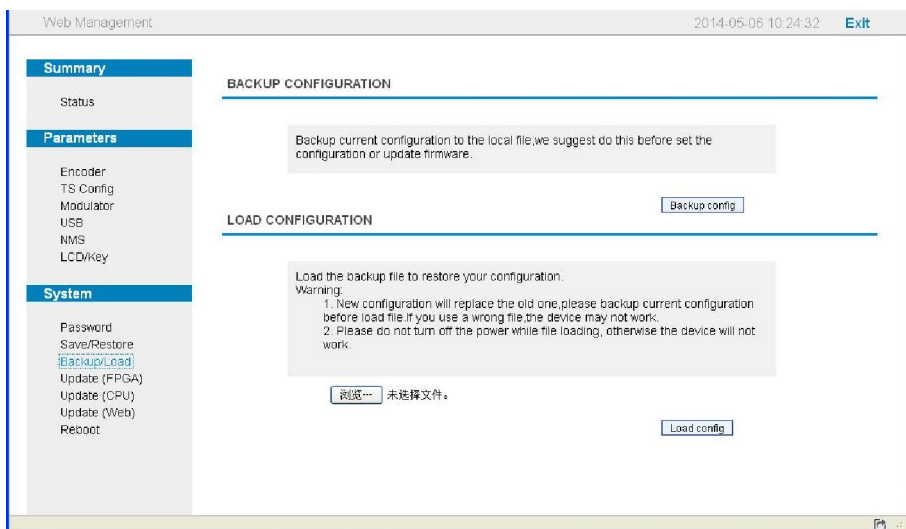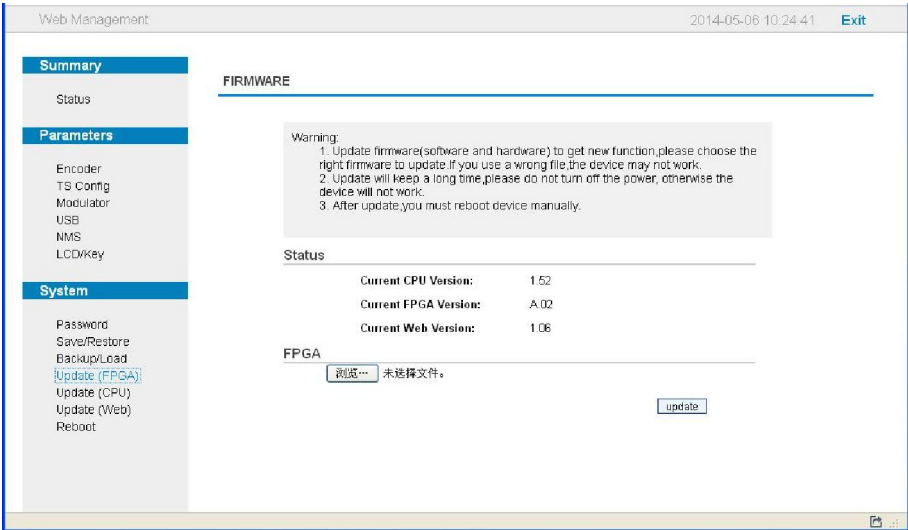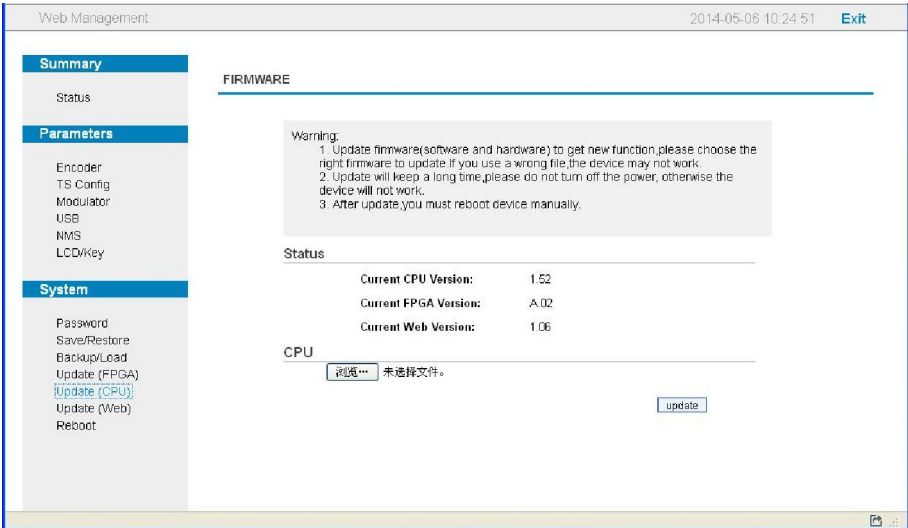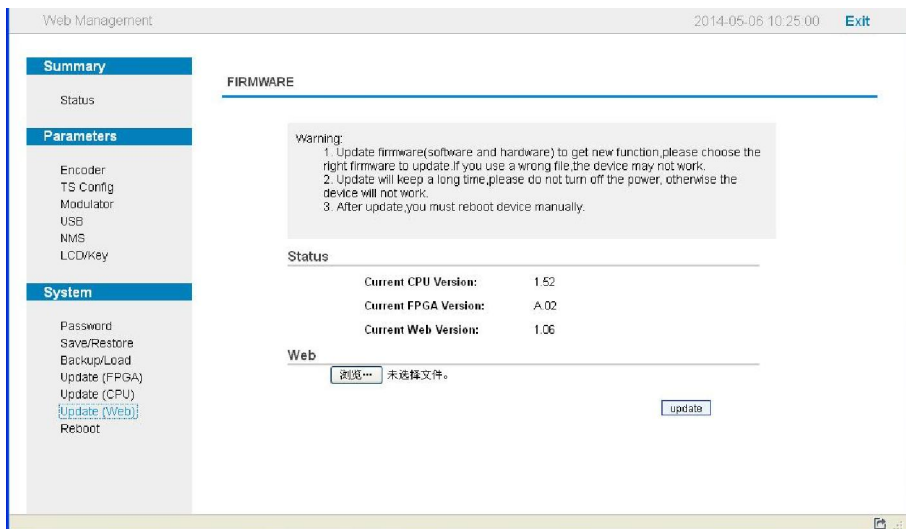

Figure-12

Figure-13

Figure-14

System　　Reboot:

From the menu on left side of the webpage, clicking "Reboot", it will display the screen as Figure-15 where to restart the device manually.
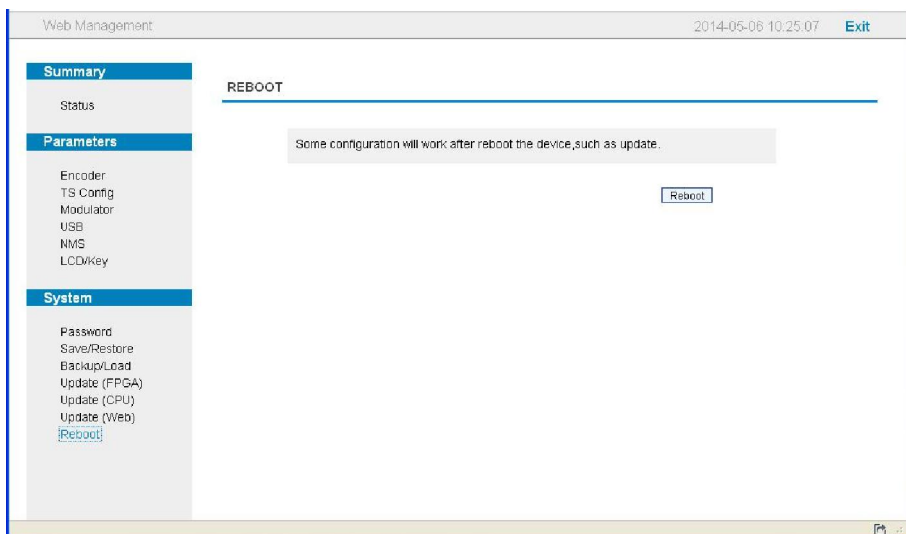

Figure-15

Appendix

Australia 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

Australia 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

Table 1 Australia Television Frequency/Channels (MHz)

Modulation Constellation	FEC	6MHz Bandwidth Guard Interval				7MHz Bandwidth Guard Interval				8MHz Bandwidth 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

Table 2 Recommended MPEG-2 Code Rate