

Operation Manual

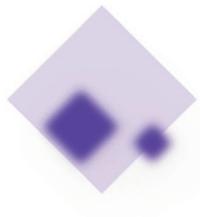
v1.0



micro
line

MLH-101

4 x HD to 4 x DVB-T/C



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

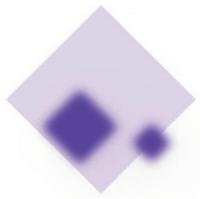
- ▶ Operate the unit only within the voltage range defined as appropriate by the manufacturer.
- ▶ Occasionally check the power connector and remove dirt or dust that may have accumulated.
- ▶ Use only the mains cord that comes with your unit.
- ▶ Do not operate the unit or plug in the mains cord if 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, dust, 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

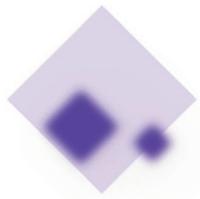
- ▶ Before connecting the unit to other electronic devices, always switch off and unplug all devices.

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. INTRO

Congratulations on purchasing the MLH-101. 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-101 is a very powerful, all-in-one mini headend device, able to receive up to 4 HD signals and convert them either in 4 x DVB-T/C RF output channels.

It supports "pool" technology, meaning that the user is able to select any program from any of the 4 inputs and assign them to any of the 4 RF outputs providing great flexibility.

The embedded web server of the MLH-101 provides a very friendly user interface as well as the ability of remote or local control of the device via LAN.

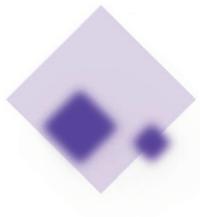
Its small size and its powerful features render the MLH-101 the ideal solution in case we want to distribute HD content eg. coming from STBs or blue ray to a CATV installation using the DVB-T/C technology.

3.2 - Features

- ▶ 4 x HD inputs
- ▶ HDCP v1.4 support
- ▶ 4 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
- ▶ SNMP v2
- ▶ Ultra-compact size
- ▶ 5-year warranty

3.2.1 - Auto-reset functions and watchdog

During the normal operation of the MLH-101, 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-101 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-101 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 4 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-101 without the need of any firmware upgrade.

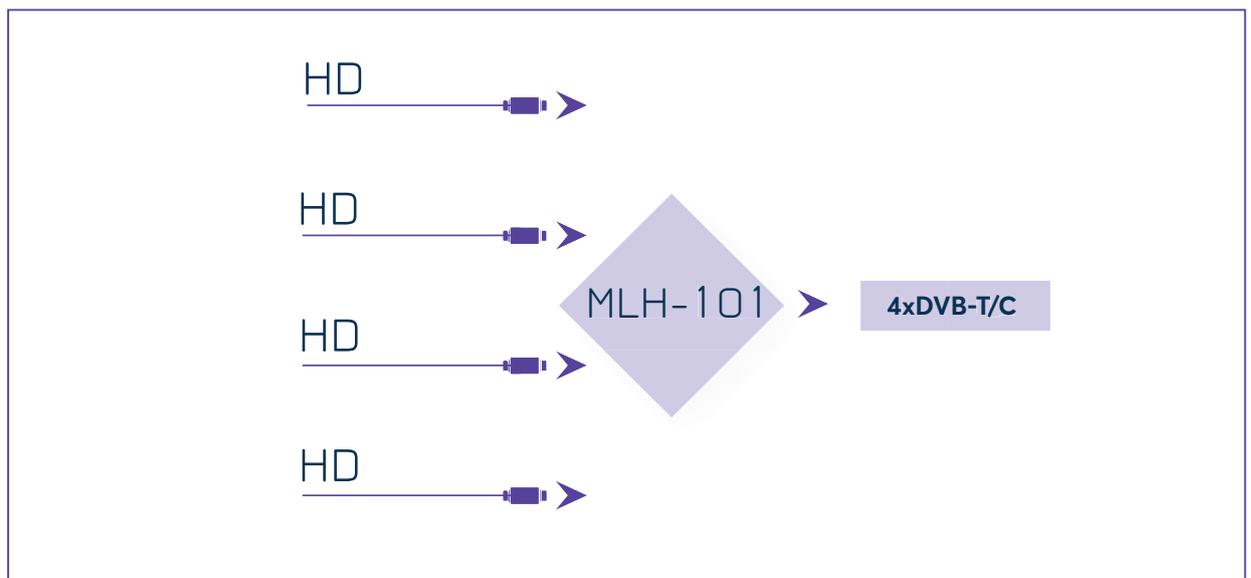
3.2.4 - Custom NIT/SDT

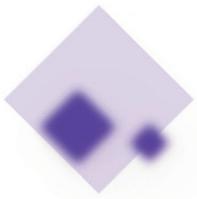
Using the MLH-101 the user is able to create custom NIT and SDT tables according to his needs.

3.2.5 - Dual power supplies

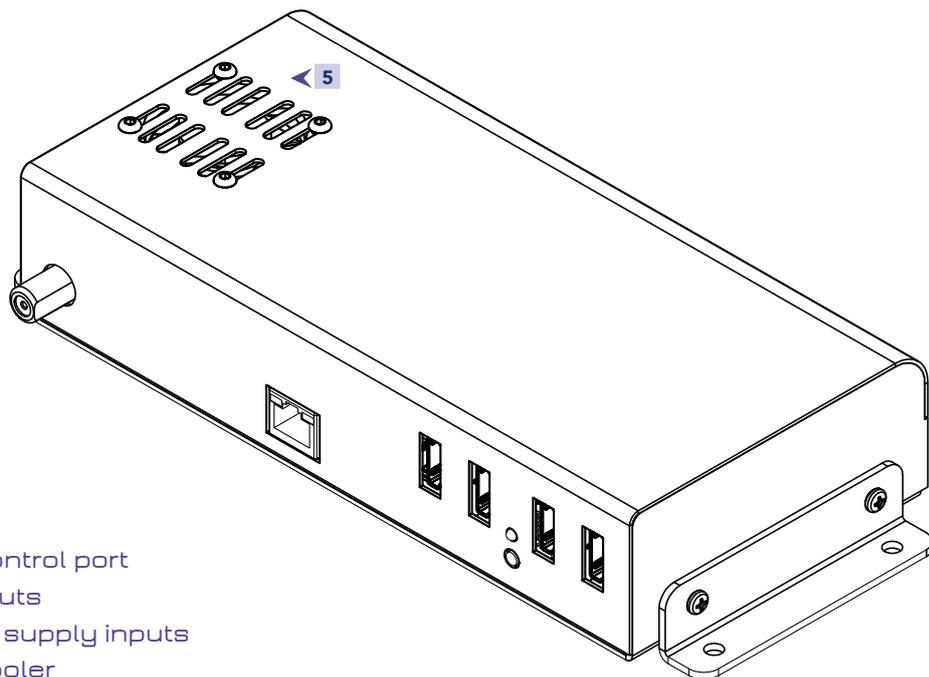
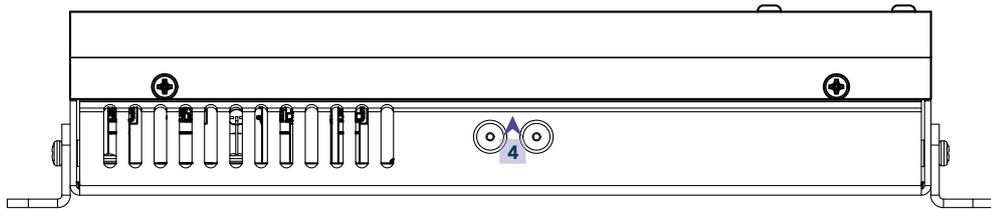
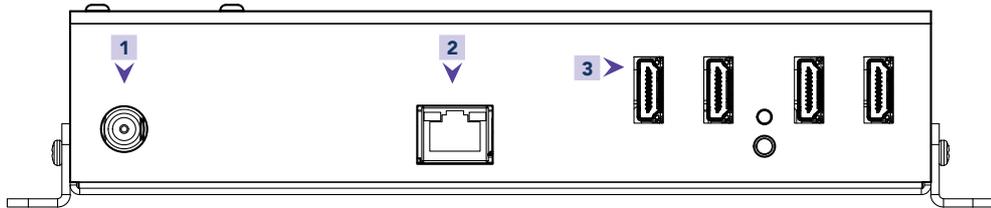
The MLH-101 is powered from one or two external power supplies of +12VDC/2.5A. In case we connect two external power supplies then they will work in redundancy mode. Thus, in case of failure of one of the two external power supplies the device will continue working without stopping.

3.3 - Block Diagram

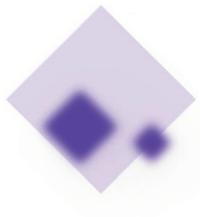




3.4 - Product drawing views



- 1. RF out
- 2. LAN control port
- 3. HD inputs
- 4. Power supply inputs
- 5. Fan cooler



4. INSTALLATION

4.1 - General

The MLH-101 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.

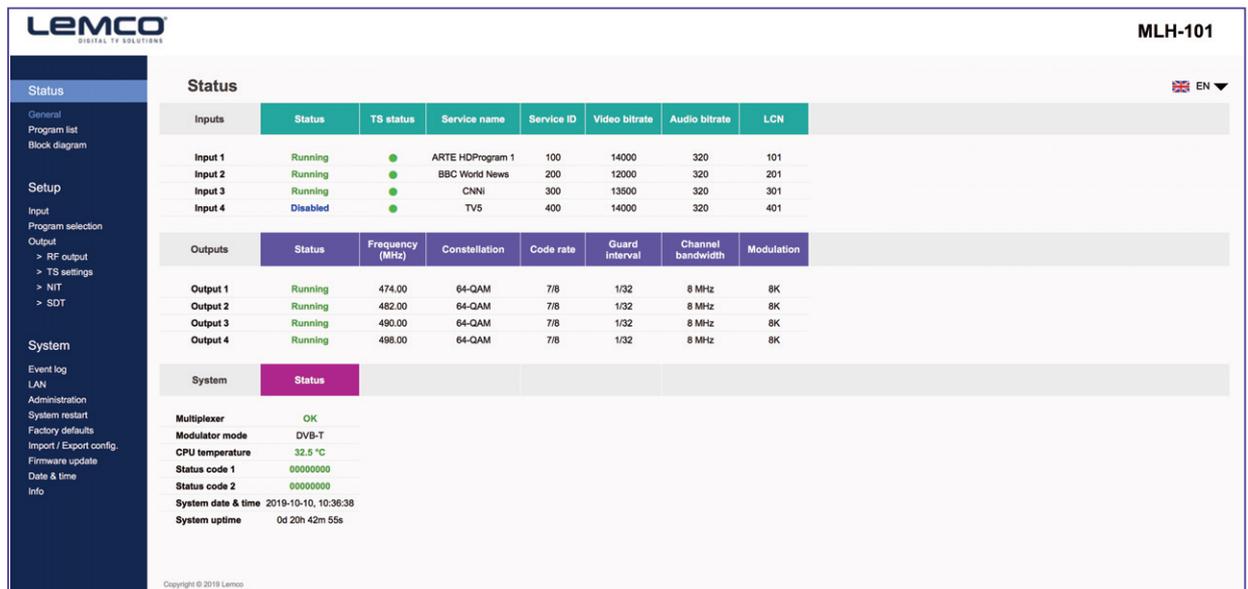
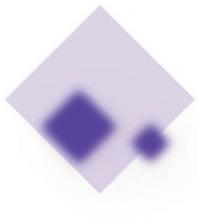


Figure No 1

Status - Inputs 1..4

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...4

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-101 provides information of all programs that are currently being distributed via its four RF outputs.

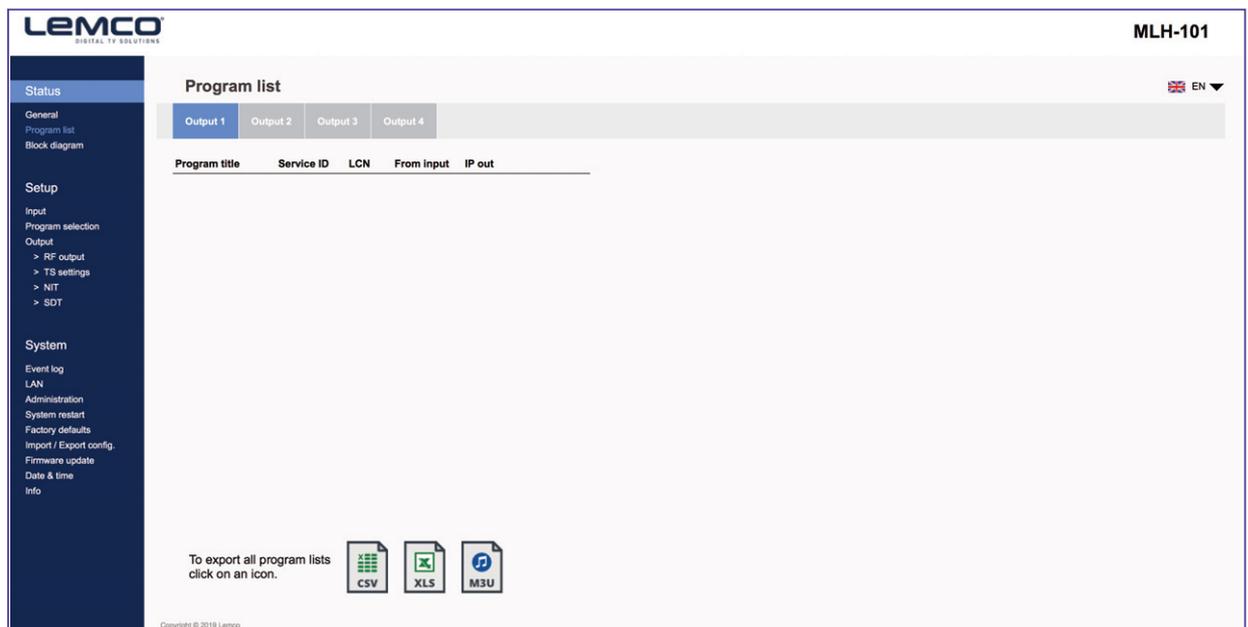


Figure No 2

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.

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.

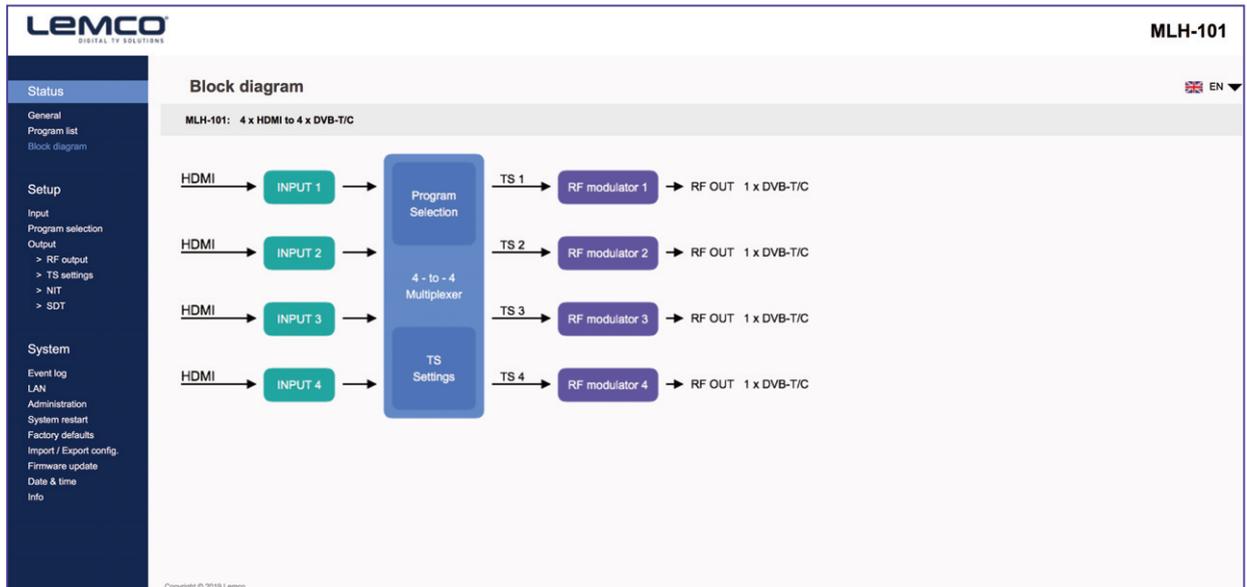
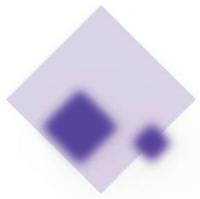


Figure No3

Setup

4.2.4 "Input" page

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

There are four tabs including all the 4 HD inputs. For each tuner the user needs to program the following fields:

The screenshot shows the 'Input' configuration page for Input 1. The page has a sidebar with navigation options: Status, Setup, and System. The 'Setup' section is expanded to show 'Input', 'Program selection', 'Output', 'TS settings', 'NIT', and 'SDT'. The 'Encoder settings' section includes the following fields:

- Input: Enabled
- Service name: ARTE HDProgram 1
- Service ID: 100 (1...65535)
- Output resolution: Auto
- Video bitrate: 14000 kbps
- Audio bitrate: 320 kbps
- Audio encoding: AAC
- HDCP: Enabled
- LCN: 101 (1...1023)
- PMT PID: 5100 (31...8100)
- Video PID: 5102 (31...8100)
- Audio PID: 5101 (31...8100)

Buttons for 'Apply' and 'Refresh' are located below the settings. The 'Encoder status' section shows:

- Encoder: Running
- Encoder version: (blank)

Figure No 4



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-101 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.

The screenshot shows the 'Program selection' page in the MLH-101 web interface. On the left is a navigation menu with sections for Status, Setup, and System. The main content area has a 'Program selection' table with the following data:

Encoder	Service name	Service ID	LCN	Bandwidth (Kbps)	Output
1	ARTE HDProgram 1	100	101	15000	TS OUT 1
2	BBC World News	200	201	13000	TS OUT 1
3	CNNi	300	301	14500	TS OUT 2
4	TV5	400	401	15000	TS OUT 2

Below the table are 'Apply' and 'Refresh' buttons. The 'Status' section contains a table with the following data:

	Bitrate (Kbps)		Peak detection	Payload	
	Max.	Current			
TS OUT 1	31668	0	Green	0%	
TS OUT 2	31668	0	Green	0%	
TS OUT 3	31668	0	Yellow	0%	
TS OUT 4	31668	0	Red	0%	

At the bottom right of the status section, there is a 'Refresh' button, a dropdown menu set to 'Every 5 sec', and a 'Now' button. A 'Reset' button is located below the status table.

Figure No 5

This page depicts all programs coming from the 4x HD inputs and their settings.

For each program the MLH-101 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

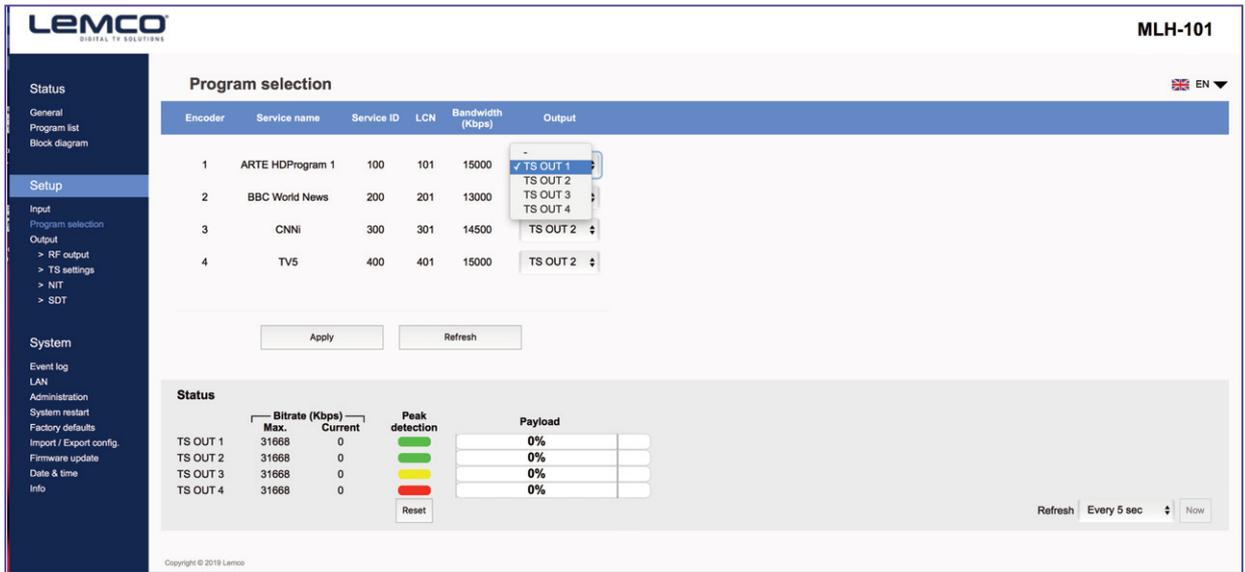
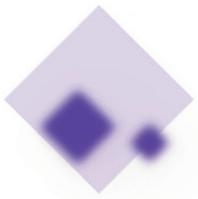


Figure No 6

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

Caution!

The number of programs that the MLH-101 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 four modulators on MLH-101 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.

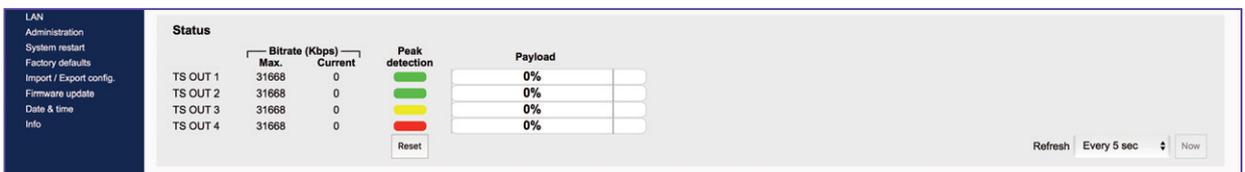
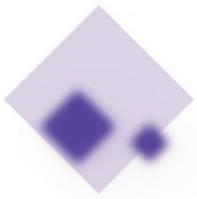


Figure No 7



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 - "RF Output" page

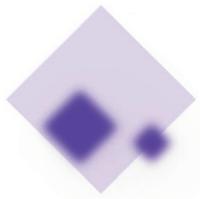
In the "RF Output" page (Figure No 8) the user is able to setup the RF output settings of the MLH-101.

The screenshot shows the MLH-101 web interface. On the left is a navigation menu with sections: Status (General, Program list, Block diagram), Setup (Input, Program selection, Output, RF output, TS settings, NIT, SDT), and System (Event log, LAN, Administration, System restart, Factory defaults, Import / Export config, Firmware update, Date & time, Info). The main content area is titled 'RF output' and includes a mode selector (DVB-C, DVB-T), a table of output settings, an 'Output level' section with sliders, and a 'Status' section with a table of bitrate and peak detection indicators.

Output	Frequency (MHz)	Constellation	Code rate	Guard interval	Channel bandwidth	Modulation	Enabled
Output 1	474.00	64-QAM	7/8	1/32	8 MHz	8K	✓
Output 2	482.00	64-QAM	7/8	1/32	8 MHz	8K	✓
Output 3	490.00	64-QAM	7/8	1/32	8 MHz	8K	✓
Output 4	498.00	64-QAM	7/8	1/32	8 MHz	8K	✓

TS OUT	Bitrate (Kbps)		Peak detection	Payload	
	Max.	Current			
TS OUT 1	31668	0	Green	0%	
TS OUT 2	31668	0	Green	0%	
TS OUT 3	31668	0	Yellow	0%	
TS OUT 4	31668	0	Red	0%	

Figure No 8



RF output

DVB-C DVB-T

With the use of the radio buttons the user is able to select the mode that the MLH-101 will operate as follows:

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

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

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

- ▣▣ 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 four outputs of the MLH-101 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 program in adjacent channels.

E.g. If the user sets the CH21 in UHF band on modulator No1 the other three modulators will be automatically set to CH22, CH23 and CH24, respectively.

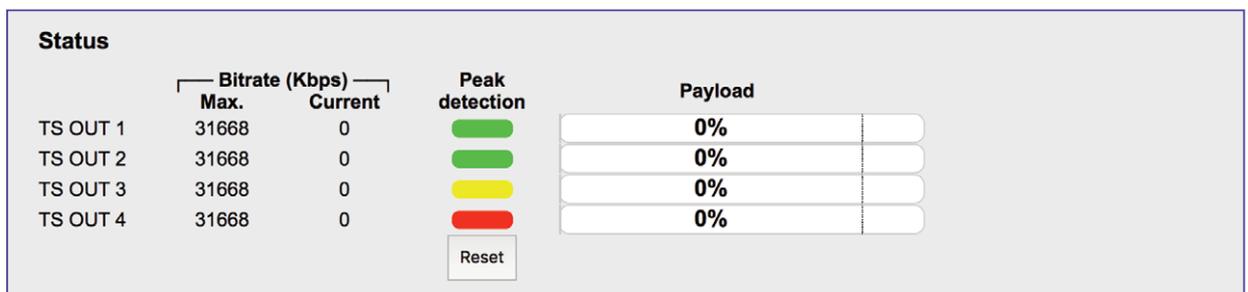
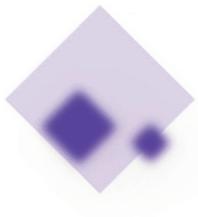


Figure No 9

The status section in (Figure No 9) 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.



4.2.7 - "TS settings" page

In this section (Figure 10), the user is able to setup all the TS settings of the four multiplex in MLH-101's output.

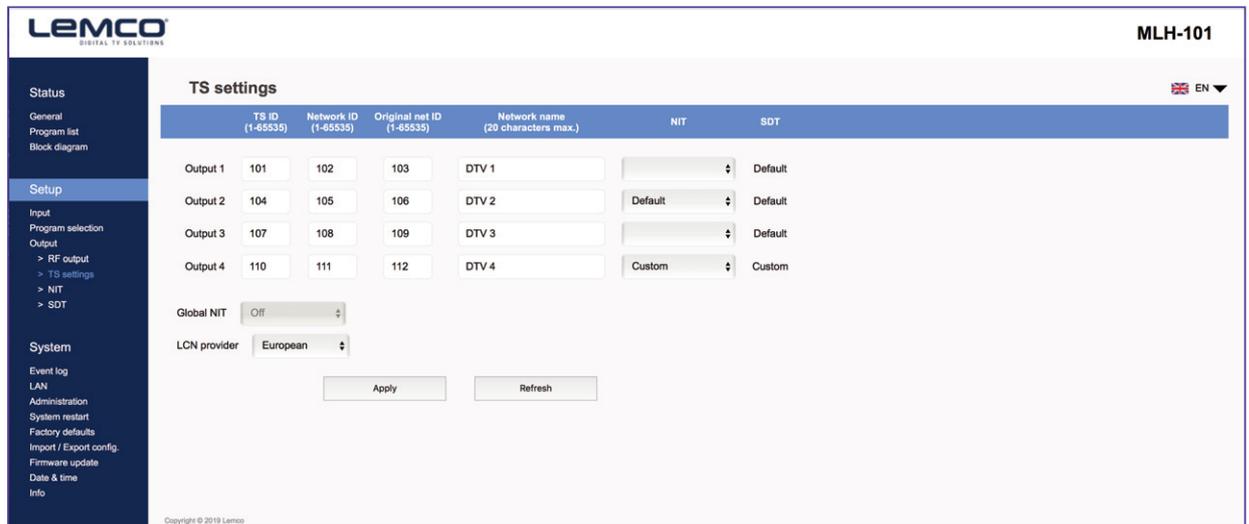


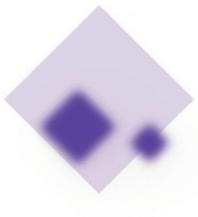
Figure No 10

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: Choose from Basic, Default and Custom
- LCN provider: Choose the appropriate LCN provider (EACEM, ITC, Nordig, APN)

4.2.8 - "NIT" page

In this section (Figure 11), the user is able to create custom NIT table for each of the four outputs of the device. Moreover, this section offers the ability to export / import a NIT table. For more information on how to create a custom NIT table please refer to "Lemco NIT creation guidelines.pdf" document in Lemco's website.



NIT - Network Information Table

Output 1 | Output 2 | Output 3 | Output 4 | Export

NIT mode: **Basic**

Network name: NIT version:

Network ID: LCN provider:

Current settings

#	TSID	Orig. Net ID	Freq (MHz)	Bandwidth	Constellation	Code rate	Guard interval	Transmission mode	Private data	Services						
										#	Svc ID	LCN	Type	Visible	Manage	

+ Add - Delete Export Import Apply Refresh

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Figure No 11

4.2.9 - "SDT" page

In this section (Figure 12), the user is able to create custom SDT table for each of the four outputs of the device. Moreover, this section offers the ability to export / import a SDT table.

SDT - Service Description Table

Output 1 | Output 2 | Output 3 | Output 4 | Export

SDT mode : **Default**

#	TSID	Orig. Net ID	Table type	Version	Services				
					#	Svc ID	Service name	Provider name	Svc type

+ Add - Delete Export Import Apply Refresh

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Figure No 12



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

4.2.10 - "Event log" page

In "Event log" page (Figure No 13) 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.

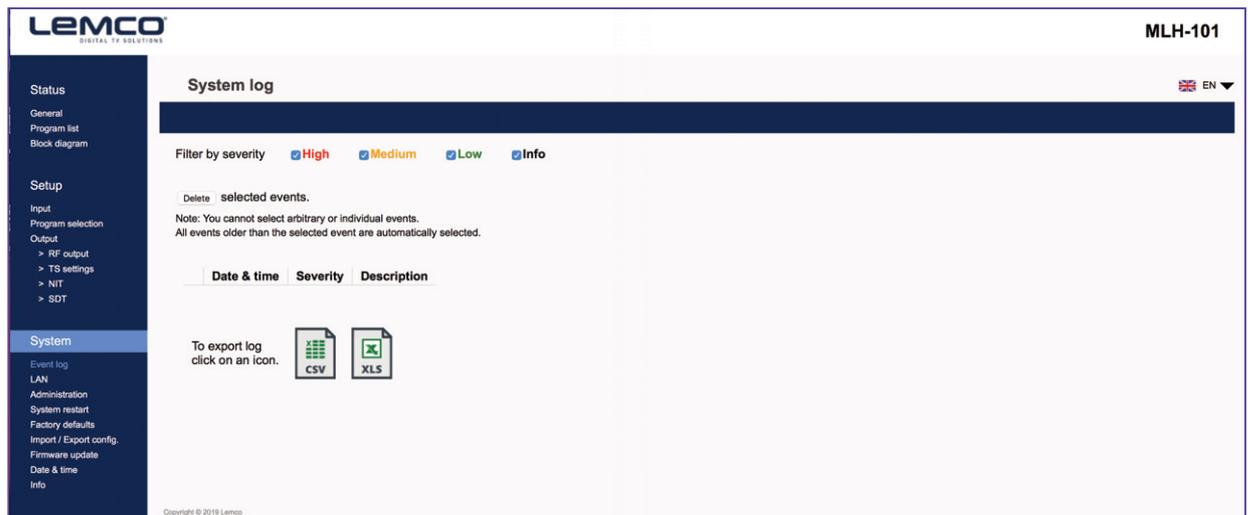
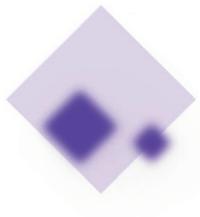


Figure No 13

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



4.2.11 - "LAN" page

In "LAN" page (Figure No 14) the user is able to setup all the parameters of the LAN control of the device as follows:

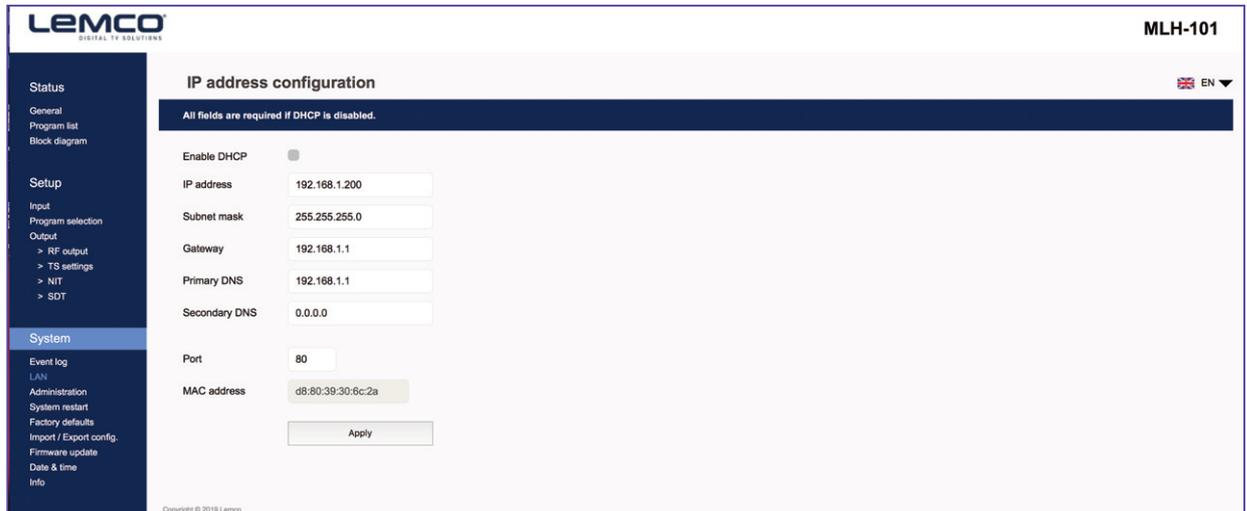


Figure No 14

- || ▸ 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
- || ▸ address: Depicts the MAC address of the LAN control

4.2.12 - "Administration" page

In "Administration" section (Figure No 15) the user is able to change the default password of the webserver.

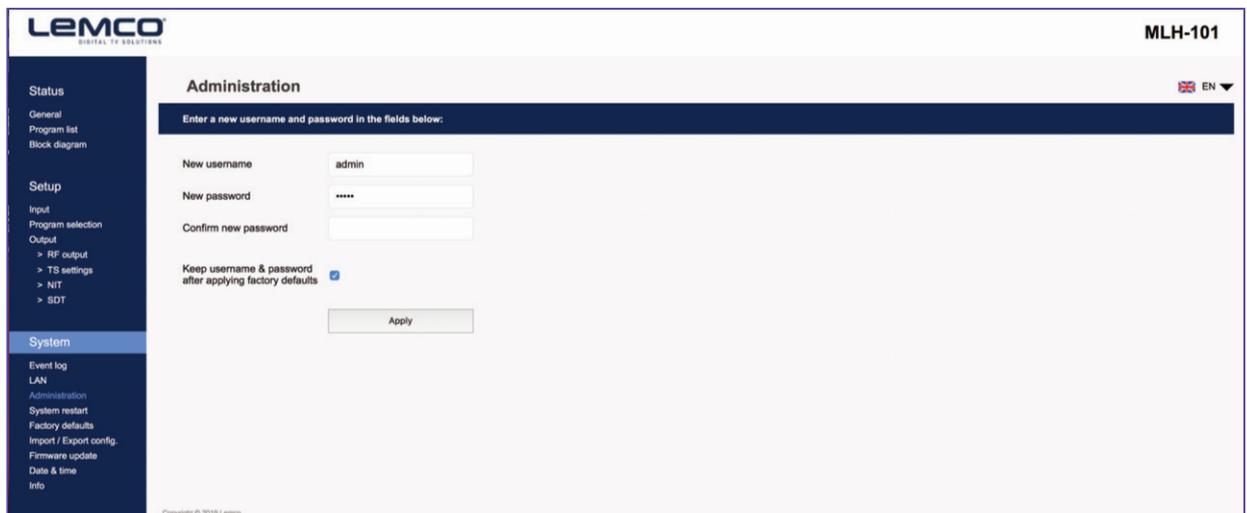
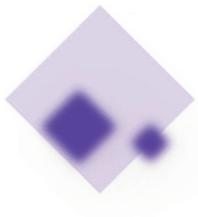


Figure No 15



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”.

4.2.13 - “System restart” page

In “System restart” section (Figure No 16) the user is able to apply a full reset to the device.

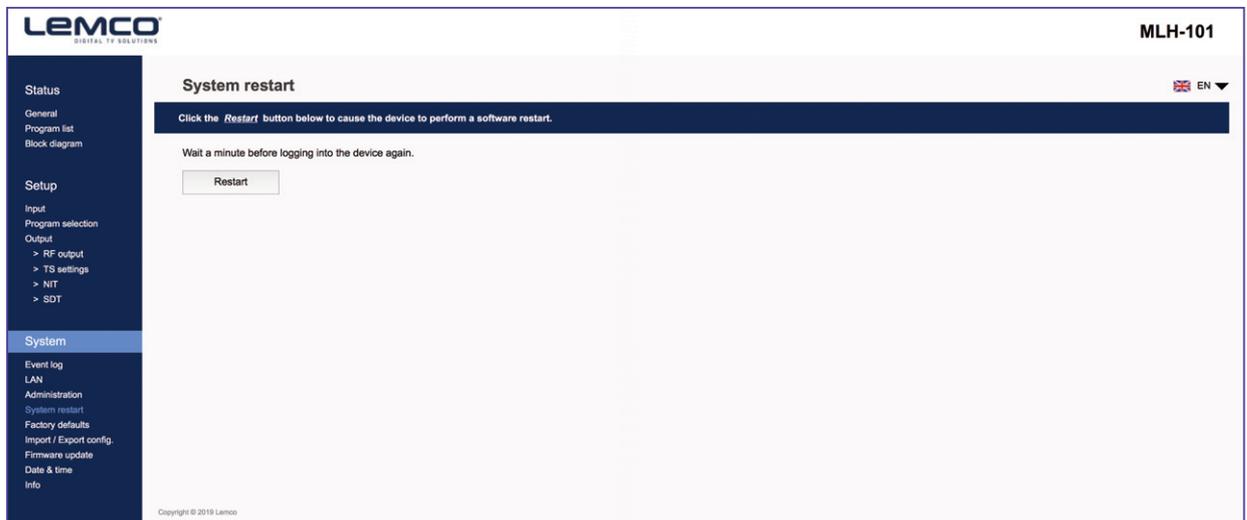


Figure No 16

4.2.14 - “Factory default” page

In “Factory default” section (Figure No 17) the user is able to apply a factory default reset either as DVB-T or DVB-C.

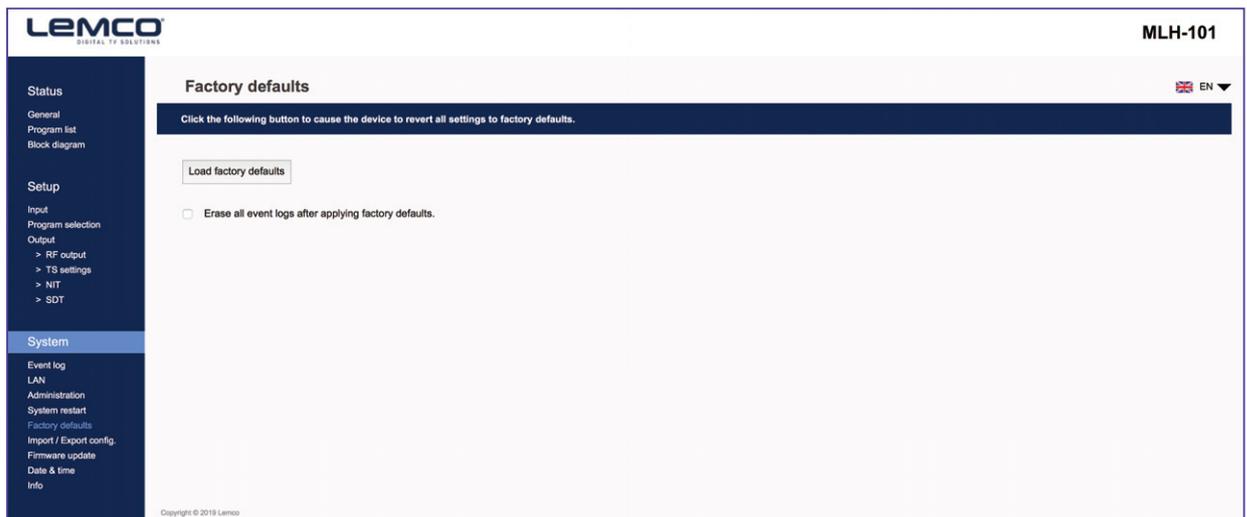
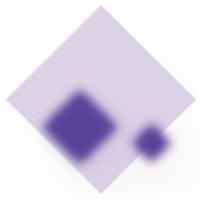


Figure No 17



4.2.15 - "Import/Export Config" page

In "Import/Export Config" section (Figure No 18) the user is able to do the following:

1. Export: Save all the configuration as a specific file
2. Import: Upload a previously save configuration file.

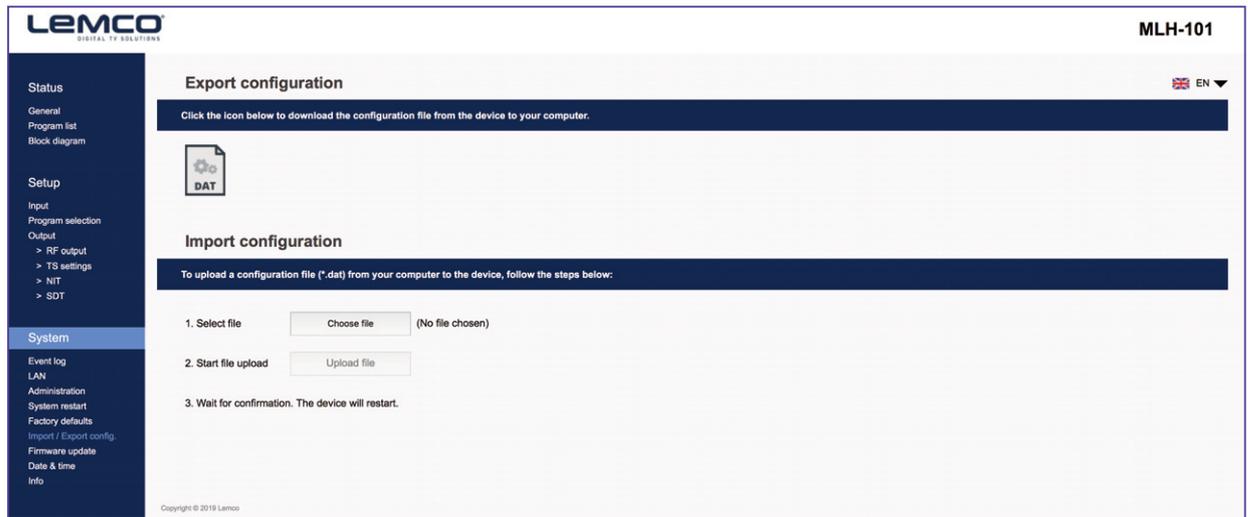


Figure No 18

4.2.16 - "Firmware update" page

In "Firmware update" (Figure No 19) section the user is able to upload a new firmware update using the appropriate file..

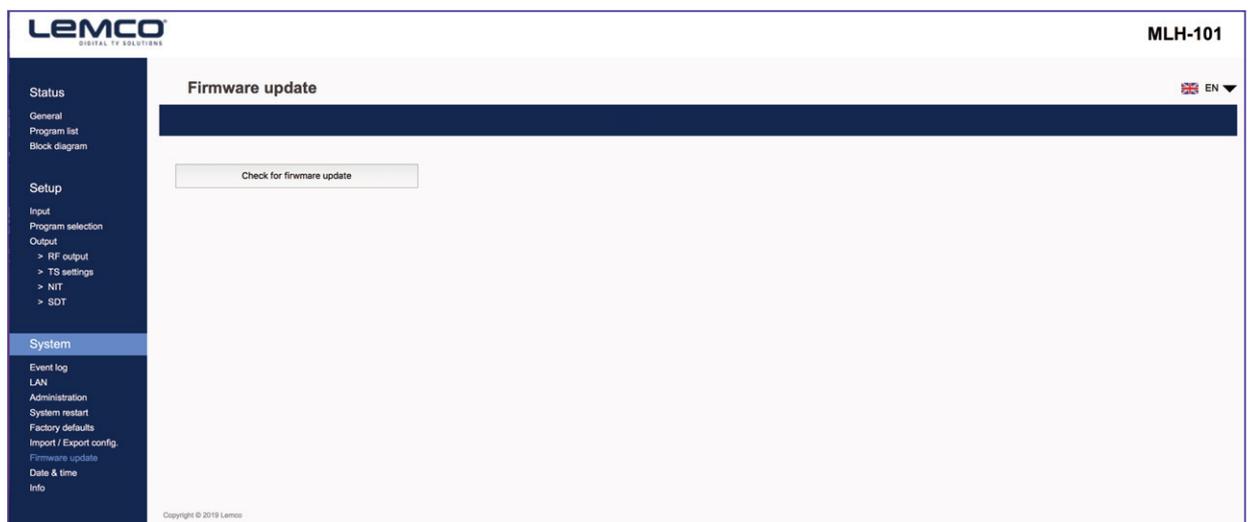
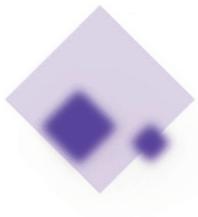


Figure No 19



4.2.17 - "Date & Time" page

In "Date & Time" (Figure No 20) 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 timezone of his country.

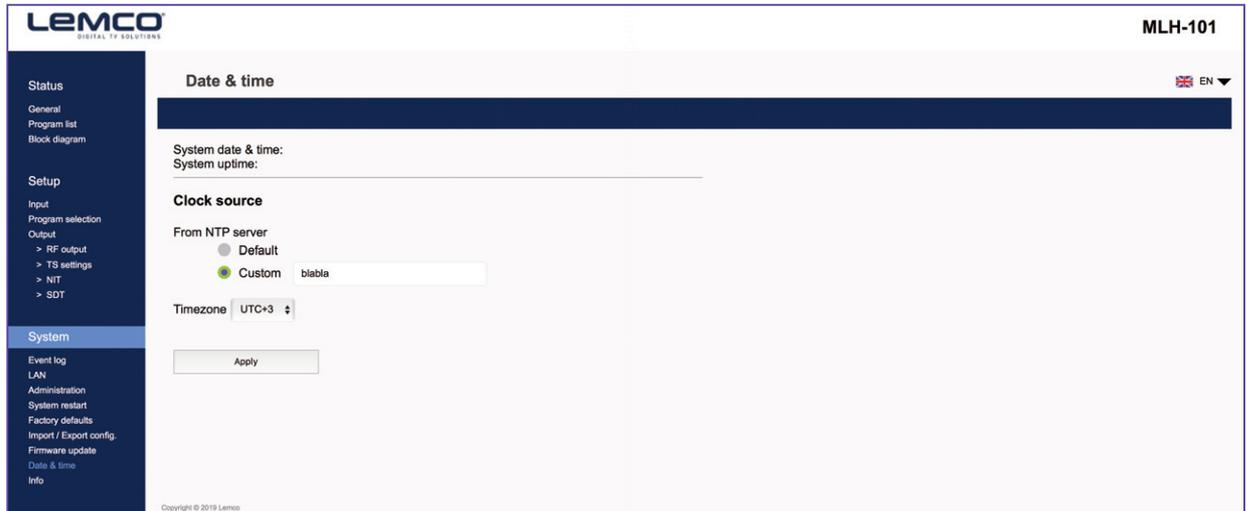


Figure No 20

4.2.18 - "Info" page

In "Info" (Figure No 21) section the user is able to see the serial No of the device as well as firmware and hardware versions.

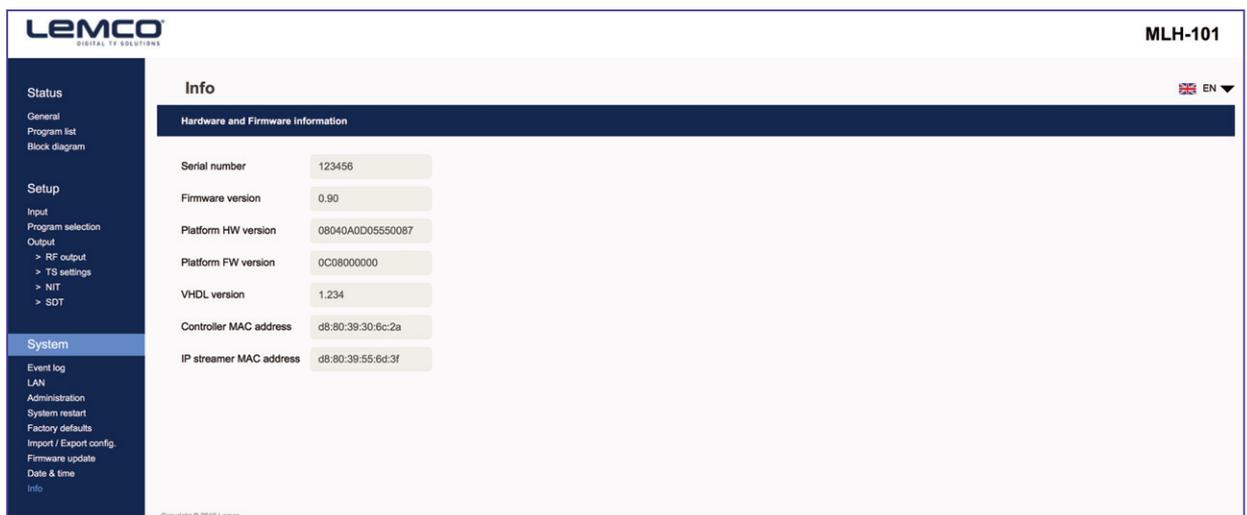
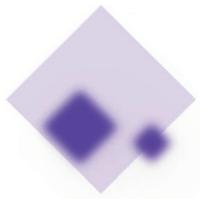


Figure No 21



5. TECHNICAL SPECIFICATIONS

Input Specifications

HD Input

Type	4 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	4 x RF out in adjacent channels
Output Frequencies	110...950MHz (1 Hz step)
Output Level	90dB μ V
Connector	75 Ω - F, female
Output Attenuator	0...-20dB
MER	>42dB
Output loop-through loss	<1dB



Transport Stream Processing

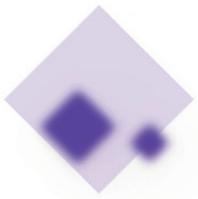
Services	User selection by service names
Automatic Regeneration	PAT, CAT, SDT, PMTs, EITs tables
NIT/SDT	Pass-through, Custom, Automatic
PCR	re-stamping
LCN support	Yes

Programming Interface

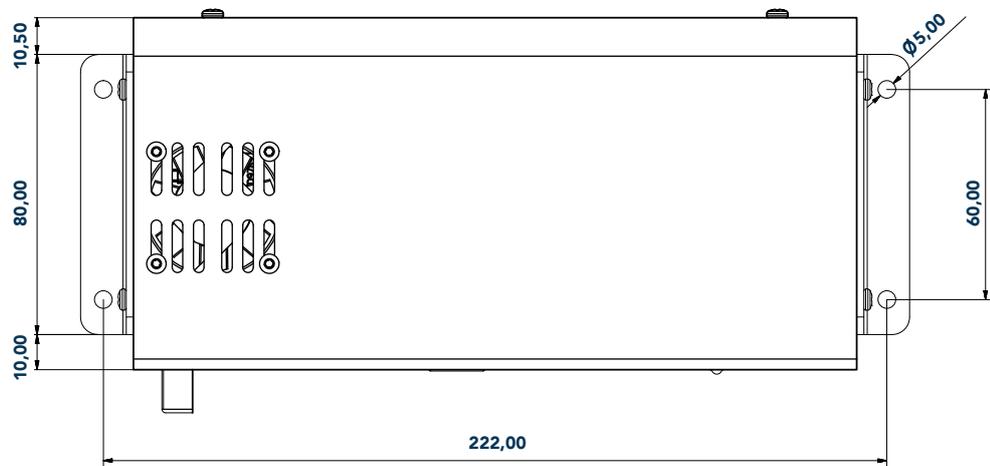
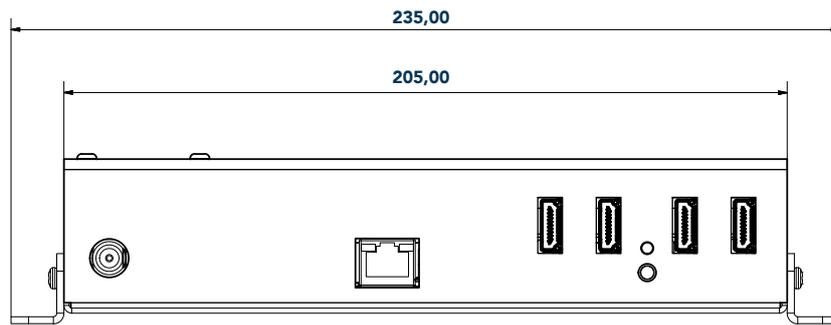
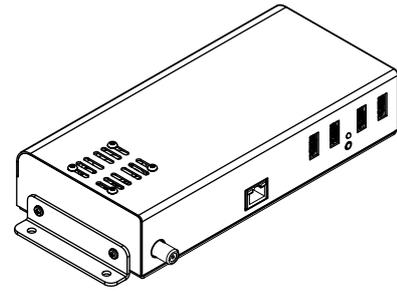
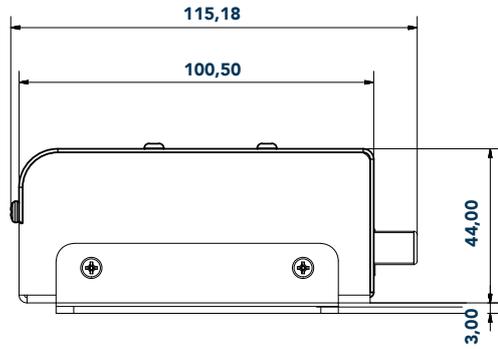
Ethernet webserver	Yes, embedded webserver
Speed	10/100 Mbps
Connector	RJ45
Browser compatibility	Chrome, Firefox, Safari, Opera, Edge etc. (Must support HTML v5.0)
SNMP support	Yes
SNMP version	v2.0

General

Power Supply	2 x +12VDC
Power supply consumption	2.0A 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. LEMCO LIMITED WARRANTY

This Lemco unit is guaranteed against defects in workmanship and materials for a period of five (5) years beginning on the date of purchase of the product. During the applicable warranty period, Lemco will repair or replace at our sole option, without charge, any defective component part of the purchased unit. The unit is to be delivered packed in adequate packing AFTER an authorization for return has been received.

The owner's responsibilities are to use the instrument in accordance with its written instructions, to provide transport to and from our facilities in the event service is required, and to provide proof of purchase if requested.

Our warranty does not cover any problem resulting from:

- (a) accident; abuse; neglect; shock; electrostatic discharge; heat or humidity beyond product specifications; improper installation, operation, maintenance or modification
- (b) any misuse contrary to the instructions in the user manual
- (c) malfunctions caused by other equipment.

WARNING!!

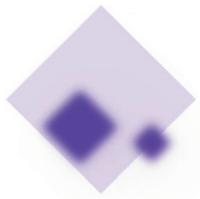
Our limited warranty is considered void if a product is returned with removed, damaged or tampered labels or any alterations (including removal of any component or external cover) carried out by unauthorized personnel.

OUT OF WARRANTY SERVICING

We repair and service units of our production even once the warranty has expired, if this is economically the best solution to the customer.

The mechanical and electronic spare parts are replaceable for a five-year period after production when the circuits are assembled with discrete components. When integrated circuits are used, the supply of spare parts is guaranteed up to the depletion of our stock and, depending on the possibility of procuring them on the worldwide market.

To avoid any unnecessary loss of time, it is very important that the instrument be returned to our premises accompanied by a proper delivery note, duly completed with all the required information, as per the legal dispositions currently enforced.



8. WARNINGS

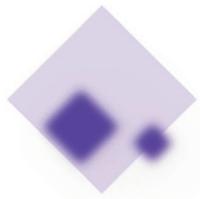
Content warning

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



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