Digital TV modulator MI520

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1. Product description

The device is a digital TV modulator with IP input and 2 RF output channels (standards DVB-T, DVB-C, J.83B, ISDB-T). The device is designed for digital modulation with Transport Stream Processing of TV or Radio programs, received from streamers, security cameras or other IPTV sources. Device supports SPTS and MPTS streams. It filters services (in MPTS case), modifies SI (Service Information), generates NIT (Network Information table), LCN (Logical Channel Number). Configuration can be changed by using the Web Interface.

MI520P is packed with external mains power supply.

Transport stream input interface is a 100 Mbit/s Ethernet and is shared with control interface.

The product is intended for indoor usage only.

2. Safety instructions

Installation of the modulator must be done according IEC60728-11 and national safety standards.

The modulator is powered from external power supply +12 V. This voltage is not dangerous to life.

Any repairs must be done by a skilled personnel.

To avoid the electric shock follow these instructions:

Do not plug mains power supply of the modulator into the mains until all cables have been connected correctly;

To disconnect the modulator from mains completely, disconnect plug of modulator power supply from mains socket;

Modulator shall not be exposed to dripping or splashing water and no objects filled with liquids, such as vases, shall be placed on it;

Avoid placing modulator next to central heating components, near highly combustible materials and in areas of high humidity;

Before connecting the modulator to multimedia system, be sure that system is installed in accordance to national safety standards;

Devices of multimedia system should have easy access to disconnect them from the mains supply;

No naked flame sources, such as lighted candles, should be placed on modulator;

If the modulator has been kept in cold conditions for a long time, keep it in a warm room no less than 2 hours before plugging into the mains;

Do not insert any objects into ventilation openings;

The ventilation should not be impeded by covering the ventilation openings with items, such as newspapers, table-cloths, curtains;

Mount the modulator on not flammable wall or in not flammable installation box in vertical position with RF connectors underneath. The modulator must be fixed with steel screws Ø 3.5-4 mm. The screws are not included in a package;

From top, front and bottom of installed modulator must be at least 10 cm free space.

Manual in .pdf

Vers. 1.06

Caution (mark on rear side).

Risk of electric shock (mark on rear side).

This product complies with the relevant clauses of the European Directive 2002/96/EC. The unit must be recycled or discarded according to applicable local and national regulations (mark on rear side) .

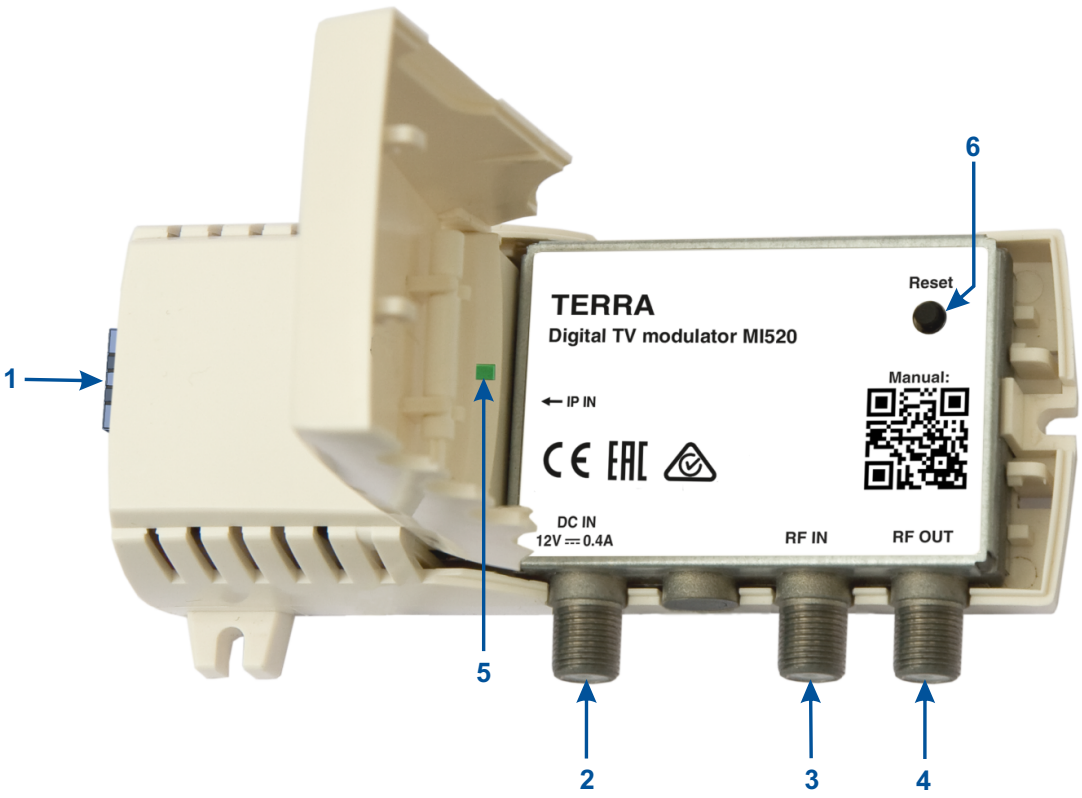
Equipment intended for indoor usage only (mark on rear side).

This product is in accordance to following norms of EU: EMC norm EN50083-2, safety norm EN62368-1 and RoHS norm EN50581.

This product is in accordance with Custom Union Technical Regulations: “Electromagnetic compatibility of technical equipment“ CU TR 020/2011, “On safety of low-voltage equipment“ CU TR 004/2011.

This product is in accordance with safety standard AS/NZS 60065 and EMC standards of Australia.

3. External view



1 - IPTV and control interface. RJ45 socket.
2 - **DC IN** - DC entry 3.5/1.3 mm (DC jack)
3 - **RF IN** - RF signal input connector (F type)
4 - **RF OUT** - RF signal output connector (F type)
5 - status indicator
6 - **Reset** - reset and restore defaults button

Figure 1. External view of the modulator

4. INSTALLATION INSTRUCTIONS

Read the safety instruction first.

Installation of system according standard IEC60728-11 ensures safety of personnel and prevents apparatus against damaging due to lightning or other sources of overvoltage surges.

If RF IN connector on the modulator is not used, connect the 75 Ω load supplied.

To wall mount the modulator - screw the modulator to the wall (see Figure 1).

Do not connect TV antennas to modulator RF IN connector directly. If you intend to combine TV signals of antennas and the modulator, plug in booster with output-to-input isolation ≥ 20 dB between antenna output and RF IN connector.

5. Operating

5.1 Login information

Modulator leaves the factory with this default IP interface parameters:

IP address of the device: **192.168.1.10**
Subnet mask: **255.255.255.0**
Default Gateway: **192.168.1.1**

Be sure, there are no any other devices in the network with the same IP address before connecting the device to the network. To access the device, use a personal computer (PC) equipped with an Ethernet card and RJ-45 cable (CAT-5E or CAT-6). The IP address of the PC/MAC must be configured within the following range: 192.168.1.2 - 192.168.1.254. Do not use 192.168.1.10, since this is the IP address of the module to be configured. To start the configuration of the device, open supported WEB browser (see specification, which browsers are supported) and type in the following location: http://192.168.1.10. The login prompt will appear on the screen (see Figure 2).

Figure 2. Login prompt window

Use the following credentials for the first login:

Username: **admin**

Password: **admin**

5.2 Home page

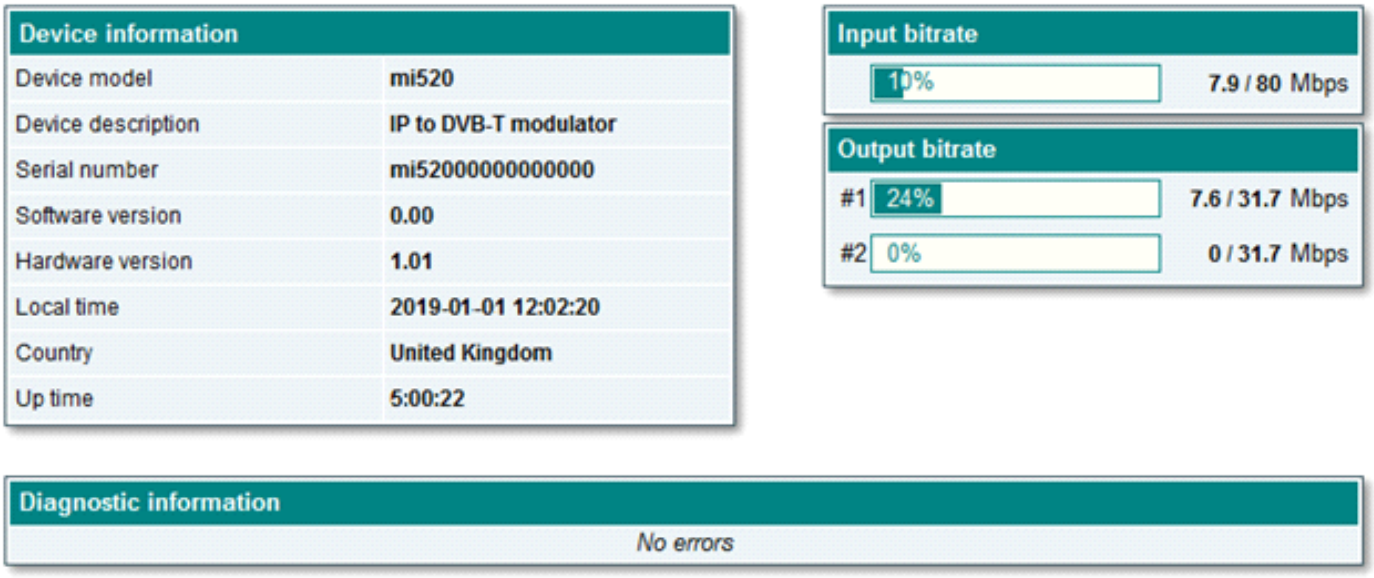


Figure 3. Home page of device

After login, home page of the device will appear with main information about the device and it‘s status. Device description table shows main information about the device. „Device description“ field shows currently selected modulation type, which can be changed at „System menu“/“Change modulation type“ submenu. „Country” must be the one in which you are. It can be changed at “System menu”/”Country selection”. “Local time” should show correct local time for selected country. “Up time” shows time duration from the last startup of the device.

“Diagnostic information” table shows all problems, which the device has at the moment. Any error message in this table will also lit the red indicator **[5]** of the device. No errors will be indicated as green indicator.

„Input bitrate“ table shows current input bitrate of IPTV. Ensure to not exceed maximum allowed bitrate, as described in "Technical specifications", otherwise even a control port will be hardly accessible.

„Output bitrate“ shows current output bitrate, and the maximum allowed bitrate according to selected modulation. Exceeding this value will raise bitrate overflow error and a pixeling effect will appear on the TV screen.

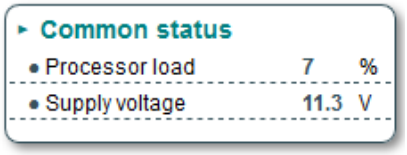


Figure 4. Common status

There is one more section in the page – „Common status“ (see Figure 4). It shows additional status parameters of the device. „Processor load“ parameter shows the load of CPU, which mainly depends on input and output bitrates. Ensure to not exceed it 90%.

„Supply voltage“ is the indicator of the power supply voltage. Make sure the value matches the permissible range described in the specification.

5.3 TS input

All input transport streams must be described in this page.

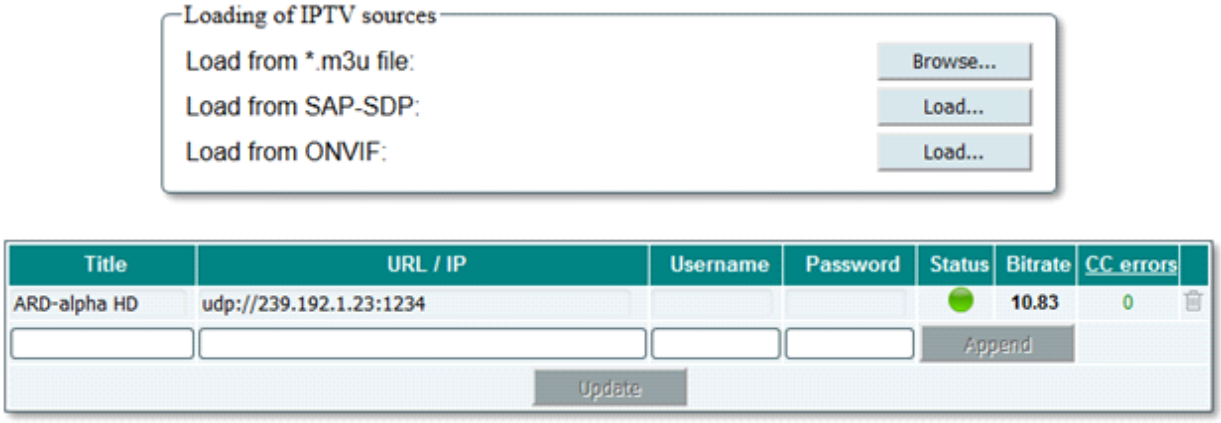


Figure 5. TS Input

The table in Figure 5 has the list of IPTV sources. „Title“ is the name of the stream. If there is no title inside the transport stream (or SDT table), this title will be used (for ex in case of RTSP) in the output. Otherwise, this title is for informational purposes only.

“URL / IP” – URL of the stream. Full URL, including protocol and port number, must be entered. If the protocol is skipped, UDP protocol will be assigned. If port number will be skipped, 1234 port number will be used for UDP protocol, 554 port number will be used for RTSP protocol.

“Username” and “Password” fields are used for RTSP only. In case of UDP protocol, these fields will be ignored.

“Status” indicator may have 3 different colors, describing the status of the input stream. Green circle indicates detection of valid signal. Yellow circle indicates a progress of a process. Usually it appears in RTSP protocol while the device is trying to establish a connection to the camera. Red circle indicates no valid stream detected.

“Bitrate” is measured input bitrate of the stream in Mbit/s.

“CC errors” shows continuity counter errors detected in the stream. Click on this title to reset all counters in this column.

Trash box icon on the right allows to remove the stream. A confirmation window will popup asking to confirm the action before it executing.

To add new streams to this table, fill-in corresponding empty fields and press “Append”. When all streams have been entered, press “Update” button to send all this information to the device.

To edit any of streams in the table, just hover the mouse over the field, press the mouse left button and edit. After modification, press <TAB> or <ENTER> key to activate “Update” button. Press “Update” to send modified values to the device.

The block named “Loading of IPTV sources” in Figure 5 "TS Input" is dedicated for automatic insertion of IPTV sources. Device supports a playlist of M3U format. Press “Browse”, select *.m3u file from your computer and click “Open”. The list will be loaded into the table. Remove all unwanted lines from the list by clicking onto the trash box icon. Press “Update”.

NOTE: Ensure, that a total bitrate in a list is in the range of specification.

The list of IPTV sources can be also loaded from SAP-SDP IP protocol. Press “Load…” button to get the list of available sources. See Figure 6.

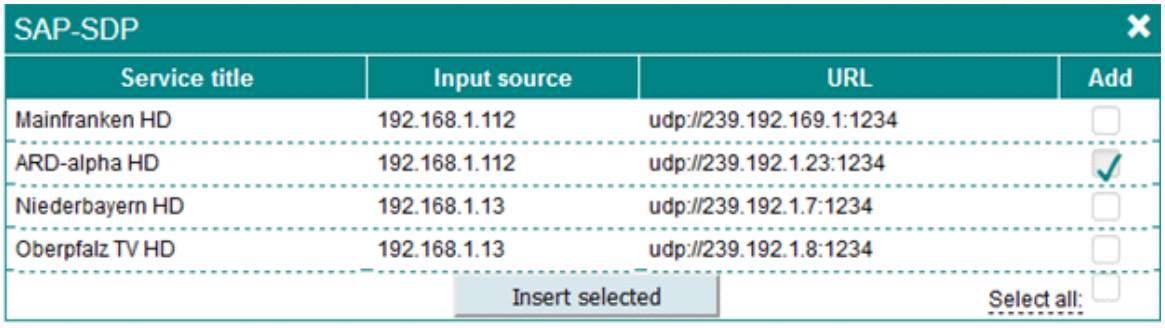


Figure 6. SAP-SDP sources

Streams, which are already in the list (Figure 5) will be marked and disabled to not re-include them again. Check “Add” checkbox to include new streams to the list and press “Insert selected”. Selected streams will be inserted to the list. Press “Update” to send this list to the device.

Most of IPTV cameras support ONVIF protocol. Device can automatically detect such cameras in the network. Press “Load…” button at “Load from ONVIF” line (Figure 5) to see ONVIF supported cameras. The list of available cameras will appear. See Figure 7.

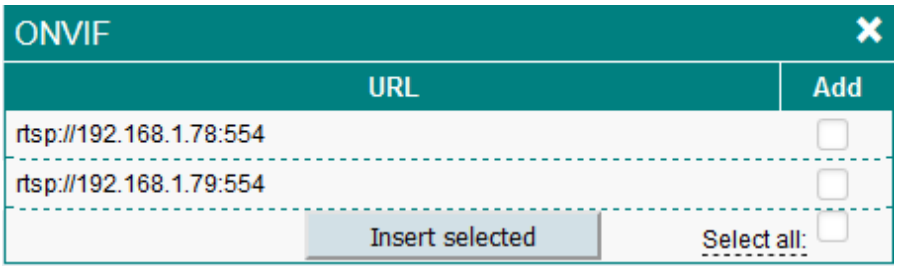


Figure 7. List of ONVIF cameras

Check the “Add” checkbox and press “Insert selected” to add cameras to the list. After that you need manually to complete missing information. “Title” is optional but recommended field to add. If camera requires a password, fill in “Username” and “Password” fields. When all fields are correct, press “Update” button to send information to the device.

ONVIF supported cameras can be controlled by device. Press on the camera icon to open control window (see Figure 8).

Figure 8. ONVIF camera control icon

If camera supports ONVIF protocol, username and password is accepted by camera, new modal window will appear with a video stream from the camera (see Figure 9). After several seconds a video from the camera will appear on the screen. At the moment, only H.264 video can be shown on the screen.

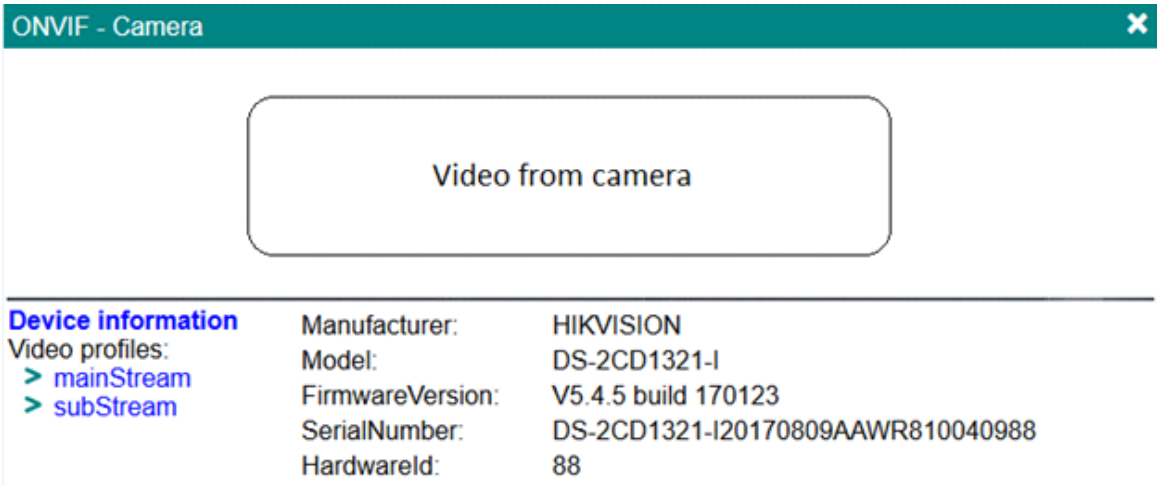


Figure 9. ONVIF camera information

On the left-bottom side menu of ONVIF exists. “Device information” shows the information about the camera. Below this line exist all video profiles, which camera has. Press on the profile’s title to open parameters of the stream. Video profile’s parameters will appear on the screen. See Figure 10.

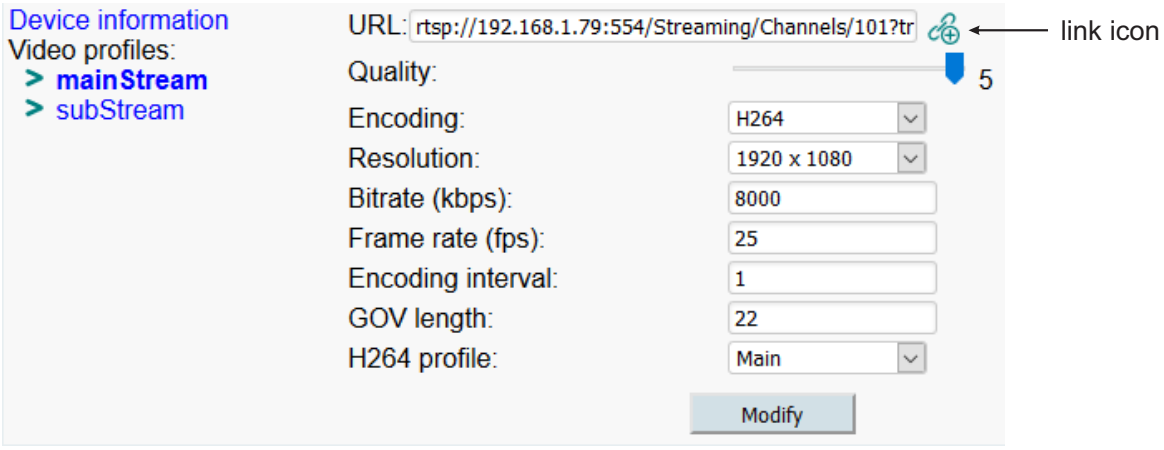


Figure 10. Video profile's parameters

The first line called "URL" is an URL to that stream. It can be copied to the device to receive this stream. URL can be copied and sent to the device by clicking onto the link icon . All other parameters are related to video configuration of the camera and are out of the scope of this user manual. Refer to camera's datasheet for more information about their meanings.

Press "Modify" to send modified parameters to the camera. Changes of some parameters (for ex., a change from H264 to H265 or vice versa) may take up to 10 seconds to get a response, so be patient.

A video in the control window is for reference only, not for monitoring the camera! Device can show only few such cameras at the same time without losing performance of the main job. It also has a latency of several seconds.

5.4 TS Transport Streams

Details of all IPTV sources (see 5.3 "TS input") will be listed in this menu (see Figure 11). All MPTS streams will be expanded to individual independent services, which can be forwarded to any RF output channel.

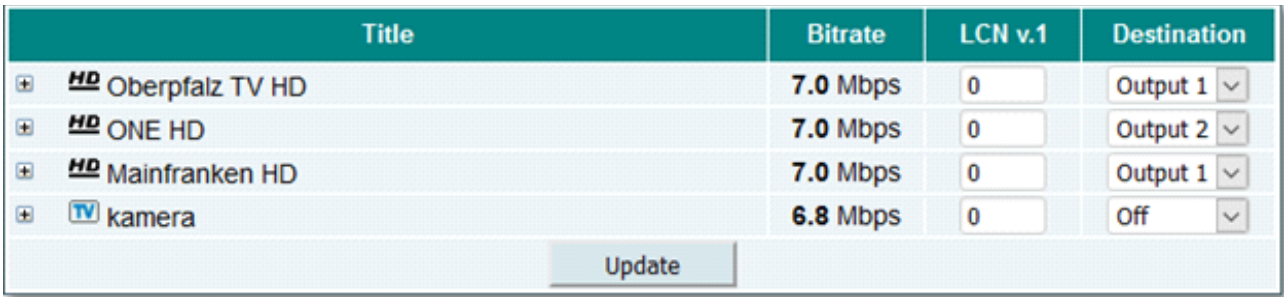


Figure 11. List of transport streams

"Title" column shows title of the service (usually is taken from SDT table). In case if a title is not found in the stream, it will be taken from the "TS Input" title field.

"Bitrate" column shows actual input bitrate in Mbps of the service.

"LCN v.1" is a logical channel number. If TV supports LCN, services will be sorted according to this number. Zero value means, that LCN does not exist for that channel. See 5.5 "NIT" section for more information about LCN.

"Destination" is RF output number, where the service will broadcast.

Sign ⊞ on the left allows to open and edit details of the service. See Figure 12.

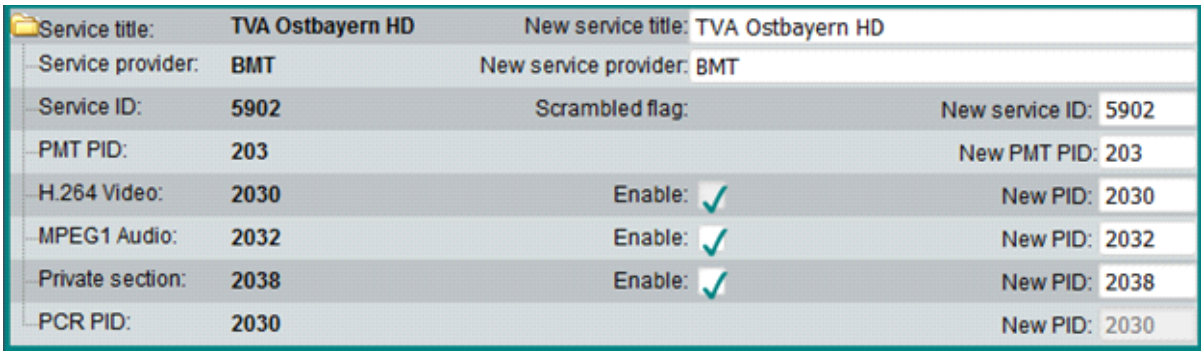


Figure 12. Details of service

On the left part of the details, original service information is displayed. On the right part fields allows to edit the information. “New service title” field allows to change service title. “New service provider” is the name of service provider. “New service ID” is the main identification of the service. All IDs must be unique within one RF channel. User may edit this value, but device will validate and modify silently if a conflict will be detected. TV may require channel rescan if this value is modified.

“New PID” allows to modify PID (packet identifier) of each elementary stream of the service. If the source comes from MPTS, several elementary streams may share the same PID. Ensure, that such streams go to the same RF output. Each elementary stream must have unique PID. Modulator will validate and modify the value if any conflict detected.

“Enable” checkbox allows to turn on/off elementary stream of the service. Streams, caring PCR cannot be disabled.

Press “Update” (Figure 11) to send modified values to the device.

5.5 NIT

NIT is Network Information Table. Two tables exist on this page. The first one is called “Global TS parameters” (see Figure 13). If other devices exist on the same network, be sure they have the same values in this table.

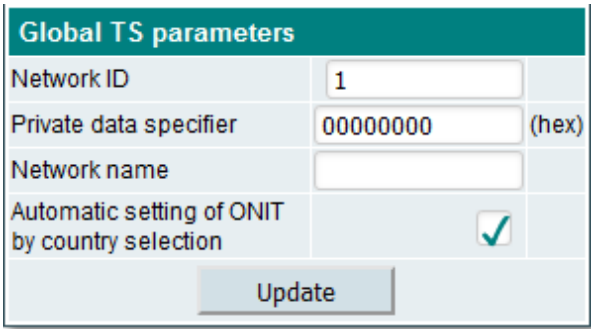


Figure 13. Global TS parameters

It describes NIT parameters, which should be identical in the whole network. “Network ID” is a network identification, which depends on country, operator, network type.

See **https://www.dvbservices.com/identifiers/network_id** for exact value.

“Private data specifier” is related to LCN provider. Zero value in this fields means, that no private data specifier descriptor will be inserted. Some example values for this field is provided in Table 1.

For a list of all values see **https://www.dvbservices.com/identifiers/private_data_spec_id**

Table 1. Private data specifier values

EACEM	00000028
Nordig	00000029
Sweden	000022F1
UK	0000233A

“Network name” is a title of the network. Any text can be entered here.

“Automatic setting of ONIT by country selection” – if this checkbox is checked, device will automatically assign the value of Original Network ID (Figure 14) according to selected country. Otherwise, these values can be edited manually.

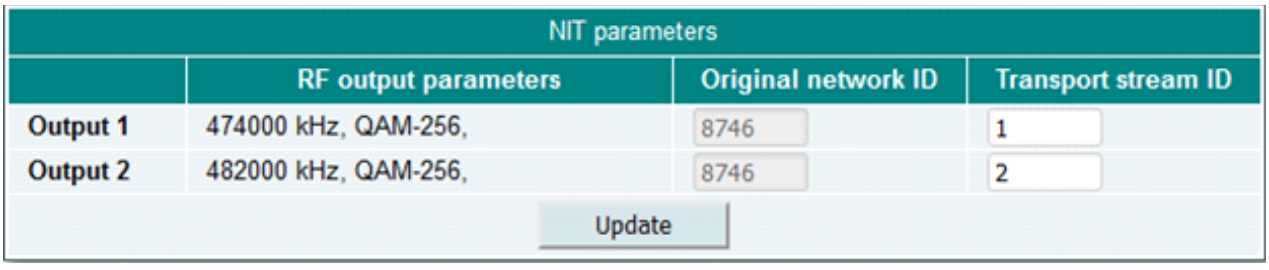


Figure 14. NIT parameters

“NIT parameters” (Figure 14) table has parameters for each RF channel. “RF output parameters” column is just for information purpose. “Original network ID” usually is related to a country. Device will calculate the value automatically if the checkbox “Automatic setting of ONIT by country selection” is checked in Figure 13. If other value is desired, uncheck this checkbox and enter value manually. Usually “Original network ID” is the same for all output channels in the whole network. See **https://www.dvbservices.com/identifiers/original_network_id** for exact value.

“Transport stream ID” must be unique for each RF channel in the whole network. If other modulators exist on the same network, ensure that this number will not conflict with other modulators!

Modulators can detect each other on the LAN via SSDP protocol and broadcast information to RF about each other, so TVs will be able to auto scan all RF channels.

5.6 RF outputs

RF parameters can be modified in this page and it depends on modulation type. The modulator is dual channel, with adjacent RF allocation. Figure 15 shows parameters of DVB-C modulation type.

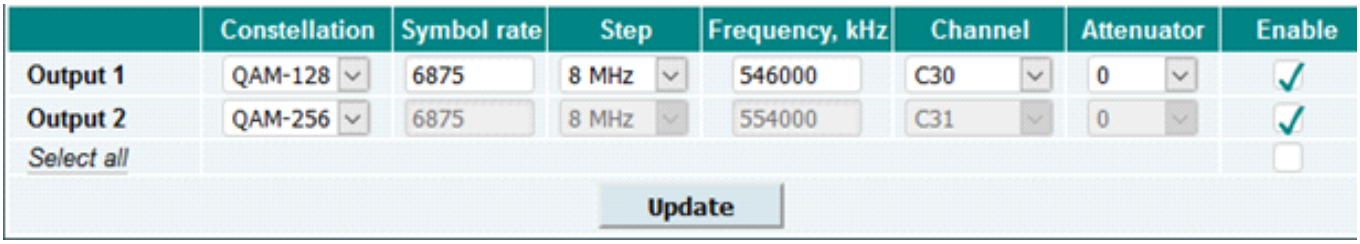


Figure 15. DVB-C RF parameters

"Constellation" parameter is independent for each RF channels and can have values from QAM-16 to QAM-256. "Symbol rate" must be the same for RF channels. "Step" is just an allocation step of RF channels. It can have values of 6 MHz, 7 MHz, 8 MHz, 8.3 MHz. RF frequency of the second modulator is calculated according to this value. "Channel" is RF channel name according to active raster, which depends on selected country. "Attenuator" allows to reduce RF channel power by up to 30 dB. Parameter must be the same for both RF channels. "Enable" checkbox will enable/disable RF output.

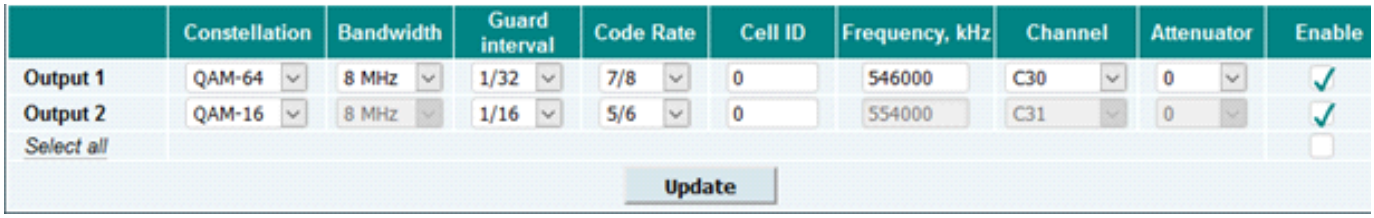


Figure 16. DVB-T RF parameters

In case of DVB-T modulation type (Figure 16), "Constellation" parameter can have values QPSK, QAM-16 and QAM-64. Bandwidth supported by modulator is 7 MHz and 8 MHz, which must be the same for both modulators. "Guard interval", "Code rate" and "Cell ID" are independent parameters of each modulator. "Frequency", "Channel", "Attenuator" and "Enable" parameters are the same as in DVB-C modulator, described above.

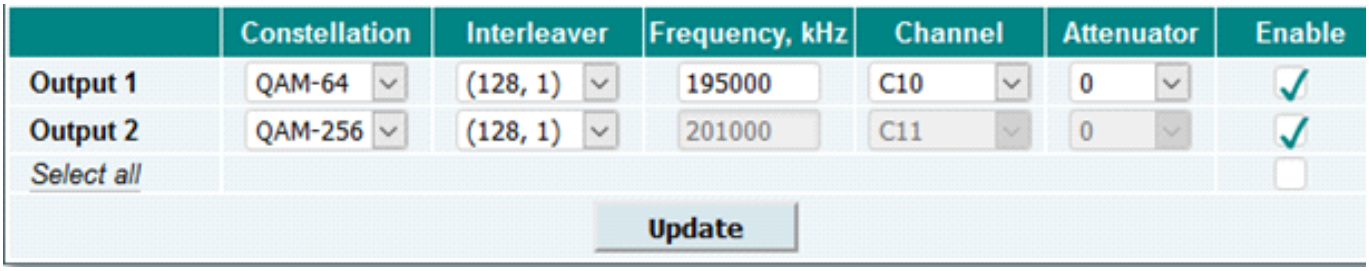


Figure 17. QAM Annex-B parameters

In case of QAM Annex-B modulation type (Figure 17), "Constellation" can be QAM-64 or QAM-256. "Interleaver" parameter can have only these values: 128/1, 128/2, 8/16, 16/8, 32/4, 64/2. Other interleaver values are not supported in the modulator. This type of modulation always has 6 MHz step of frequencies and 6 MHz bandwidth. "Frequency", "Channel", "Attenuator" and "Enable" parameters are the same as in DVB-C modulator, described above.

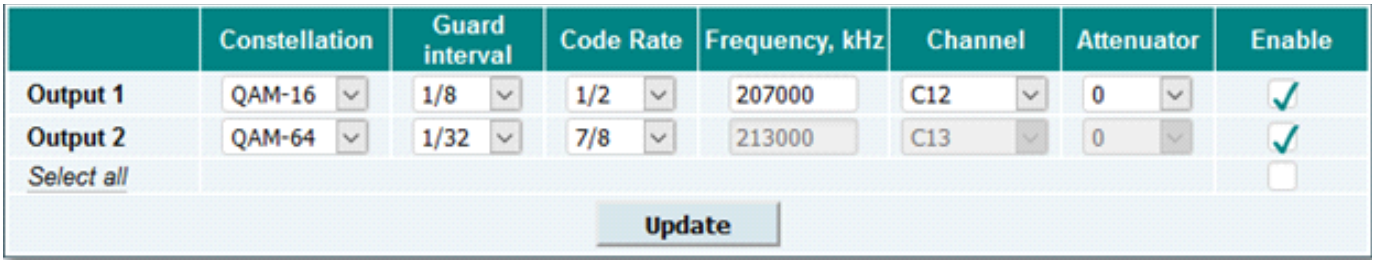


Figure 18. ISDB-T parameters

In case of ISDB-T modulation type (Figure 18), "Constellation" can be QPSK, DQPDK, QAM-16 or QAM-64. This type of modulation always has 6 MHz step of frequencies and 6 MHz bandwidth. Other parameters are the same as in DVB-T modulator.

5.7 IP parameters

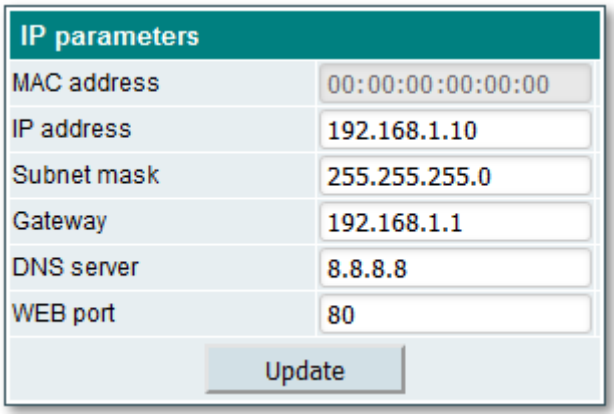


Figure 19. IP parameters

All device IP settings can be configured here – “IP address”, “Subnet mask”, “Gateway”, “DNS server” (Domain Name System), see Figure 19. Starting with software version 1.07, the “WEB port” number can be customized. Default is 80. You must restart the device for the port change to take effect. All other IP parameters will be updated immediately after pressing „Update“ button and redirect to new location.

NOTE: IP address can be reset to default (192.168.1.10) by pressing "RESET" button for at least 3 seconds. Status indicator **[5]** will start to toggle red-green quickly to inform, that the reset IP address request has been accepted. Device will be restarted with default IP address.

To restore all parameters to default values (including password), keep pressing the button for additional 4 seconds. The green indicator will start blinking after that time indicating, that a “restore defaults” command has been accepted. Now the button can be released. Red indicator will light on while resetting parameters. After that device will restart with all default values.

5.8 System menu

Additional system parameters (Figure 20) are provided in this menu, related to management of the system. Depending on user access type, some items of this menu may be unavailable.

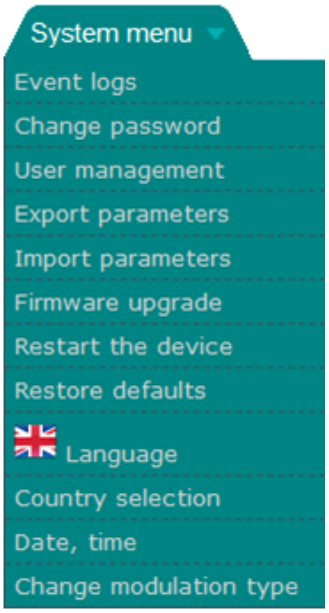
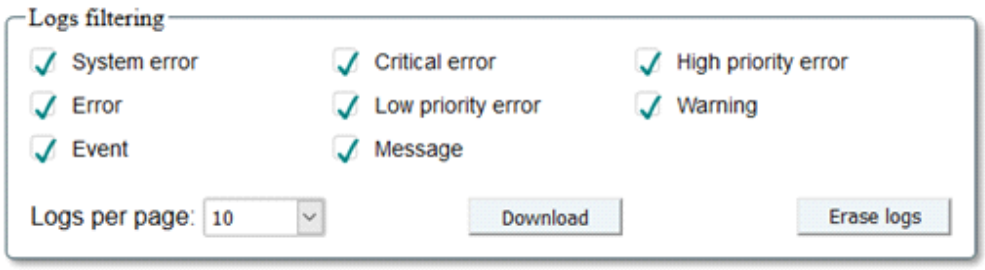


Figure 20. System menu

5.8.1 Event logs

Various important events, errors, warnings will be logged into the system (Figure 21). Each record has an event type, which can be used to filter particular messages. Just select checkboxes in the „Logs filtering“. Messages will be filtered automaticaly. „Erase logs“ button will erase all logs from the system. “Download” button creates logs.json file, which can be used in a support request as an addition. Messages will be exported in english language independing on language selection (5.8.9).



Date, Time	Event type	Event description
2019-04-16 16:19:56	Event	User admin logged in
2019-04-16 16:19:31	Event	Successfully connected to NTP server
2019-04-16 16:19:26	Event	Control ETH interface link up: 100Base-TX full-duplex
2019-04-16 16:19:25	Error	No input signal at ARD-alpha HD
2019-04-16 16:19:23	Message	Software restart occurred

Figure 21. Event logs

Each record has a log time when the event appeared. A time is shown in user‘s local time, detected by web browser. Device has 8 different event types, sorted by seriousness of the event. Only messages with selected event types in „Logs filtering“ table will be listed here.

5.8.2 Change password

Currently logged in user can change it‘s username and password. A „Change password“ window will pop up, as shown in Figure 22.

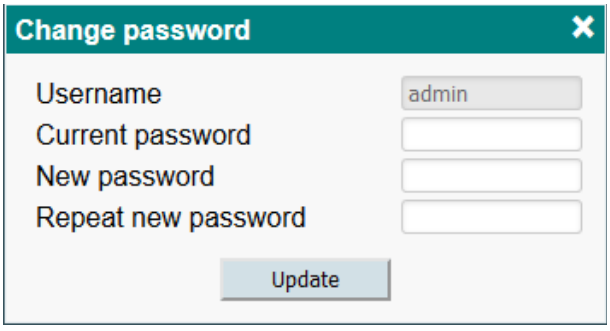


Figure 22. Change password

Only dedicated username „admin“ can not be changed. All other usernames can be changed in „Username“ field. User must enter current password in the „Current password“ field before setting a new password. Press „Update“ to send new information to the device.

5.8.3 User management

„Admin“ privilege having user can see this menu and can add/remove users, which can access to the system. Figure 23 shows user management window.

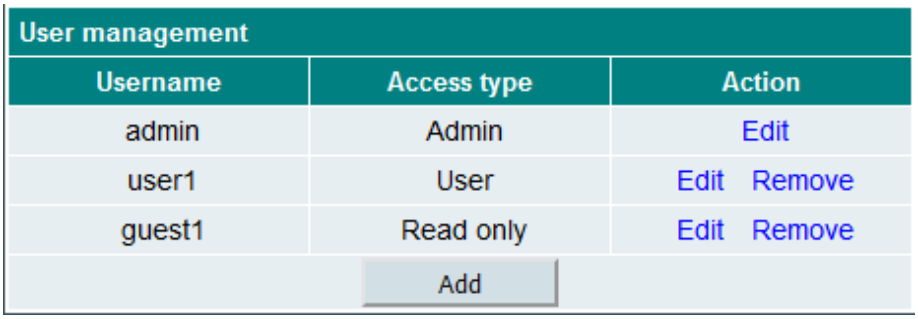


Figure 23. User management

Press „Add“ to create new user. New po pup window shown in the Figure 24 will appear. Parameter „Role“ is the user‘s access type. „Admin“, „User“ or „Guest“ type can be selected.

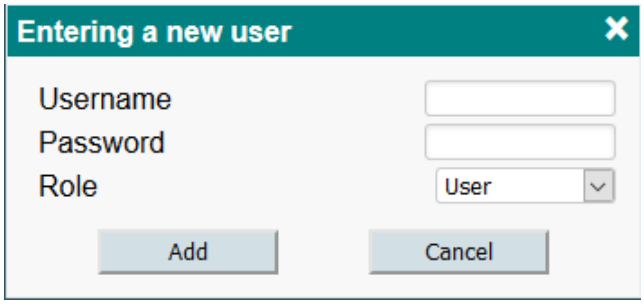


Figure 24. Entering a new user

Admin“ user has no restrictions. „User“ is almost the same as „Admin“, but user management is disabled. „Guest“ has read only access. No any change of parameters are allowed.

„Admin“ access user can edit other user‘s password or change the role. Press „Edit“ to change data. To remove user, press „Remove“. A confirmation request will appear to confirm, that you realy want to remove the user.

5.8.4 Export parameters

„Parameters of the same device type can be imported and exported from one device to another. Press „Export parameters“ menu line and locate file location, where parameters should be saved. Use this file for importing parameters into another device (same type), or into the same device.

5.8.5 Import parameters

Exported parameters from one device can be imported into another. Press „Click to select file“ button (Figure 25) to select a file, which want to import.

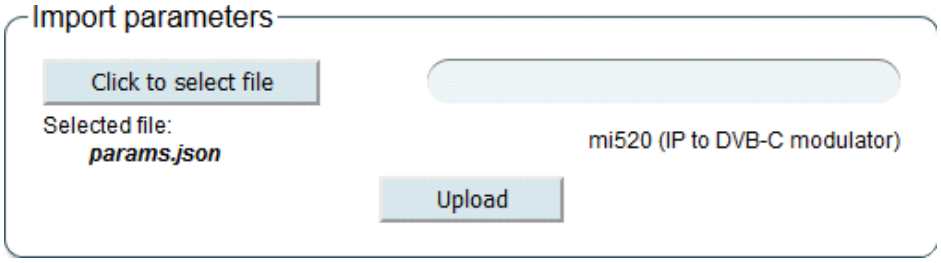


Figure 25. Import parameters

The file must be previously exported from the same device type. Also, device operating mode must be the same. For ex., if the file was exported from device running as DVB-T modulator, parameters cannot be imported into device with DVB-C modulator. Web interface will validate the content just after file selection and will not allow to import invalid content. If the validation was proceed, device type and description will appear on the screen, from which the file was exported. Press “Upload” to send new settings to the device.

Importing parameters from one software release to another is also allowed. Just keep in mind, than new software release may miss some previous or have new additional parameters. In this case warning will appear, that some parameters were not imported.

5.8.6 Firmware upgrade

Web browser will check for the latest software release after clicking on „Firmware upgrade“ menu. A table (Figure 26) with the list of the latest firmware releases will appear on the screen.

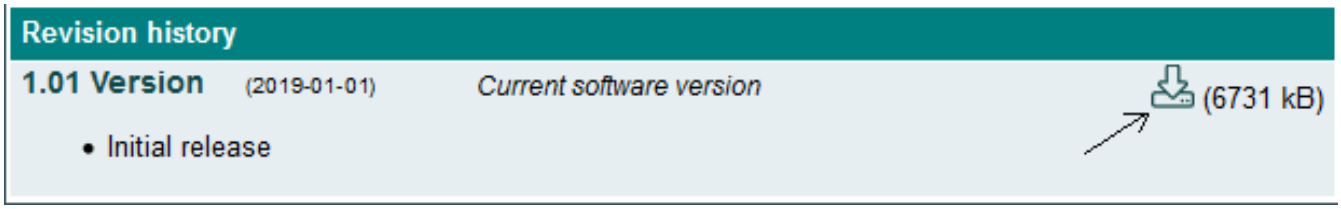


Figure 26. Revision history

Press on the icon to download the firmware from the server to computer. „Current software version“ note will be written if device has this firmware version already.

Various release notes will be listed here about each firmware release. Notes will be written in English language only, independing on language selection.

After firmware file has been downloaded, press „Select firmware file“ button in „Firmware upgrade“ table (Figure 27).

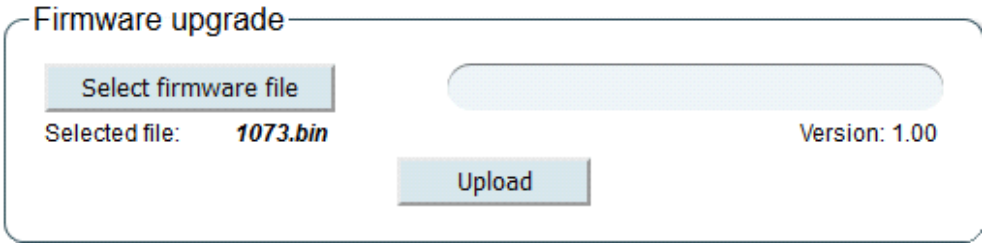


Figure 27. Firmware upgrade

If valid firmware file was selected, firmware version number will be written on the screen, like shows in the Figure 27. Press „Upload“ button to send the file to the device. A confirmation message will appear on the screen asking to reboot the device. After confirmation, status indicator **[2]** will start to blink with red/green colors indicating the programming process. Do not disconnect power supply from the device while the programming is in progress.

Login window will appear on the screen as soon as firmware upgrade is finished. No need to refresh the browser. All device settings will remain unchanged.

5.8.7 Restart the device

Device can be restarted by selecting „Restart the device“ menu. A confirmation message will appear on the screen to confirm you are realy want to do it. After confirmation, device will reboot. A login window will appear on the screen as soon as the device will get ready.

Device also can be restarted by pressing a reset button **[6]** shortly.

5.8.8 Restore defaults

All settings can be restored to factory default by selecting „Restore defaults“ menu. A confirmation message will appear on the screen to confirm you are realy want to do it. After confirmation, all settings will be restored to default values, all streams and logs will be erased.

All settings can be reset to default values by holding a reset button **[6]** for a long time. This feature is available from the 1.03 software release. See „5.7 IP parameters“ section for more details.

5.8.9 Language

User can select any of predefined languages (see "Technical Specifications") for user interface. Language selection is saved in browser‘s cookies, so different browsers or different computers may have different language selections. Press „Language“ menu item with current language‘s flag. Language selection dialog will appear on the screen. See Figure 28.

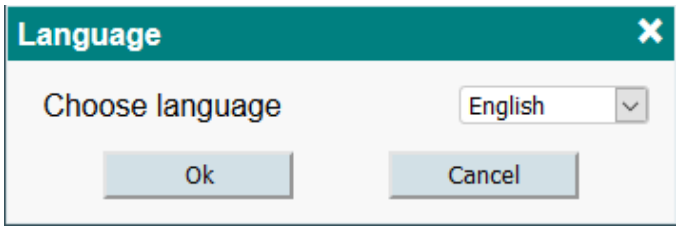


Figure 28. Language selection

After language selection, browser will be refreshed with a new language. No any device restart require. All event logs (5.8.1) will be also switched to selected language.

5.8.10 Country selection

Different countries have different NIT standarts, different TV channel rasters, different timing zones. It‘s hightly recomended to setup the country, where the modulators works in. Country selection dialog will appear on the screen (see Figure 29).

Figure 29. Country selection

After country selection, the „Selected time zone“ field will be updated automatically according to selected country. If selected country has DST (winter/summer time switching), the „(+DST)“ note will be added to GMT string. In this case device will automatically switch winter/summer timing zone and will also broadcast this timing zone to RF, so TV will know the time. Just ensure, the device can access NTP server to have correct time. RF channel raster also depends on selected country. Channel names will be updated accordingly.

Original network ID (5.5) is highly related to the country. If the „Automatic setting of ONIT by country selection” checkbox (Figure 13) is checked, “Original network ID„ (Figure 14) fields will be updated automatically and NIT regenerated with new values.

5.8.11 Date, time

It’s important that the device has correct time. It broadcasts time to RF, and TV will take the time from there. Device without proper time may result wrong display of EPG in TV or other issues.

Any NTP server can be used as a date/time source. Select “Date, time” menu and a table with date/time selection will appear on the screen (see Figure 30).

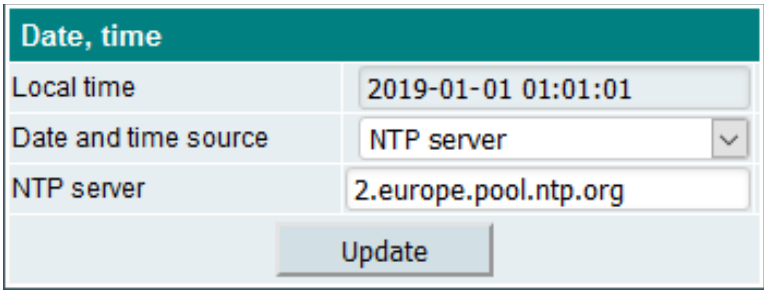


Figure 30. Date, time

“Local time” shows the time, which device currently has, taking into account possible DST switchings. Make sure you selected correct country (5.8.10) if the time in this line is not correct. “Date and time source” has two options for selection – “NTP server” and “Manual input”. In case of NTP server, URL must be provided of the server. Make sure, "IP settings" (5.7) are correct and device can access the server. Press “Update” to send information to device. After that, device will try to connect to the server and update the “Local time” line if server was accessible. Later on device will try to access the server every 5 minutes and resynchronise the time if necessary.

“Manual input” option can be used for testing only, because it will newer be synchronized to any external time source, and the time will be reset if the power supply will be disconnected.

5.8.12 Change modulation type

Device supports several operating modes, which differs by modulation type. Each modulation type has different set of parameters, so importing and exporting parameters are allowed only for the same type of modulation.

Modulation type selection dialog will appear on the screen, as shown in the Figure 31.

Figure 31. Changing mdulation type

After modulation type selection, press “Ok“. Device will restart in another operating mode.

6. REQUIREMENTS FOR EXTERNAL POWER SUPPLY UNIT (PSU)

- Output voltage +12 V ± 1 V
- Output current ≥ 0.5 A
- Ripple at single and/or double mains frequency < 10 mV p-p
- Ripple & noise < 180 mV p-p
- Output connector type 3.5/1.3 (+) plug or 5.5/2.1 mm (+) plug
- Short circuit protection
- Double insulated (marked ⧈)
- Meet EN 55022 class B conducted emisions requirements, measuring with grounded load

7. Technical specifications

IP input	standard	IEE802.3 10/100 BaseT			
	bit rate	≤ 80 Mbit/s			
	protocols	UDP / RTP / RTSP			
	MPTS, SPTS	Yes			
RTSP specification	transport layer	UDP			
	video coding	H.264 / H.265			
	audio coding	AAC*			
RF output	number of channels	2			
	standard pr.	**DVB-T**	**ISDB-T**	**DVB-C**	**J.83B**
	modulation pr.	QPSK/QAM16/QAM64	QPSK/QAM16/ QAM64/DQPSK	QAM16/QAM32/QAM64/ QAM128/QAM256	QAM64/QAM256
	frequency range pr.	174-230 MHz, 470-862 MHz		96-862 MHz	
	channel allocation	adjacent			
	level/impedance	90 dBμV/75 Ω			
	MER	≥ 35 dB		≥ 40 dB	
	channel bandwidth	7/8 MHz pr.	6 MHz	1.15...8.3 MHz	6 MHz
	guard interval pr.	1/4, 1/8, 1/16, 1/32		-	
	code rate pr.	1/2, 2/3, 3/4, 5/6, 7/8		-	
	symbol rate	-		1...7.2 Msps pr.	5.057/6.36 Msps
	transmission mode	2K		-	
	total output level adjustment pr.	0 ÷ 30 dB by 1 dB step			
	loop through frequency range	45-862 MHz			
	loss	≤ 2.5 dB			
Management port		standard IEE802.3 10/100 BaseT (the same as stream input)			
UI language		English, Russian, German, Lithuanian			
Current consumption		12 ± 1 V 375 mA (MI520)			
Power consumption		100-240 V~ 50/60 Hz 5.5 W (MI520P)			
Operating temperature range		0° ÷ +40° C			
Dimensions/Weight (packed)		133x63x39 mm/0.18 kg (MI520); 133x63x39 mm/0.26 kg (MI520P)			

pr. software control

* starting from software version 1.06

MI520P is packed with external power supply SYS1381-1212-W2E.

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