LEMCO
TV SOLUTIONS

Manual
v.1.1

DTV - Headend

MLH-100

2 x HDMI to 2 x DVB-T/C

2

Contents

1. IMPORTANT SAFETY PRECAUTIONS INFORMATION

READ THE FOLLOWING WARNINGS BEFORE YOU USE YOUR DEVICE

WARNING

The following safety precautions must be observed to prevent fire or electric shock hazard. Safety precautions include but are not restricted to the following:

Power supply / Mains cord

- Operate the unit only within the voltage range defined as appropriate by the manufacturer.
- Occasionally check the power connector and remove dirt or dust that may have accumulated.
- Use only the mains cord that comes with your unit.
- Do not operate the unit or plug in the mains cord if it is broken, split, or damaged in any way.
- Do not place the mains cord next to heating devices. Do not pull it, place heavy objects on it or damage it in any way. Keep it out of reach of children.
- Ensure that the device is plugged in a properly grounded socket. Insufficient grounding may cause electrocution.
- Always carefully disconnect all plugs by pulling on the plug and not on the cord. Make sure the unit's power switch is turned off before removing the cord from an outlet.
- Disconnect the mains cord when the unit is not in use for long periods of time or during storms.
- Do not connect the unit to a multiple-outlet to avoid plug overheating.

Disassembling

- This unit contains parts that cannot be repaired by the user. Do not disassemble or try to repair it as this will void all warranties. Please contact the manufacturer if you experience any problems with your unit.

Water/humidity

- Do not keep the unit in a humid place or near water.
- Do not plug/unplug the unit with wet hands.

Fire

- Never place a candle or another source of fire on the unit as it may fall and start a fire.if the mains cord or the power connector is damaged or destroyed, or if there is a sudden loss of picture during operation, or if you notice a strange smell or there is smoke, immediately switch the unit off, disconnect the mains cord and contact the manufacturer's technical support department.

Installation / Storage

- This unit contains high precision pieces of electronics. To ensure optimal performance and avoid damage, do not store it in any location where it may collect dirt, duct, lint, etc. Do not expose it to extreme heat or cold (e.g. in direct sunlight, near a heater or in the car during the day). Place the unit in a secure place to avoid falls.
- Before moving the unit, always unplug all cords first.
- When installing the unit, make sure that an outlet is within easy reach. In case of malfunction, switch the unit off and unplug the power cord. When the unit is not in use for a long period of time, make sure that the mains cord is disconnected.

Connectivity

- Before connecting the unit to other electronic devices, always switch off and unplug all devices.

Maintenance

- Do not spill liquids on the unit. Do not use any diluents or volatile liquid to clean the unit. Instead, use a soft slightly damp cloth and allow the unit to dry completely before using again.

Handling

- Do not poke your finger into the openings on your unit.
- Never put paper, metal parts or other objects into the openings of your unit. If you suspect that there are foreign parts in your unit, switch it off and unplug the mains cord. Contact the manufacturer's technical support department.
- Do not step on or place heavy objects on top of the unit. To avoid hardware damage, handle all buttons, connectors and switches gently.

2. INTRODUCTION

Congratulations on purchasing the MLH-100. You now own a high quality, professional DTV headend. To get the most out of your purchase, please take the time to carefully read through this manual.

3. INSTRUCTIONS

3.1 - DESCRIPTION

The MLH-100 is a very powerful, all-in-one mini headend device, able to receive up to two (2) HD signals and convert them either in two (2) x DVB-T/C RF output.

It supports "pool" technology, meaning that the user is able to select any program from any of the two (2) inputs and assign them to any of the two (2) RF outputs providing great flexibility.

The embedded web server of the MLH-100 provides a very friendly user interface as well as the ability of remote or local control of the device via LAN.

Its small size and its powerful features render the MLH-100 the ideal solution in case we want to distribute HD content eg. coming from STBs or blue ray to a CATV installation using the DVB-T/C.

3.2 - FEATURES

- 2 x HD inputs
- HDCP v1.4 support
- 2 x RF output DVB-T/C (software selectable)
- "Pool" technology
- MER value > 42dB
- Dual power supplies offering redundancy mode
- Custom NIT/SDT
- Local or remote control via webserver
- Very friendly user interface
- Wall or rack mount options
- Ultra-compact size
- 5-year warranty

3.2.1 - Auto-reset functions and watchdog

During the normal operation of the MLH-100, the main CPU monitors all the internal parts in order to ensure that the device works normally. In case of an internal error or module failure, the MLH-100 immediately initiates the recovery procedure by resetting the appropriate module or the device. Finally, watchdog timers ensure that the device will be reset in case of CPU failure.

3.2.2 - "Pool" technology

The MLH-100 supports "pool" technology, meaning that the user is able to select any TV or Radio program from any input and assign it to any of the two (2) outputs providing great flexibility.

3.2.3 - DVB-T or DVB-C compliant

The user is able to software select the modulation standard, between DVB-T and DVB-C, of the MLH-100 without the need of any firmware upgrade.
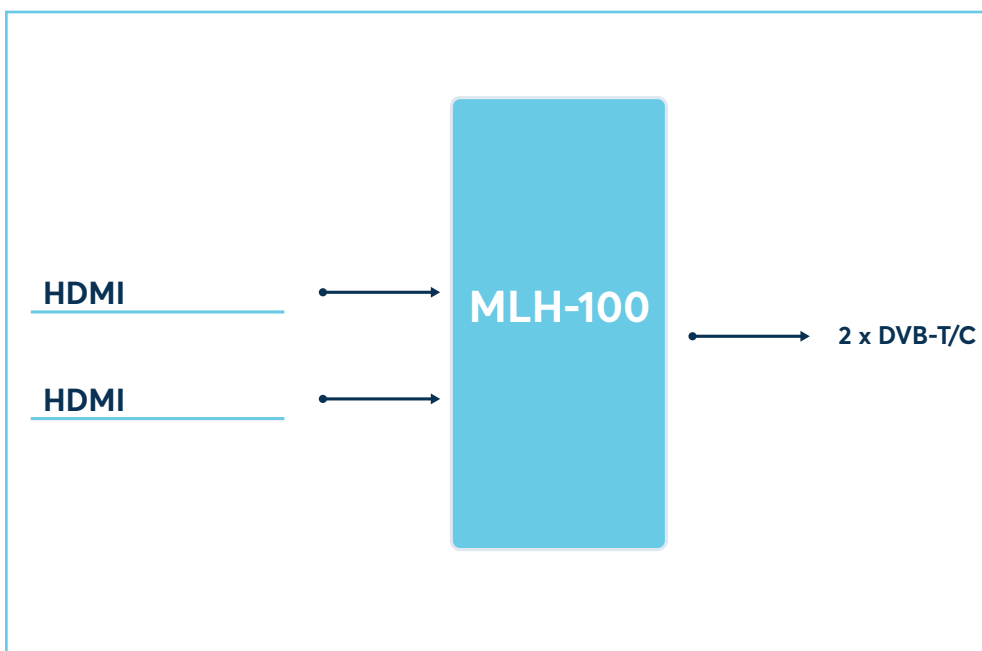
3.2.4 – Custom NIT/SDT

Using the MLH-100 the user is able to create custom NIT and SDT tables according to his needs.
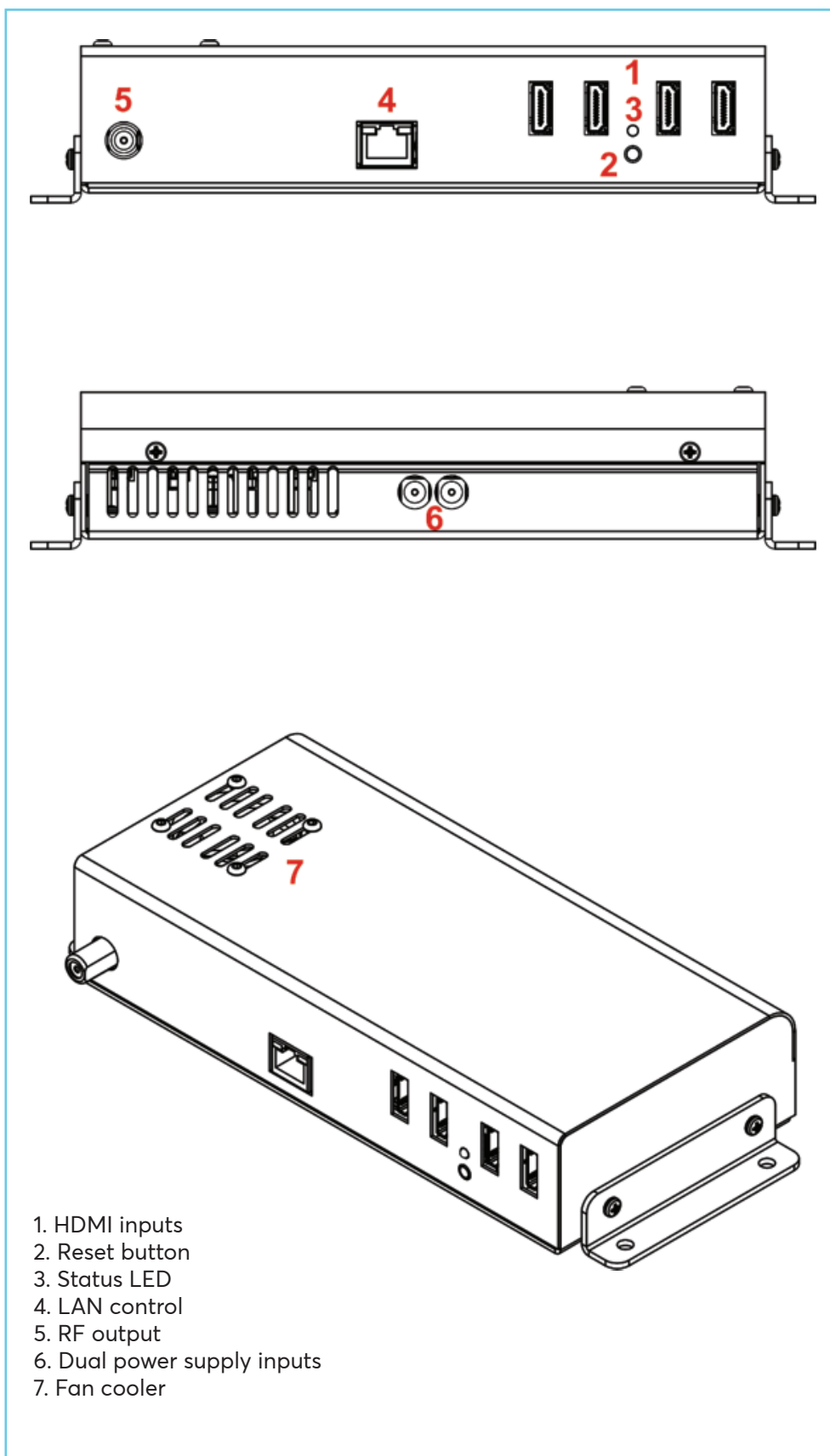
3.2.5 – Dual power supplies

The MLH-100 is powered from one or two external power supplies of +12VDC/2.5A. In case we connect two external power supplies then they will work in redundancy mode. Thus, in case of failure of one of the two external power supplies the device will continue working without stopping.

3.3 - BLOCK DIAGRAM

3.4 – Product drawing views

1. HDMI inputs
2. Reset button
3. Status LED
4. LAN control
5. RF output
6. Dual power supply inputs
7. Fan cooler

4. INSTALLATION

4.1 - General

The MLH-100 has a very friendly interface for programming and monitoring purposes. The user is able to gain access to the embedded webserver, by opening an Internet browser (e.g. Internet Explorer, Firefox or Chrome) and type the following static IP: 192.168.1.205.

The default username and password are the following:

Username: admin
Password: 12345

4.2 - Embedded Webserver

Status

4.2.1 - "General" page

Every time that the user is connected to the device, the "General" page (Figure No 1) is loaded providing a current general status information of the device.
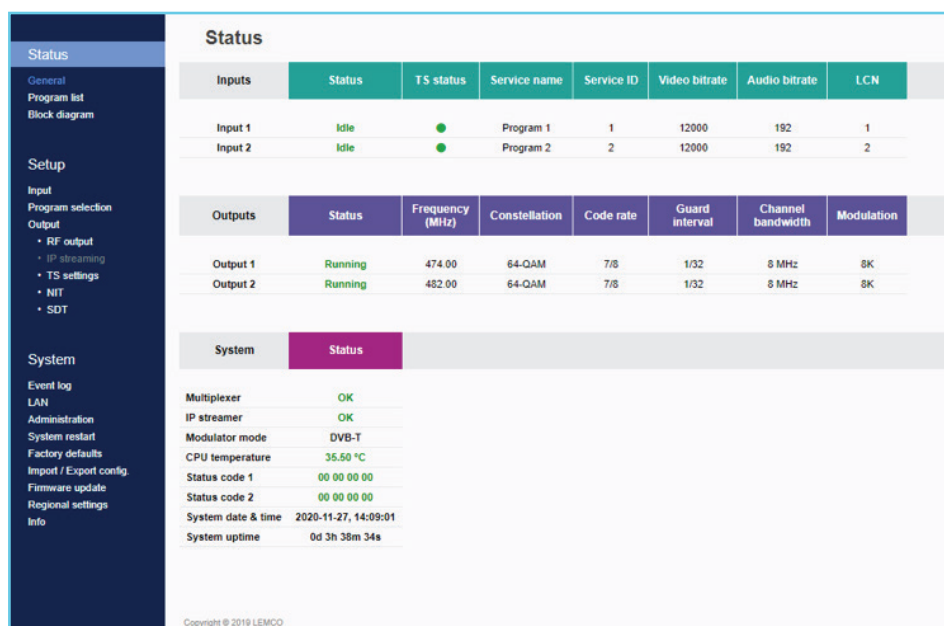
• Figure No 1

Status - Inputs 1...2

In these fields, the user is able to see the status of each HD input e.g. if the H.264 encoder is running or if it is in idle state, its Service name, its Service ID, video/audio PID and LCN number.

Outputs – Modulator 1...2

In these fields, the user is able to see the status of all the RF outputs of the device such as modulator's state, RF output frequencies and modulation settings.

System

This section provides general information of the device, like internal status of all device's modules, CPU temperature and fan state as well as error codes for troubleshooting purposes.

4.2.2 - "Program list" page

In "Program list" page (Figure No 2) the MLH-100 provides information of all programs that are currently being distributed via its two RF.
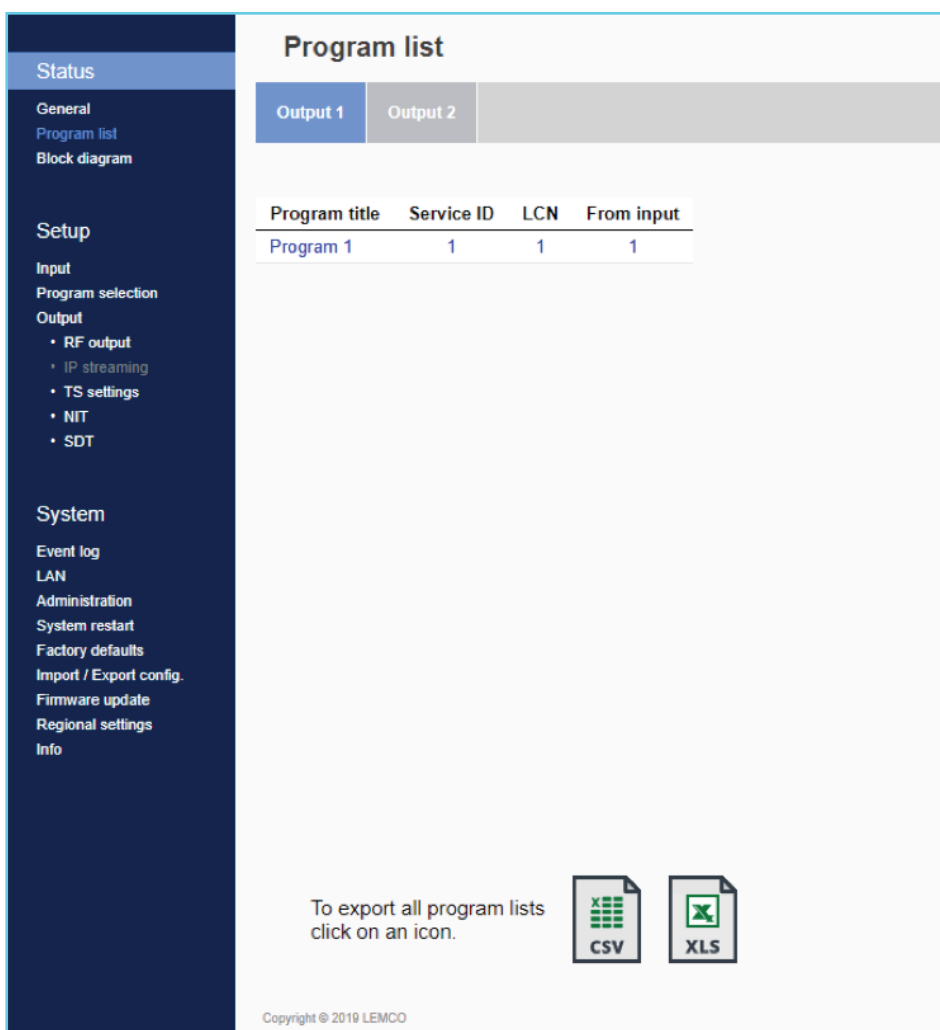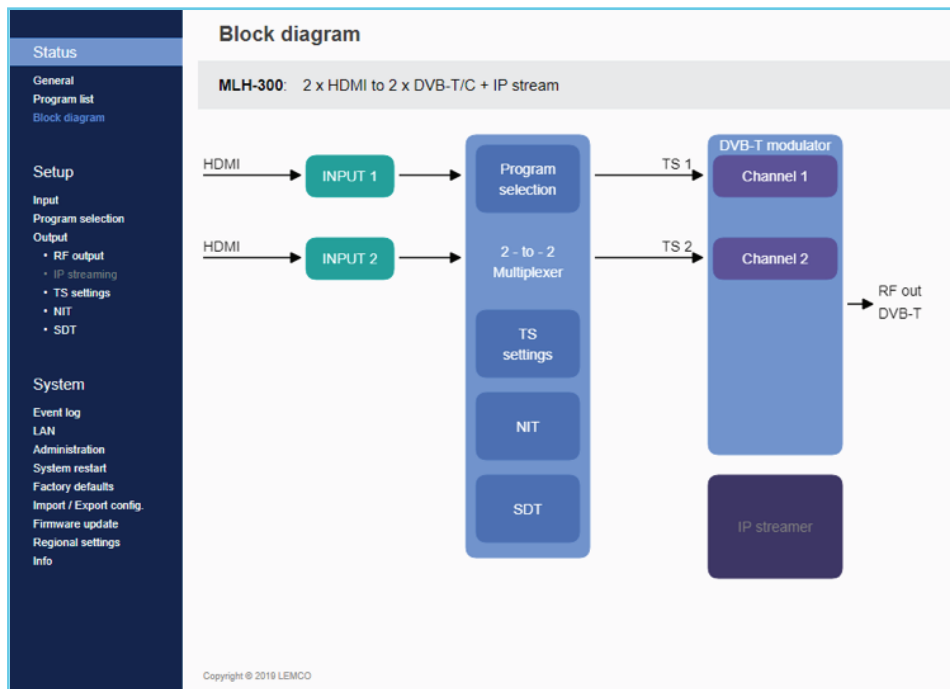
- Figure No 2

At the same time, the device offers the whole channel list to be exported under the follow file types:

- Excel   –   All the program list is exported in .xlsx format
- CSV   –   All the program list is exported in .csv format
- M3U   –   All the program list is exported in .m3u

4.2.3 - "Block diagram" page

The "Block diagram" page (Figure No 3) provides a general view of device's internal modules and architecture.
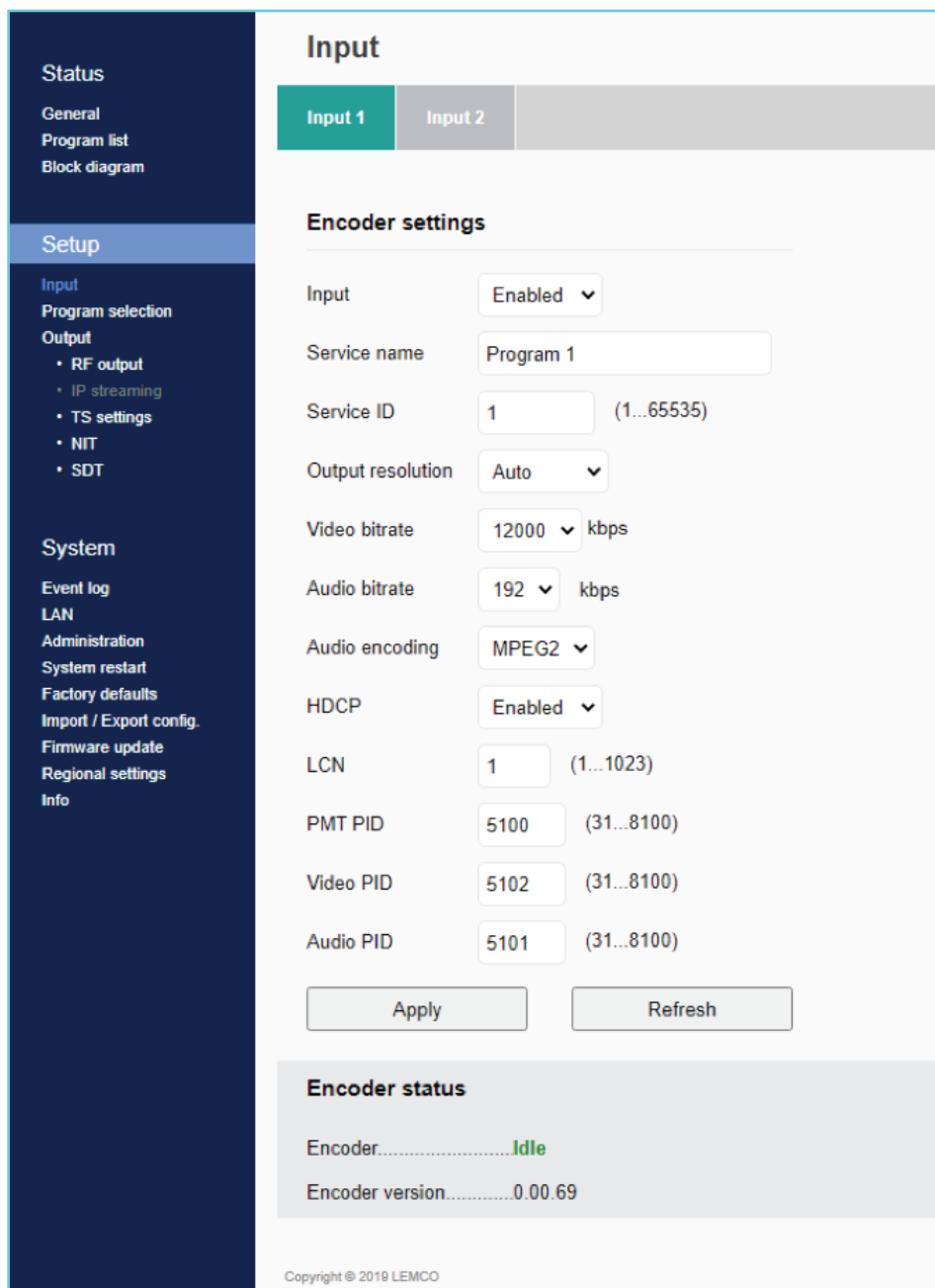

• Figure No 3

All icons are clickable providing the ability to the user to go directly to the setup page of all internal modules of the device. The grey icons mean that the current module is disabled.

Setup

4.2.4 "Input" page

In the "Input page" (Figure No 4) the user is able to setup each HD input independently.

• Figure No 4

There are two tabs including all the two (2) HD inputs. For each tuner the user needs to program the following fields:

1. Input Enabled/Disabled - Enable or disable the specific HD input
2. Service Name – Insert the preferred service name
3. Service ID – Insert the service ID number
4. Video Bitrate – Set the video bitrate (2000-19000 Kbps)
5. Audio Bitrate – Set the audio bitrate (64,96,128,192,256,320 Kbps)
6. Audio encoding – Set the audio encoding (AAC, AC3, MPEG2)
7. HDCP – Enable/disable the HDCP function
8. LCN – Set the LCN number
9. PMT PID – Set the PMT PID
10. Video PID – Set the Video PID
11. Audio PID – Set the Audio PID

Once all settings are being written, the user must click the "Apply" button for the settings to be saved.

Encoder status

For each HD input the MLH-100 provides its current state e.g. if it is running or if it is in idle state.

4.2.5 - "Program Selection" page

In the "Program Selection" section (Figure No 5) the user is able to select any program from any input and assign it to any output using the "pool" technology.

• Figure No 5

This page depicts all programs coming from the two (2) x HD inputs and their settings.
For each program the MLH-100 provides the following information:

- Service Name – which is the name of the program
- Service ID – which is the Service ID number of the program
- LCN No – which is the logic channel number of the program
- Bandwidth – which is the bitrate of the program

- Figure No 6

Using the Drop down menu from "Output" column (Figure No 6) the user is able to assign any program to any of the two outputs. By doing the same process for each program, from all inputs the user is able to create the two (2) custom multiplexes in device's output.

Caution!
The number of programs that the MLH-100 can distribute on its output depends on the video bitrate that the user selects for each program.

For example, if we select the following DVB-T setting for the two modulators on MLH-100 outputs:
- Constellation: 64 QAM
- Guard Interval: 1/32
- Code rate: 7/8
- Bandwidth: 8MHz
According to Appendix A we will have a total output bitrate of 31.67Mbps/ modulator. That means that we can select as many programs but their total bitrate must not exceed the 31.67Mbps, otherwise artifacts may occur.

- Figure No 7

The status section in (Figure No 7) provides a general idea to the user of the current payload (according to the selected programs) comparing to the max. output payload.

It is recommended that the user must not exceed the 85% from each output, since all the bitrate are variable according to their specific content.

Peak Detection mechanism

As shown in Figure No 7 there is a colored indicator of the peak detection mechanism, for each output transport stream. This indicates if any overflow has occurred on modulator's output bitrate with the following colors:

- Green   –   No overflow occurred
- Yellow   –   No overflow occurred but the input bitrate is close to the output bitrate
- Red   –   Overflow occurred. The user must decrease the input bitrate

4.2.6 - "Output" page

At the "RF Output" page the user is able to select in which modulation standard the two (2) output modulator will operate (Figure No8).
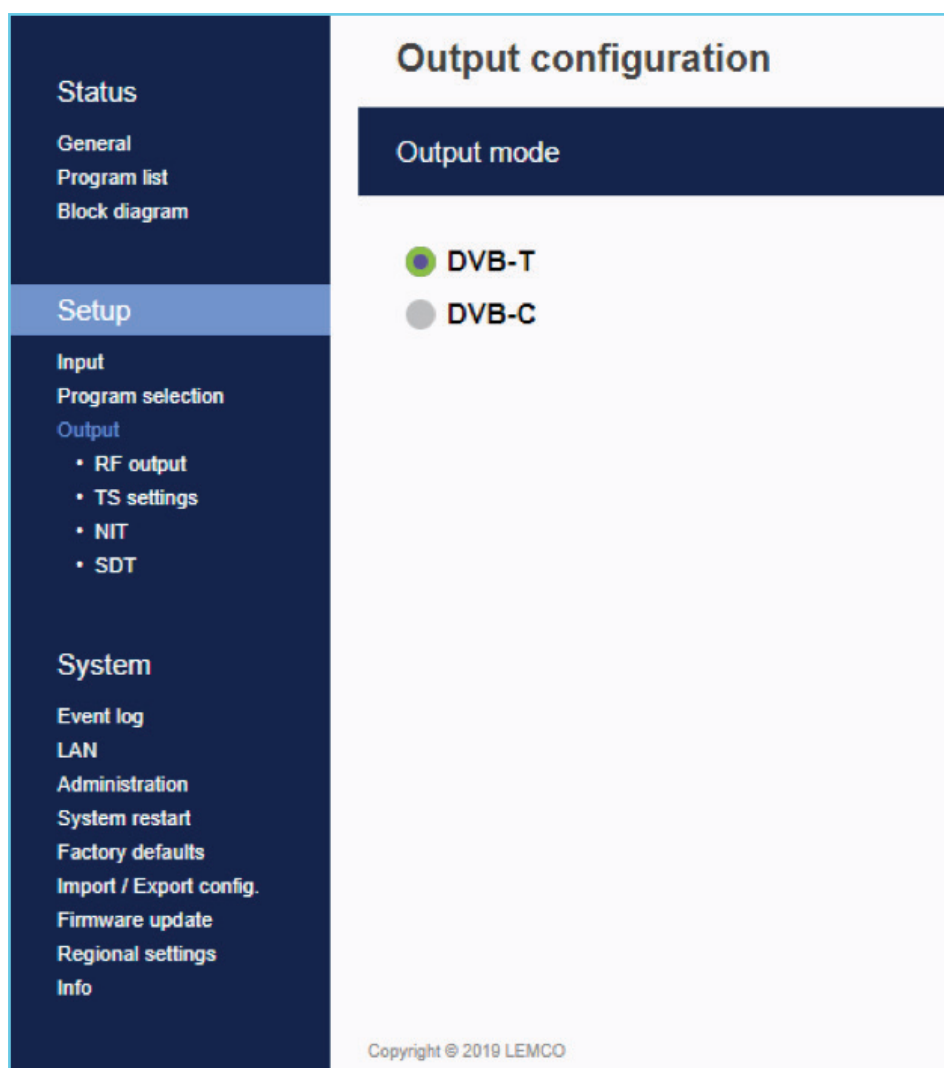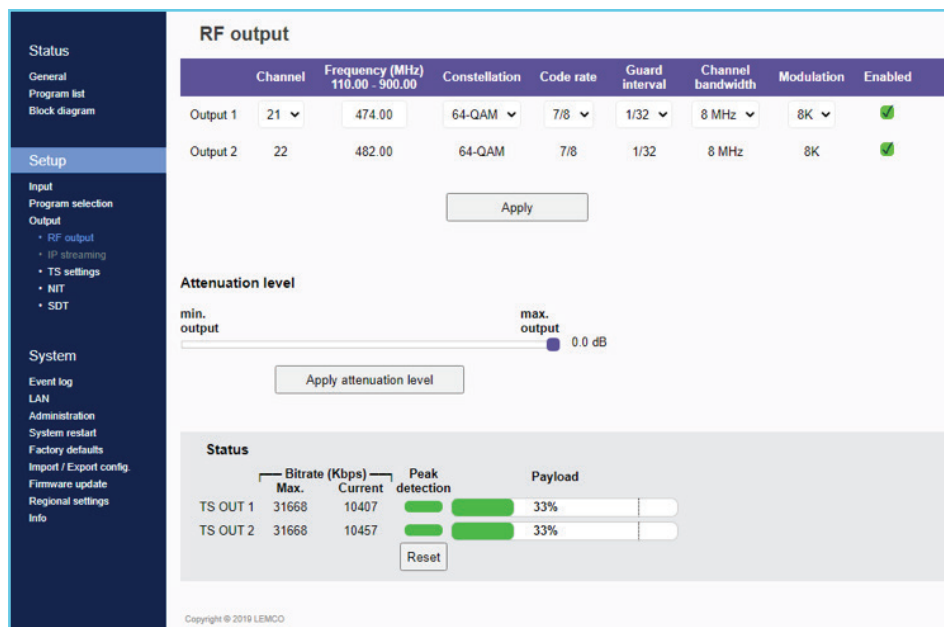

- Figure No8

DVB-T: 4 x modulator working in DVB-T standard
DVB-C: 4 x modulator working in DVB-C standard

4.2.7 - "RF Output" page

At the "RF Output" page (Figure No 9) the user is able to setup the RF output settings of the device.
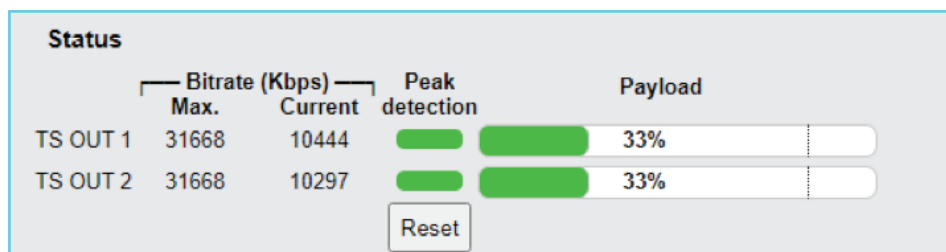

- Figure No 9

For each modulator in DVB-T mode the user is able to setup the following parameters:

- Channel – The output channel for the first modulator*
- Frequency – The output frequency of the first modulator*
- Constellation – The constellation of the first modulator*
- Code Rate – The coder rate of the first modulator*
- Guard Interval - The guard interval of the first modulator*
- Channel Bandwidth – The channel bandwidth of the first modulator*
- Modulation – The modulation type of the first modulator*
- Enable/Disable – Enable or disable the current modulator
- Output level – Adjust the output level for each modulator from 70-90dBμV.

* All the two outputs of the MLH-100 operate in adjacent RF output channels. This means that the user setups only the first modulator and all the other three modulators have the same settings and automatically are being programmed in adjacent channels.

E.g. If the user sets the CH21 in UHF band on modulator No1 the other modulator will be automatically set to CH22, respectively.

The status section in (Figure No 10) provides a general idea to the user of the current payload (according to the selected programs) comparing to the max. output payload.

It is recommended that the user must not exceed the 85% from each output, since all the bitrate are variable according to their specific content.

4.2.8 - "TS settings" page

At this section (Figure 11), the user is able to setup all the TS settings of the two multiplexes at device's output.
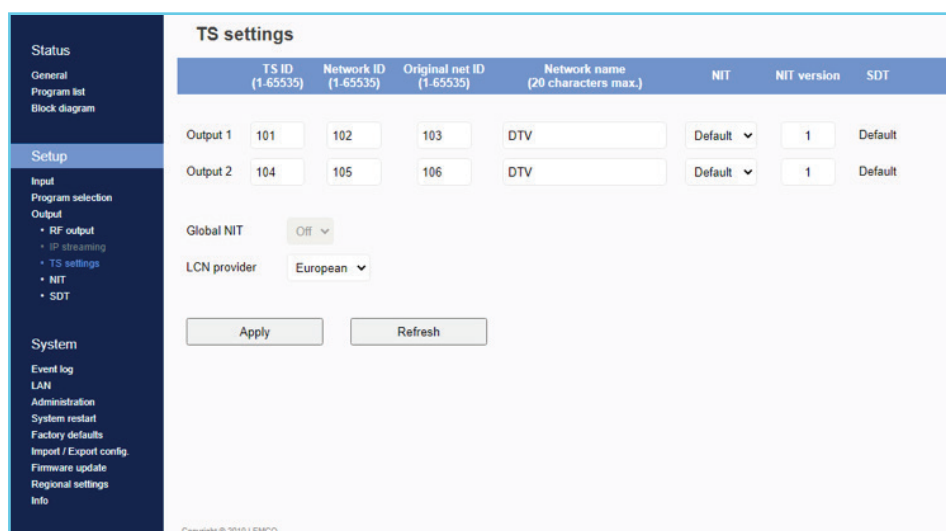
For each multiplex output the user can setup the following settings:

TS ID:	Which is the ID No of the specific multiplex (1…65535)
Net ID:	Which is the Net ID No of the specific multiplex (1…65535)
Original Net ID:	Which is the Org. Net ID No of the specific multiplex (1…65535)
Network Name:	Which is the network name of the specific multiplex
NIT:	Select from Global, Default and Custom options
NIT version:	Select the NIT version
Global NIT:	Select the input source of Global NIT. In this case NIT will be the same for all outputs.
LCN provider:	Choose the appropriate LCN provider (EACEM, ITC, Nordig, APN)

4.2.9 - "NIT" page

At this section (Figure 12), the user is able to create custom NIT table for each of the two outputs of the device. Moreover, this section offers the ability to export / import a NIT table.
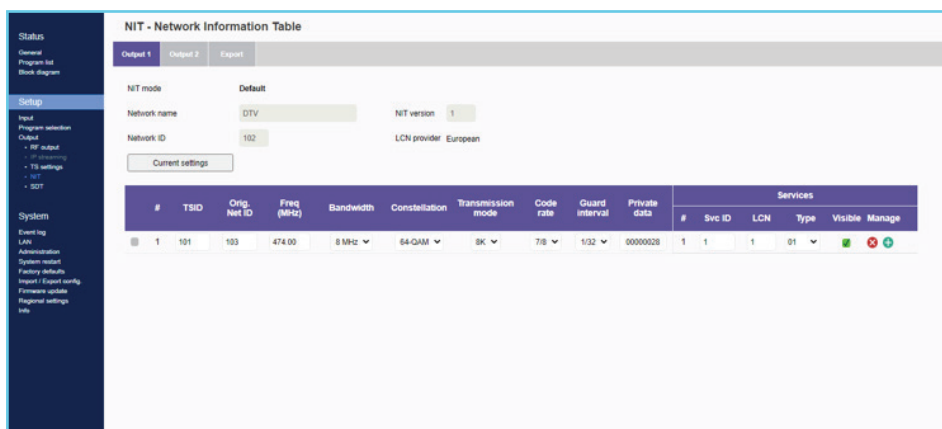
• Figure No 12

For more information on how to create a custom NIT table please refer to "Lemco NIT creation guidelines.pdf" document in Lemco's website.

4.2.10 - "SDT" page

At this section (Figure 13), the user is able to create custom SDT table for each of the two outputs of the device. Moreover, this section offers the ability to export / import a SDT table.
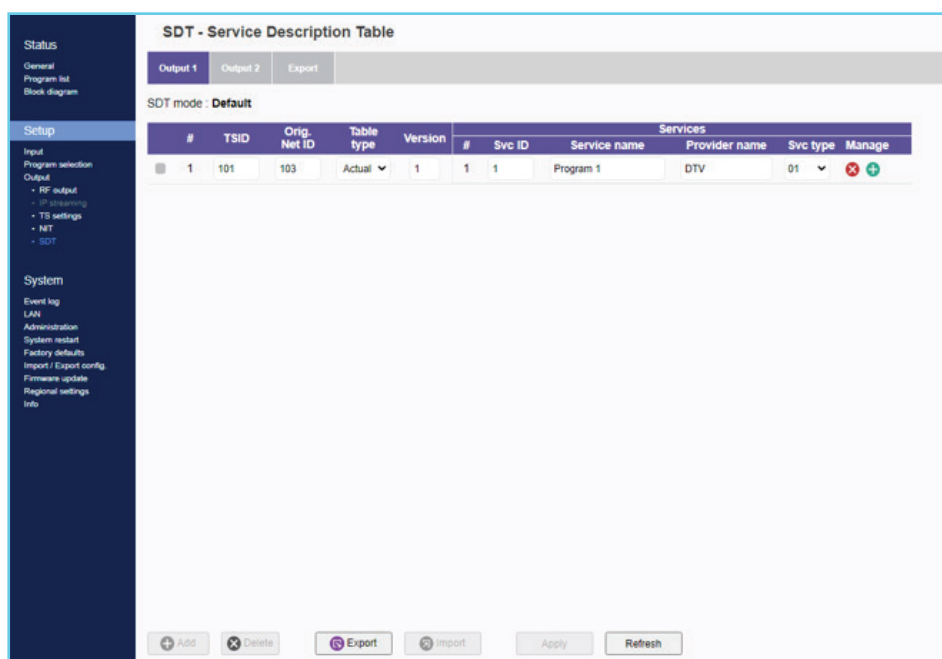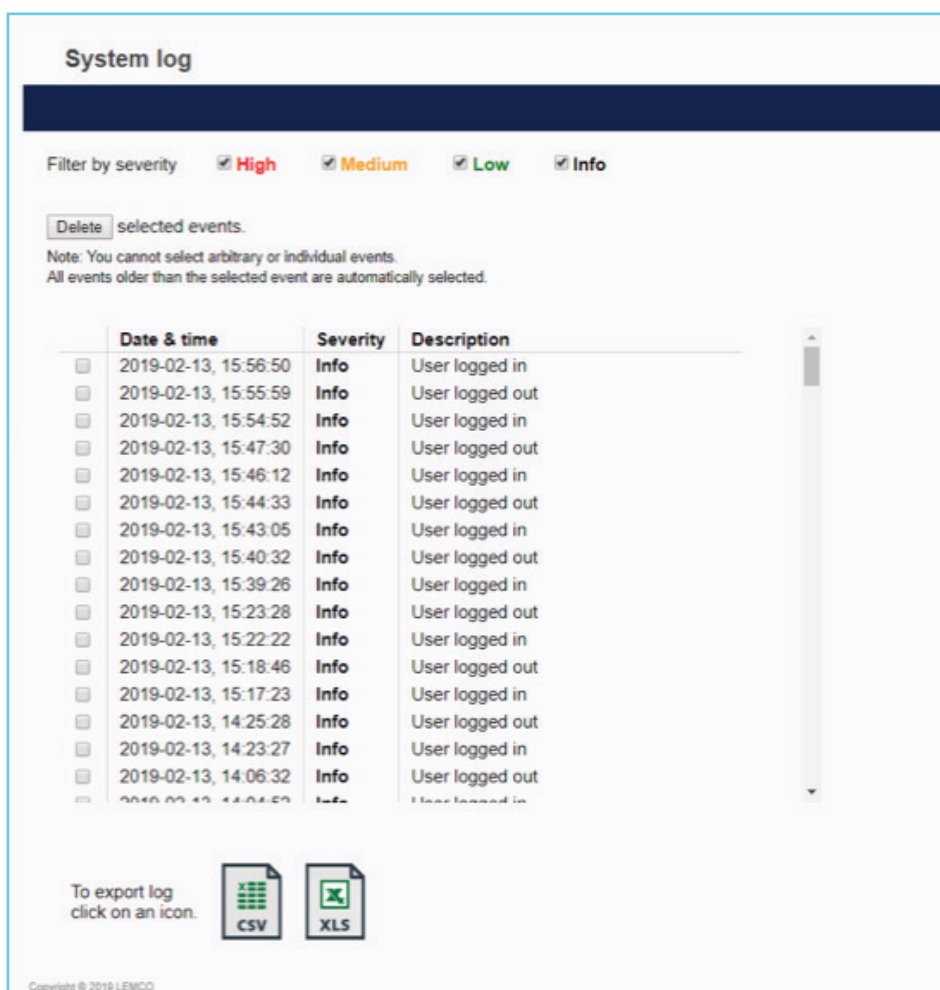

• Figure No 13

For more information on how to create a custom SDT table please refer to "Lemco SDT creation guidelines.pdf" document in Lemco's website.

System

4.2.11 - "Event log" page

At "Event log" page (Figure No 14) the system logs all the events occurs in the device during its operation. These logs are divided in three different categories based on their priority as follow:

- High   –   Using the red color the system logs the events which are of high priority.
- Medium   –   Using the orange color the system logs the events which are of medium priority.
- Low   –   Using the red color the system logs the events which are of low priority.

- Figure No 14

The user has the ability to select which kind of events to display as well as the device gives the opportunity to export these logs as follow:

- Excel   –   All the program list is exported in .xlsx format
- CSV   –   All the program list is exported in .csv format

4.2.12 - "LAN" page

At "LAN" page (Figure No 15) the user is able to setup all the parameters of the LAN control of the device as follows:

- Figure No 15

- DHCP – Enable or disable DHCP
- IP address: Set a static IP address for controlling the device
- Subnet mask: Set the specific Subnet mask
- Gateway: Set the gateway's IP address
- Primary DNS: Set the IP address of the primary DNS
- Secondary DNS: Set the IP address of the secondary DNS
- Port: Assign the control port
- MAC address: Depicts the MAC address of the LAN control

4.2.13 - "Administration" page

At "Administration" section (Figure No 16) the user is able to change the default password of the webserver.

• Figure No 16

Caution!
• In case of factory default procedure, the username and password will be reset unless we select the check box "Keep username & password after applying factory defaults".

4.2.14 - "System restart" page

At "System restart" section (Figure No 17) the user is able to apply a full reset to the device.
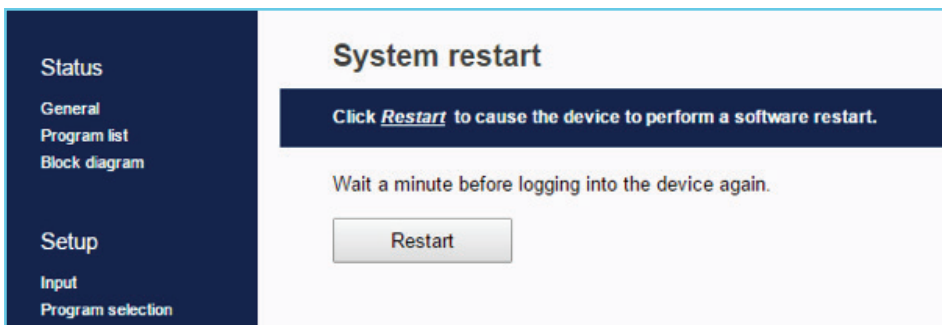
Figure No 17

4.2.15 - "Factory default" page

In "Factory default" section (Figure No 18) the user is able to apply a factory default reset to the device and select if the event logs should be deleted or not.
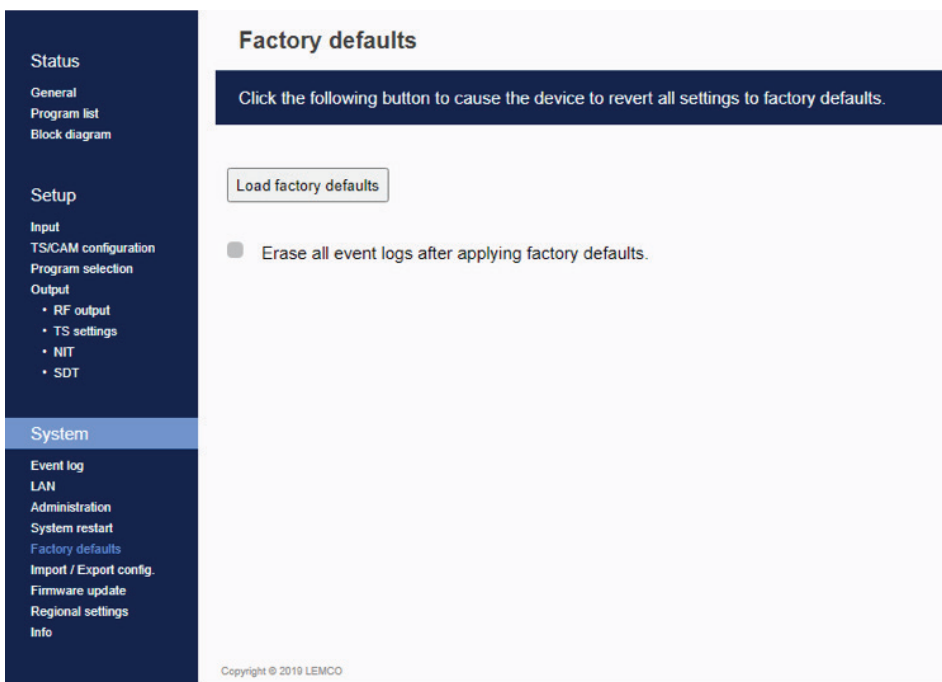
•   Figure No 18

4.2.16 - "Import/Export Config" page

At "Import/Export Config" section (Figure No 19) the user is able to do the following:

- 1. Export: Save all the configuration is a specific file
- 2. Import: Upload a previously save configuration file.
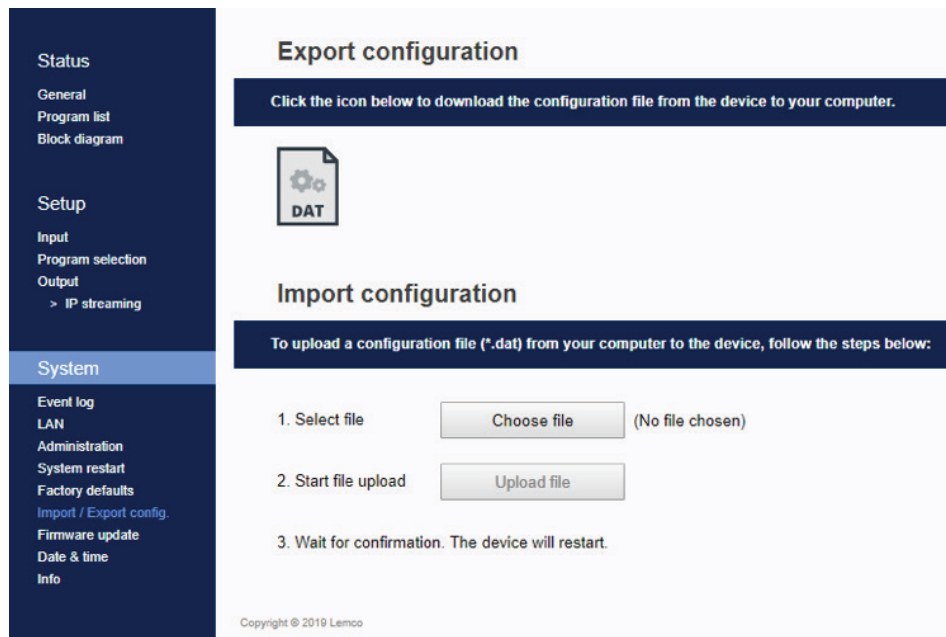
- Figure No 19

4.2.17 - "Firmware update" page

In "Firmware update" (Figure No 20) section the user is check if there is any new firmware for the device. In case of new firmware, the user is able to proceed with the firmware update procedure.

Caution!
For the above procedure a internet connection is mandatory.
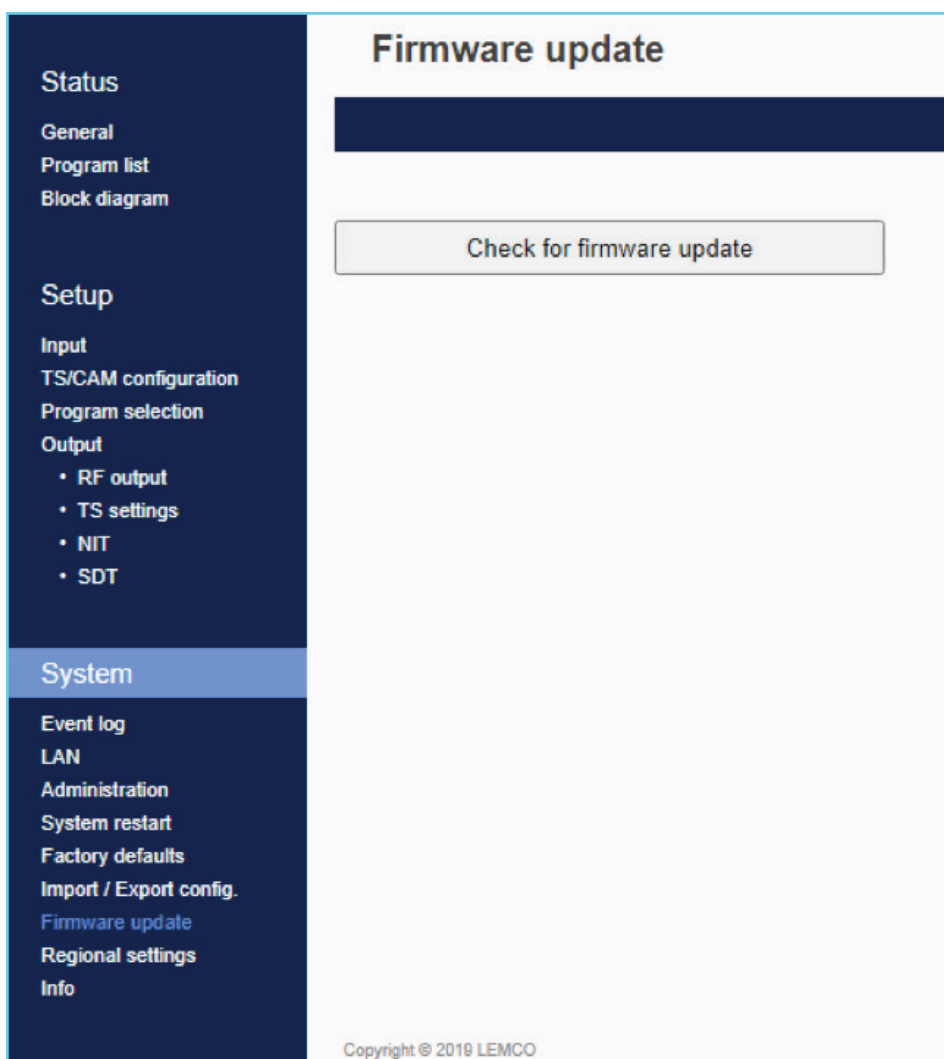
· Figure No 20

4.2.18 - "Date & Time" page

In "Regional settings" (Figure No 21) section the user is able to select the NTP server in order for the device to receive the date and time as well as to set the time zone of his country and his region.
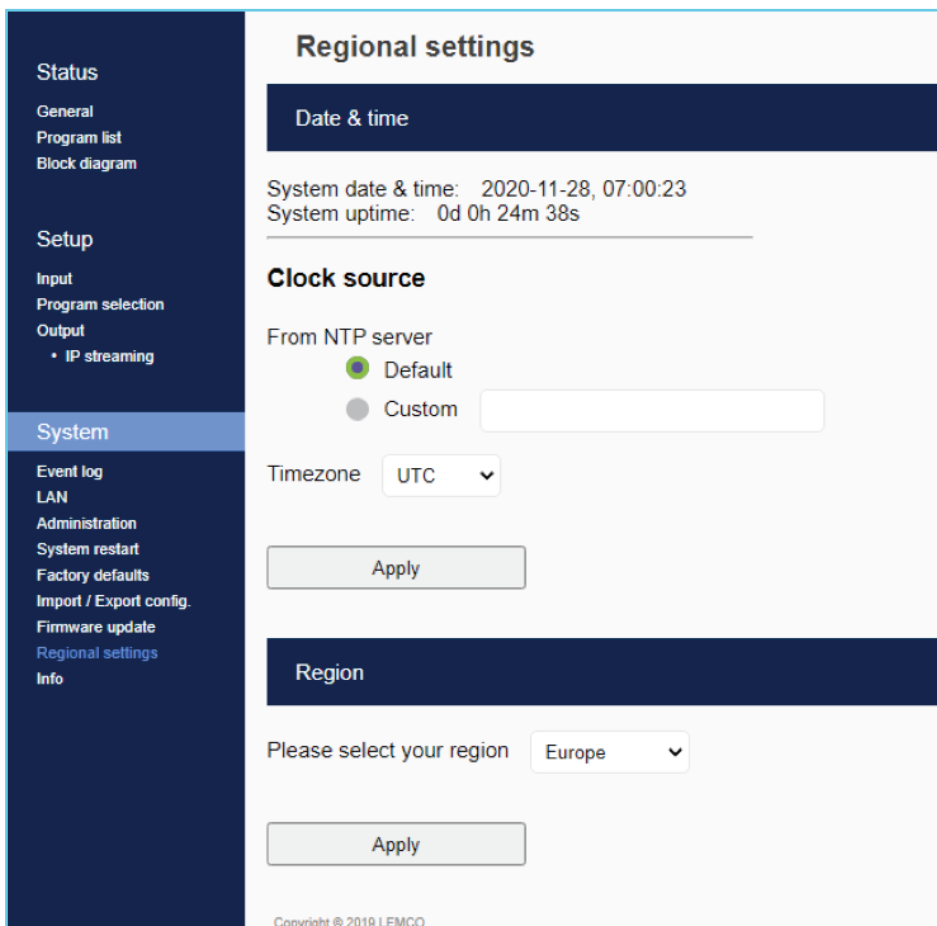
• Figure No 21

4.2.19 - "Info" page

In "Info" (Figure No 22) section the user is able to see the serial No of the device as well as firmware and hardware versions.

• Figure No 22

5. TECHNICAL SPECIFICATIONS

Input Specifications

HD Input

Type	2 x HD inputs
Video coding	MPEG-4 AVC / H.264
Profile	High profile 4.0
Input resolution	Up to 1920 x 1080 - 50/60 p & i
Output resolution	Up to 1920 x 1080 - 30p
HDCP support	Yes, v1.4

Audio

Audio	HD
Standard	MPEG-1 Layer II
Audio Bit Rate	64, 96, 128, 192, 256, 320 Kbps
Format	MPEG2, AAC, AC3

H.264 encoder

Standard	MPEG-4 AVC / H.264
Bit Rate	1 – 19 Mbps adjustable
Configurable Parameters	Service Name, Service ID
LCN processing	Yes

Output Specifications

DVB-T

Bandwidth	5, 6, 7, 8 MHz
Mode	2K, 8K
Constellation	QPSK, 16QAM, 64QAM
Guard Interval	1/4, 1/8, 1/16, 1/32
Code Rate	1/2, 2/3, 3/4, 5/6, 7/8

DVB-C

Bandwidth	5, 6, 7, 8 MHz
Mode	2K, 8K
Constellation	16QAM, 32QAM, 64QAM, 128QAM, 256QAM
Symbol Rate	1-7.2 Ms/s

RF Output

Type	2 x RF out in adjacent channels
Output Frequencies	110…950MHz (1 Hz step)
Output Level	90dBµV
Connector	75Ω - F, female
Output Attenuator	0…-20dB
MER	>42dB
Output loop-through loss	<1dB

Transport Stream Processing

Services	User selection by service names
Automatic Regeneration	PAT, CAT, SDT, PMTs, EITs tables
NIT/SDT	Pass-through, Custom, Automatic
PCR	re-stamping
LCN support	Yes

Programming Interface

Ethernet webserver	Yes, embedded webserver
Speed	10/100 Mbps
Connector	RJ45
Browser compatibility	Chrome, Firefox, Safari, Opera, Edge etc. (Must support HTML v5.0)

General

Power Supply	2 x +12VDC
Power supply consumption	2A max.
Operating Temperature	0 °C to 40 °C
Storage Temperature	-10 °C to +70 °C
Humidity	Up to 90%
Dimensions	235 x 115 x 48 mm
Weight	0.45 Kg

6. DIMENSIONS

*dimensions in mm
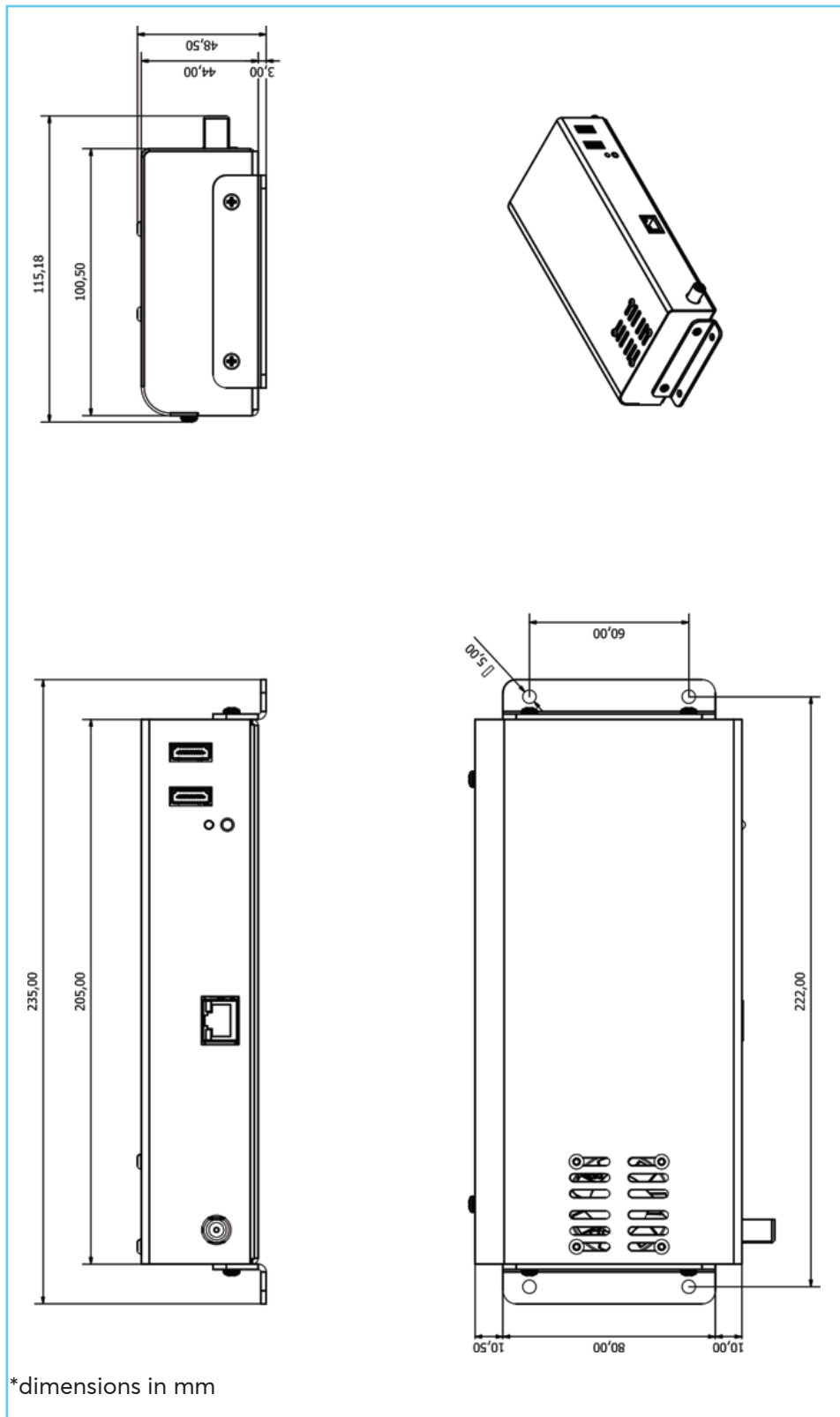
7. WARRANTY TERMS & CONDITIONS

Lemco provides warranty for its products under the following terms and conditions:

1. Products covered by Lemco warranty

Products covered by Lemco warranty policy are products solely produced by Lemco and labeled under the Lemco logo, as well as products sold by Lemco and labeled under the Lemco Addons logo. No third-party products or parts of products are covered by Lemco warranty policy. Lemco bears not responsibility for third party products sold along with Lemco products. Such third-party products are covered by the warranty policy of their manufacturer. Lemco warranty does not cover any accessories and/or consumables that come along with its products (i.e. cables, batteries, remote controls etc.).

2. Liability

Lemco accepts no liability whatsoever for loss of profit, loss of associated product, loss of goodwill or other costs arising from any malfunction of the product in question before and after repairs are completed to return the product to normal operation.

3. Clauses

Equipment repaired under warranty shall be warranted to the end of the original warranty period - including any parts replaced.

4. State of the products

Warranty covers defective products. Defective products are products unfit for proper use due to a defect existing already at the time of their purchase. Any defect attributable to normal wear and tear or improper use by the customer does not constitute the merchandise defective and is not covered by the conditions of defective merchandize warranty.

It rests in Lemco's absolute discretion to determine whether the defect of the product is attributable to a misuse by the customer or is attributable to a defect existing already at the time of purchase.

5. Warranty does not cover any problem resulting from:

a. Mechanical or electric damages resulting from incorrect installation, configuration, usage or other activities inconsistent with the operation manual or contradictory to technical specifications attached to the device;
b. Damages caused by acts of God, floods, fires, lighting, electrostatic discharge, heat, humidity beyond product specifications, accident, abuse, neglect or other natural disasters, wars, unexpected events, inappropriate voltage, defective supply materials or other external factors;
c. The device that has been tempered with by the Warranty beneficiary or any other person in any way, including reconfiguration, repair, willful constructional variations, modifications and adjustments;
d. The device with serial numbers and/or the Guarantor seals damaged or illegible;
e. The activities specified in the operation manual, which remain the sole responsibility of the Customer in his own capacity and at his own expense;
f. Defects resulting from the usage of improper or non-genuine supply materials;
g. Damages due to the user's fault or lack of knowledge;
h. Defective functioning of the device caused by a conflict or incompatibility between software applications installed on the damaged device or on the equipment, which the device permanently cooperates with in accordance with the intended purpose of the device

6. Duration of the warranty

Lemco warranties for its products labeled under the "Lemco" logo for a period of five (5) years after their purchase. Lemco warranties for its products labeled under the "Lemco Addons" logo for a period of two (2) years after their purchase.

For the whole duration of the warranty period, and provided the product meets warranty requirements under paragraph No4 above, Lemco is obliged to repair or exchange the product at no cost to customer.

7. Warranty Claims

Claims under warranty must be reported and returned to Lemco within 30 days from the date of detection and need to specify at least the following information via the RMA procedure that can be found at www.lemco.gr (additional information may be requested):

- Details of the defective Products; and for System warranty also details of other used components.
- Installation date, invoice date.
- Detailed problem description, number and %, date and code of defects.
- Equipment operating hours.
- Photos (and videos if possible) of defective product.

Lemco does not bear any responsibility for the transportation of the products to its premises and/or back to customer's premises. Customer shall be solely responsible to ensure a safe transportation of its products at Lemco's premises.

After the product is received, Lemco Service Department will examine whether the product is covered by warranty and will notify customer respectively. Lemco undertakes all best-efforts obligation to inform customer within twenty-four [24] hours after the product has been delivered to Lemco.

If the product is covered by warranty, Lemco will repair or replace it and send it back to customer within 15 working days from receiving the product (depending on product's overall condition) at no repair costs to customer.

Lemco can charge Client for returned Products that are not found to be defective or non-conforming, in addition to shipping- test-, and handling costs associated therewith.

8. Competent Courts – Jurisdiction

The present warranty terms are construed in accordance to Greek law and the Courts of Athens shall have exclusive jurisdiction for any dispute arising out of or in connection with the present warranty terms.

Lemco reserves the right to refuse to provide any Warranty services if it would result in a breach of applicable laws.

8. WARNINGS

Content warning

This document contains preliminary information about a product of Lemco company. Lemco reserves the right to make any changes or modifications at any time without prior notice.

APPENDIX A

DVB-T bitrates (Mbit/s) for 8 MHz bandwidth (non-hierarchical systems)

Modulation	Coding Rate	Guard Interval			
		1/4	1/8	1/16	1/32
QPSK	1/2	4.976	5.529	5.855	6.032
	2/3	6.635	7.373	7.806	8.043
	3/4	7.465	8.294	8.782	9.048
	5/6	8.294	9.216	9.758	10.053
	7/8	8.709	9.676	10.246	10.556
16-QAM	1/2	9.953	11.059	11.709	12.064
	2/3	13.271	14.745	15.612	16.086
	3/4	14.929	16.588	17.564	18.096
	5/6	16.588	18.431	19.516	20.107
	7/8	17.418	19.353	20.491	21.112
64-QAM	1/2	14.929	16.588	17.564	18.096
	2/3	19.906	22.118	23.419	24.128
	3/4	22.394	24.882	26.346	27.144
	5/6	24.882	27.647	29.273	30.160
	7/8	26.126	29.029	30.737	31.668

DVB-T bitrates (Mbit/s) for **7 MHz** bandwidth (non-hierarchical systems)

Modulation	Coding Rate	Guard Interval			
		1/4	1/8	1/16	1/32
QPSK	1/2	4.354	4.838	5.123	5.278
	2/3	5.806	6.451	6.830	7.037
	3/4	6.532	7.257	7.684	7.917
	5/6	7.257	8.064	8.538	8.797
	7/8	7.620	8.467	8.965	9.237
16-QAM	1/2	8.709	9.676	10.246	10.556
	2/3	11.612	12.902	13.661	14.075
	3/4	13.063	14.515	15.369	15.834
	5/6	14.515	16.127	17.076	17.594
	7/8	15.240	16.934	17.930	18.473
64-QAM	1/2	13.063	14.515	15.369	15.834
	2/3	17.418	19.353	20.491	21.112
	3/4	19.595	21.772	23.053	23.751
	5/6	21.772	24.191	25.614	26.390
	7/8	22.861	25.401	26.895	27.710

DVB-T bitrates (Mbit/s) for **6 MHz** bandwidth (non-hierarchical systems)

Modulation	Coding Rate	Guard Interval			
		1/4	1/8	1/16	1/32
QPSK	1/2	3.732	4.147	4.391	4.524
	2/3	4.976	5.529	5.855	6.032
	3/4	5.599	6.221	6.587	6.786
	5/6	6.221	6.912	7.318	7.540
	7/8	6.532	7.257	7.684	7.917
16-QAM	1/2	7.465	8.294	8.782	9.048
	2/3	9.953	11.059	11.709	12.064
	3/4	11.197	12.441	13.173	13.572
	5/6	12.441	13.824	14.637	15.080
	7/8	13.063	14.515	15.369	15.834
64-QAM	1/2	11.197	12.441	13.193	13.572
	2/3	14.929	16.588	17.564	18.096
	3/4	16.796	18.662	19.760	20.358
	5/6	18.662	20.735	21.995	22.620
	7/8	19.595	21.772	23.053	23.751

9. NOTES

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