MAINTENANCE AND OPERATION
INSTRUCTION MANUAL

DB94-RX

Compact MPX over IP Decoder

DB94-SFN

Compact MPX over IP Decoder
with MicroMPX and SFN Support

DEVA® BROADCAST

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Contents

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Introduction

DEVA Broadcast Ltd. is an international communications and high-technology manufacturing organization, its corporate headquarters and facility located in Burgas, Bulgaria. The company serves the broadcast and corporate markets worldwide – from consumers and small businesses to the largest global organizations. It is dedicated to the research, design, development and provision of advanced products, systems and services. DEVA Broadcast launched its own brand back in 1997 and has nowadays evolved to become known as a market leader and internationally reputed manufacturer of user-friendly, cost-effective and innovative broadcast products.

Creativity and innovation are deeply woven into DEVA Broadcast corporate culture. Through successful engineering, marketing and management our team of dedicated professionals creates future-oriented solutions to improve customers' performance. You may rely that all issues communicated to our crew would be addressed accordingly. We pride ourselves on our pre and post-sales support and purchase services, which along with the outstanding quality of our radio gear have won us due respect and the market authority position.

DEVA Broadcast best-of-breed solutions have become the best sellers for our partners. The strategic partnerships which have been formed with industry leaders during all these years that we have been operating on the broadcasting market, have proved us a reliable business partner and a valuable asset, as our dealers worldwide would confirm. In constant pursuit of precision and long-term satisfaction, DEVA Broadcast enhances the reputation of our partners and clients alike. Furthermore, we have already a proven merit as a credible partner provider.

Our portfolio offers complete line of high quality and competitive products for FM and Digital Radio, Radio Networks, Telecommunication Operators and regulation authorities. For almost two decades of intensive software and hardware development, we have achieved a unique price-performance and endurance of our product lines. Our company's multitude of equipment and services is in line with the latest technologies and key trends. The most recognizable characteristics attributed to DEVA Broadcast products are their clear-cut, streamlined design, easiness of use and cost-effectiveness: simplicity of forms but multiplicity of functions.

For us there is no stage when we deem that we have reached the most satisfactory level in our work. Our engineers are in constant pursuit of new ideas and technologies to be captured in DEVA Broadcast solutions. Simultaneously, a strict control is being exercised at each step of any new development. Experience and hard work are our fundament but the continuous improving process is what we never leave aside. DEVA Broadcast participates on a regular basis in all landmark broadcasting events, not only to promote its products, but to exchange valuable know-how and experience. We are also engaged in international large-scale projects involving radio and audio solutions which makes us even more competitive on the global market.

All DEVA Broadcast products are developed and produced in accordance with the latest ISO 9001 quality control standards.

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Typographic conventions

The following table describes important conventions used in the manual.

Convention and Style	Description	Examples
Menu > Sub Menu > Menu Command	A menu item(s) and menu command that you need to click in sequence	Click ***Settings > General***
[Button]	Interface Interactive buttons	Press [OK] to save the changes
NOTE	Important notes and recommendations	**NOTE:** The notification will appear only once
"Reference Name" on Page XXX	References and links	refer to "New Connection" (see "Monitoring" on page 56)
`Example`	Used when example text is cited	Example for E-mail Notification: `Date: 04 Nov 2013, 07:31:11`

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DB94-RX General Information

DB94-RX COMPACT MPX OVER IP DECODER

The DB94 is a high-performance, compact MPX over IP Encoder tailored to meet the modern demands of broadcast audio transmission. At its core is the innovative MicroMPX (µMPX) algorithm developed by Thimeo, a purpose-built codec specifically designed for FM MPX transport. This technology ensures efficient use of network bandwidth, down to as little as 320 kbps while preserving excellent audio quality and maintaining full stereo and RDS integrity. The DB94 enables robust, low-latency streaming over public or private IP networks, making it an ideal solution for both regional and nationwide broadcasting scenarios.

Despite its streamlined design, the DB94 integrates effortlessly into existing setups. LED indicators on the front panel offer immediate insight into operational status, while configuration and monitoring are made simple through DEVA's intuitive HTML5-based web interface. This web control panel is accessible via any modern browser on PC, tablet, or smartphone, ensuring flexible management whether locally or from remote locations. The unit also supports HTTPS, FTP, NMS, and SNMP protocols for secure and comprehensive remote control.

As part of DEVA's growing portfolio of IP audio solutions, the DB94 is engineered with precision and built using top-tier components, including high-grade ADCs for maximum signal fidelity. It supports both Analog MPX and Digital AES192 outputs, ensuring broad compatibility across different transmitter systems and network architectures. Whether deployed for a single transmitter site or integrated into a larger network, the DB94 delivers consistent, high-quality audio over IP.

Combining DEVA's proven reliability with cutting-edge MicroMPX technology, the DB94 offers broadcasters a cost-effective, future-ready encoder that meets the demands of modern FM transmission. It is the perfect choice for professionals seeking dependable, bandwidth-efficient MPX distribution without compromising audio performance.

By choosing DEVA's DB94, broadcasters benefit from the company's tradition of innovation, quality, and support—hallmarks that continue to define DEVA's role as a leader in broadcast technology.

DB94-RX PRODUCT FEATURES

- High quality FM MPX encoding function
- High end ADC converter for optimal quality
- Ultra low latency, all-digital DSP based design
- Remotely upgradable firmware to ensure improved operation
- Headphone audio output
- Very Intuitive Embedded WEB server for interactive supervision
- Full online remote control of all parameters via IP
- Configuration via web user interface for easy setup
- Quick view status page for a fast overview
- Forward Error Correction to reduce bit errors in data stream
- USB flash drive for Audio Backup Storage
- SNMP v2c agent permitting full device management
- Apple and Android devices support
- SNTP for automatic synchronization of the built-in clock
- Protected access to the device settings
- LAN port for full TCP/IP remote control and monitoring
- Attractive price and very good price-performance ratio
- Proved and reliable hardware for 24/7/365 operating
- Compact and Robust Aluminum Case for high RF immunity
- Easy Installation and Setup

DB94-RX TECHNICAL SPECIFICATIONS

AUDIO DECODER	
Codec	µMPX or raw PCM
Sample rates	192 kHz and 216 kHz, 24 bits
Signal Processing	24 Bit AD/DA conversion
PCM	
Bit depth	12 - 16, 20, 24 bit
FEC	RIST, ProMPEG FEC #3, release 2
Bandwidth	2.4 - 4.6 Mbps (no FEC)
µMPX	
Bitrates	320, 384, 448, 576, 800 kbit/s
FEC	µMPX FEC, RIST, Pro-MPEG FEC #3 release 2
Bandwidth	320 - 800 kbps (no FEC)
ANALOG MPX OUTPUT	
Connector	BNC
Type	Unbalanced
Level	+14 dBu (max. +16 dBu)
Sample rate	192 kHz and 216 kHz, 24 bits
Dynamic range	121 dB
DIGITAL MPX AES192 OUTPUT	
Connector	RJ-45, balanced, EMI suppressed
Standard	AES3
Sampling Rate	up to 192kHz, 24 bits

GPS PORT	
Connector	DB15, Male
Protocol	NMEA 0183, 9600bps
Sync	1 PPS, Square Wave, TTL Compatible
FRONT PANEL	
Status Indicators	4 LEDs
Headphones	1/8” (3.5mm) phones jack
USB	Type A for Backup audio player
USER INTERFACE	
SNMP	ver.2c, ver.3
Web interface	Full control and Status information
NETWORK	
Connector	RJ-45
Type	Ethernet, 1000Mbps
Device discovery	UPnP support
OPERATING CONDITIONS	
Temperature	-15°C to 55°C
Humidity	< 95%, non-condensing
Altitude	0 to 5000m above sea level
POWER	
Voltage	12V DC, 1A; External PSU, wall-mount 100-264 V
Power Consumption	10VA
Connector	Power Jack 5.5mm
SIZE AND WEIGHT	
Dimensions (W;H;D)	125 x 31 x 160 mm
Shipping Weight	270 x 54 x 230 mm / 1.1kg
HS Code	8517620000

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DB94-SFN General Information

DB94-SFN COMPACT MPX OVER IP DECODER WITH µMPX AND SFN SUPPORT

The DB94-SFN is a next-generation, compact MPX over IP Decoder engineered to deliver reliable and efficient audio transmission for professional FM broadcasting. Utilizing the purpose-built µMPX (MicroMPX) algorithm developed by Thimeo, the DB94-SFN ensures high-quality audio reproduction with remarkably low network bandwidth starting from just 320 kbps. Designed specifically for FM MPX transport, µMPX preserves the integrity of the stereo signal and RDS data while significantly reducing IP requirements, making the DB94-SFN ideal for applications over narrowband or public IP links.

In addition to its advanced decoding capabilities, the DB94-SFN introduces full Single Frequency Network (SFN) support, enabled through ultra-precise GPS timing synchronization. By aligning audio and MPX output timing with sub-microsecond accuracy, the unit ensures perfectly phase-coherent transmissions across multiple synchronized transmitters. This eliminates interference in overlap regions and guarantees seamless coverage extension, an essential requirement for modern SFN-based broadcast networks. The GPS-locked timing reference allows the DB94-SFN to deliver deterministic delay, stable long-term synchronization, and highly reliable operation, even in complex multi-transmitter deployments.

Compact yet powerful, the DB94-SFN fits seamlessly into any broadcast infrastructure. LED indicators on the front panel provide instant system status, while an intuitive HTML5-based web interface allows complete configuration and monitoring from any desktop or mobile browser. For added convenience and control flexibility, the device supports remote access via HTTPS, FTP, NMS, and SNMP protocols empowering engineers to manage systems from virtually anywhere.

Engineered with DEVA's hallmark attention to detail and reliability, the DB94-SFN delivers pristine audio quality thanks to top-grade DAC components and precision signal processing. It supports both Digital AES192 and Analog MPX outputs, ensuring compatibility with a wide range of FM transmitters and studio setups. Whether deployed at a single transmission point or within a larger network, the DB94-SFN guarantees low-latency, uninterrupted signal decoding across all environments.

The DB94-SFN stands as a testament to DEVA's commitment to innovation and customer-driven design, offering an advanced, cost-effective solution for MPX over IP distribution. Its support for µMPX sets it apart as a future-ready decoder that meets the growing need for efficient, high-performance broadcast tools.

Choosing DEVA's DB94-SFN means choosing reliability, flexibility, and the confidence that comes with decades of expertise in broadcast technology.

DB94-SFN PRODUCT FEATURES

- High quality FM MPX decoding function
- High end DAC converter for optimal quality
- Ultra low latency, all-digital DSP based design
- Remotely upgradable firmware to ensure improved operation
- Headphone audio output
- Very Intuitive Embedded WEB server for interactive supervision
- Full online remote control of all parameters via IP
- Configuration via web user interface for easy setup
- Quick view status page for a fast overview
- Forward Error Correction to reduce bit errors in data stream
- USB flash drive for Audio Backup Storage
- SNMP v2c agent permitting full device management
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USB	Type A for Backup audio player
USER INTERFACE	
SNMP	ver.2c, ver.3
Web interface	Full control and Status information
NETWORK	
Connector	RJ-45
Type	Ethernet, 1000Mbps
Device discovery	UPnP support
OPERATING CONDITIONS	
Temperature	-15°C to 55°C
Humidity	< 95%, non-condensing
Altitude	0 to 5000m above sea level
POWER	
Voltage	12V DC, 1A; External PSU, wall-mount 100-264 V
Power Consumption	10VA
Connector	Power Jack 5.5mm
SIZE AND WEIGHT	
Dimensions (W;H;D)	125 x 31 x 160 mm
Shipping Weight	270 x 54 x 230 mm / 1.1kg
HS Code	8517620000

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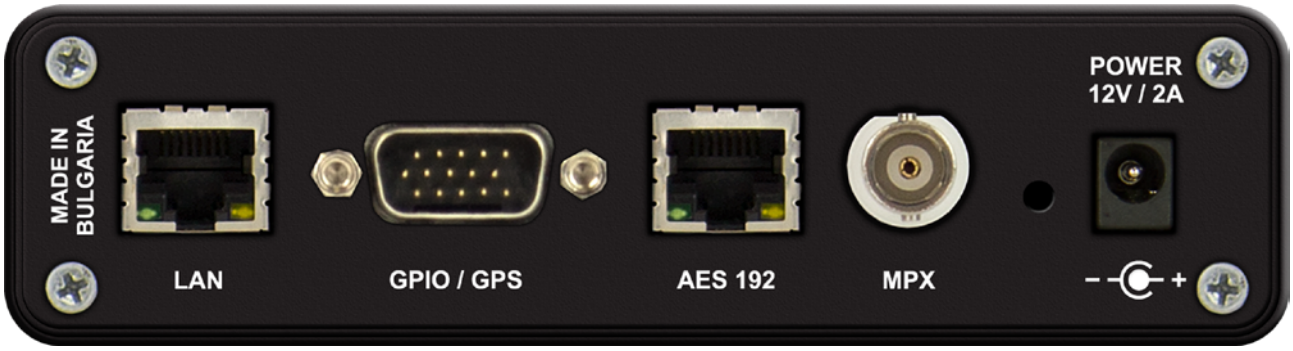
Panel Indicators and Appointments

FRONT PANEL

1. Phones Output. The following audio signals are reproduced through the headphones: Voice Announcement of DB94' s IP address upon startup; Audio signal identical to that of the outputs audio;
2. Power LED Indicator.
3. LAN LED Indicator;
4. Memory LED indicator;
5. LINK LED indicator;
6. USB port

REAR PANEL



1. LAN Port / Internet Input – standard RJ-45 port;
2. Network Activity LED Indicator (RJ-45 built-in);
3. Network Availability LED indicator (RJ-45 built-in);
4. GPIO / GPS Port - DB15 HD, Male;
5. AES 192 – RJ-45, Digital MPX Output;
6. MPX – BNC, Analog MPX Output;
7. Factory Defaults Reset button;
8. Power Supply (12 V, 2A);

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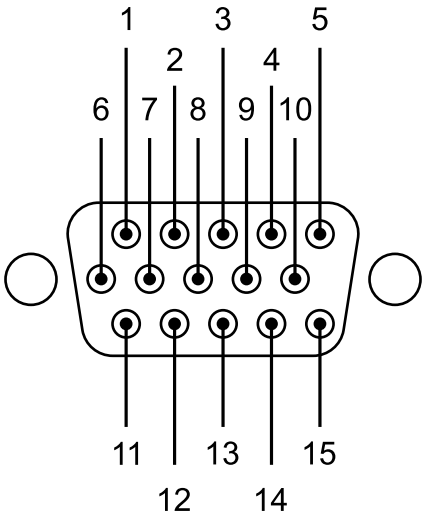
THE PINOUT OF A DB15 HD GPIO / GPS CONNECTOR



DB15 HD, Male

Pin	Function	Direction
1	GPI2	Opto isolated Input
2	GPS RX	GPS Communication Output
3	5V GPS	GPS +5V, Fuse protected (0.5A)
4	GPO3	Solid State Relay
5	GPO1	Solid State Relay
6	GPI3	Opto isolated Input
7	GPI1	Opto isolated Input
8	GPS TX	GPS Communication Input
9	PPS IN	GPS PPS (Pulse Per Second) Input
10	GPO2	Solid State Relay
11	GPICOM	Common GPO rail
12	GP5V	+5V (Out), Fuse protected (0.5A)
13	GPS GND	GPS Ground
14	GPGND	GPIO Ground
15	GPOCOM	Common GPO rail

GPI EXAMPLE CONNECTIONS

To activate one Input, GPI pin would be pulled to ground , with a voltage applied on the GPICOM pin (Common to all GPI).

Using external power supply is the recommended method in order to avoid possible ground loops between equipment, as shown in Figure 1-1. The maximum allowed external power supply for logic control is 48 volts DC.

NOTE the presence of Current Limiting Resistors per GPI pin. The intention is to limit the current to 20mA for each GPI pin. Use the table below to choose the suitable Resistor's value.

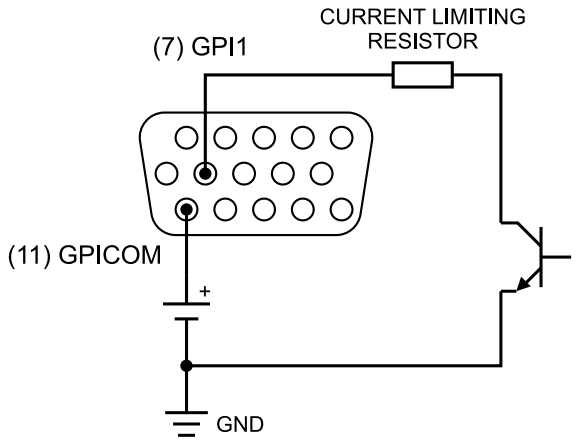


Figure 1-1 - External Power Supply

If the equipment being controlled is electrically isolated, then the use of the GPIO port's power supply is acceptable. The easiest way is shown on Figure 1-2.

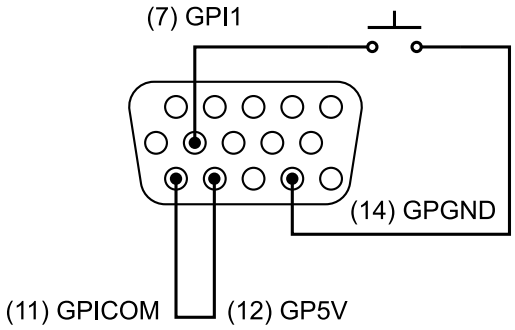


Figure 1-2 - GPIO Port's Power Supply

CAUTION: The use of current limiting resistor per GPI pin is required for some voltages, see table (each input has an internal 330ohms protection).

NOT PROTECTING THE GPI COULD DAMAGE YOUR DEVICE.

VDC	External Resistor
5	0
6	0
12	680 / 0.25Watt
24	1.8k / 0.5Watt
48	3.9k / 1Watt

GPO EXAMPLE CONNECTIONS

The GPO portion of the GPIO port are Solid State Relays. Current should be limited to 100 mA per GPO pin of a port. Maximum allowed voltage is 48 volts. The following diagram shows the recommended connections for outputs with the use of an external power supply.

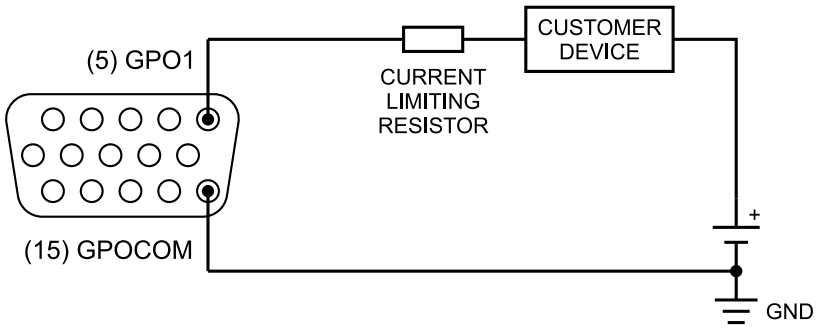


Figure 2-1 - External Power Supply

If necessary, a Current Limiting Resistors must be used to limit the current to 100mA for each GPO pin.

NOT PROTECTING THE GPO COULD DAMAGE YOUR DEVICE.

If the device being controlled is electrically isolated, than the internal GP5V supply can be used, maintaining a 100mA limit on current drawn.

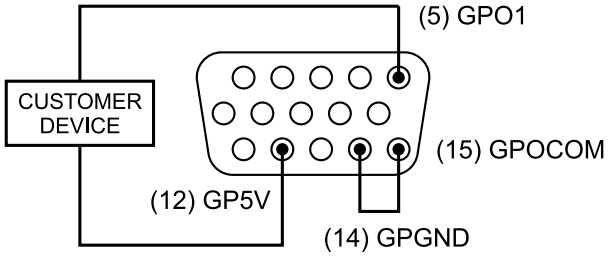


Figure 2-2 - GPIO Port's Power Supply

NOTE: GPO pins and GPOCOM are not polarized, current can flow both directions.

INTERNAL CONNECTIONS OF THE GPIO PORT

GPIO port provides 3 GPI (opto isolated inputs) and 3 GPO (solid state relays). Port is capable of driving a combined current of 100mA. Each GPI pin should be limited to 20mA of current.

Figure 3 shows a simplified diagram of the internal wiring behind the connector. The EMI Filters' parts are omitted for the sake of simplicity.

All of the inputs and all of the outputs on the GPIO port are grouped together. The 3 GPOutputs are on 3 separate output pins, but they share the same "Common Return" connection GPOCOM on pin 15. Similarly, the 3 GPInput pins share one high-side rail GPICOM, connected to pin 11.

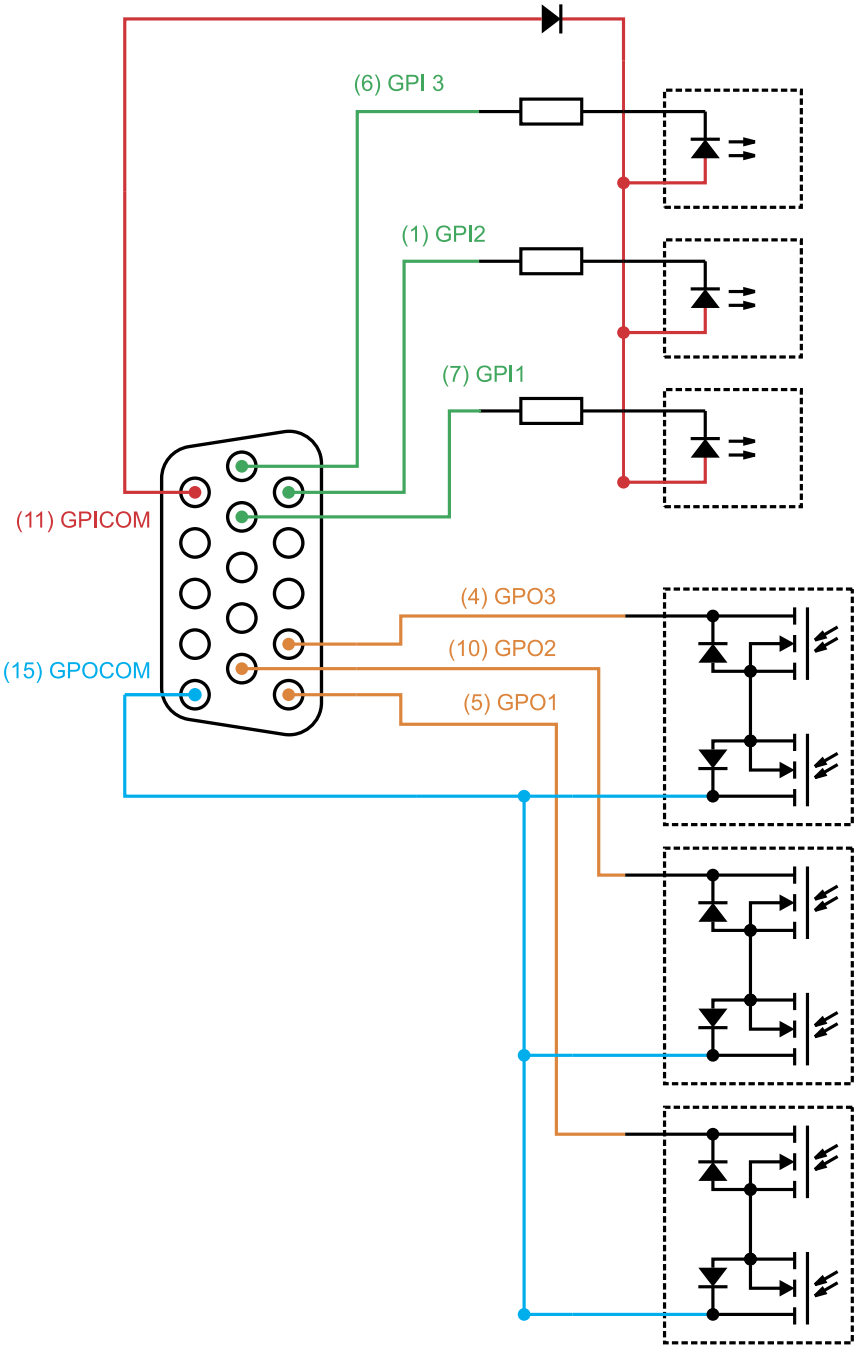


Figure 3

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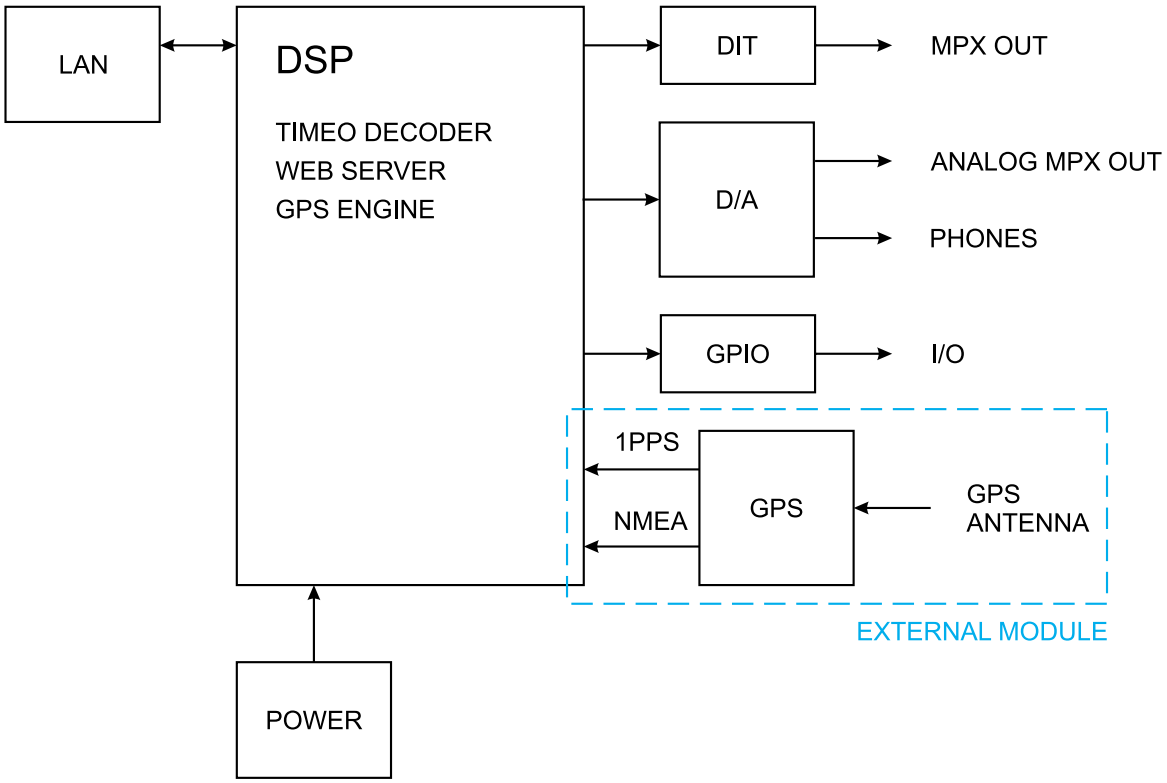
Block diagram

A simplified block diagram of DB94-RX / DB94-SFN is shown below:



NO USER-SERVICEABLE COMPONENTS INSIDE.
REFER ALL SERVICING TO QUALIFIED TECHNICAL PERSONNEL

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Safety Warning

ALWAYS OBSERVE THE SAFETY PRECAUTIONS.

Careful observance of the safety precautions will help prevent physical injury, damage of the equipment, and extend the equipment life.

- The servicing of electronic equipment should be performed only by qualified personnel;
- Before removing the covers the unit must be switched off and the mains cable unplugged;
- When the equipment is open, the power supply capacitors should be discharged using a suitable resistor;
- Never touch the wires or the electrical circuits;
- Use insulated tools only;
- Never touch the metal semiconductor. They might carry high voltages;
- For removing and installing electronic components, follow the recommendations for handling MOS components.
- Do not remove the factory sticker from the equipment. It contains information as regards the name, serial number and MAC address of the device.
- To join the equipment to the mains supply, use the power cord purchased with the equipment.

ATTENTION: The device has an internal Lithium battery. Do not try to re-charge this battery! In case the battery needs to be changed, please contact us for detailed instructions and information of the battery type.

Operating Recommendations

To ensure normal operation of the DEVA unit, we recommend following the instructions listed below.

- Install the unit in places with good air conditioning. The unit is designed to operate within the ambient temperature range of 10 to 50°C. The equipment rack should be ventilated in order for the device to keep its internal temperature below the maximum ambient temperatures;
- We do not recommend installation in rooms with high humidity, dusty places or other aggressive conditions;
- Although the device is intended to be installed closed to exciters or transmitters, we do recommend the device to be located away from abnormally high RF fields.
- Use only checked power supply cables. We strongly recommend the usage of shielded cables;
- Connect the DEVA unit to reliable power supply sources only. In case of unstable power supply, please use Uninterruptible Power Supply (UPS);
- Use the device only with its top cover on to avoid electromagnetic anomalies. Otherwise, this may cause problems with the normal functionality of the unit;
- To ensure normal remote operation of the unit, make sure to connect the device to a good quality Internet connection;
- For the normal operation of your DEVA device, check if the network settings past through all the required data traffic.

Unpacking and inspection

Upon receipt, the equipment should be inspected for possible shipping damages. If such are found or suspected, notify the carrier at once and contact DEVA Broadcast Ltd. The original shipping carton box and packing materials should be kept for possible reuse, in case of return for Warranty repair, for example. Shipping damages as a result of improper packing for return may invalidate the Warranty!

The packing material (plastic bags, polystyrene, nails, etc.) must never be left within reach of children, as these items are potential sources of danger.

IT IS VERY IMPORTANT that the "Product Registration Card" included in the Manual be completed accurately and returned. This will assure coverage of the terms of the Warranty and it will provide a means of trace in case of lost or stolen equipment. In addition, the user will automatically receive SERVICE OR MODIFICATION INSTRUCTIONS from DEVA Broadcast Ltd.

Mounting

RACK REQUIREMENTS 1U

The unit mounts in a standard 19-inch equipment rack and requires only 1¾ inches (1U) of vertical rack space. In order the painted finish around the mounting holes to be protected, the use of plastic washers is recommended.

RACK REQUIREMENTS COMPACT UNITS

Our customized 1U 19-inch rack accessory provides a professional mounting option for up to three compact size DEVA units. It is made of milled aluminum and finished in black powder coat. Two extra blanking panels and set of mounting screws are provided with each rack bracket kit.

STAND-ALONE DEVICES

DEVA's stand-alone units (Radio Explorer series, BandScanner series, DVB Explorer) do not require additional tools or installation brackets.

Overview

MicroMPX or µMPX is a codec that transfers a full FM composite or MPX signal, meaning audio plus stereo pilot and RDS, over a low bitrate connection. It currently supports bitrates from 320 upto 800 kbit/s, and bitrates down to 176 kbit/s if you're using MicroMPX+ mode.

MicroMPX was developed specifically for use on FM, and even though the bitrates are low, it does not introduce typical lossy compression artifacts such as pre- and postringing or watery sounds. It also maintains peak control. If you use a composite clipper, the extra loudness that composite clipping generates also survives the MicroMPX codec. So for all relevant purposes, there's no real difference between connecting the direct composite output of a processor to the FM transmitter and connecting the MicroMPX decoder output to that same transmitter. (It is a lossy codec so the signal is not identical, which can become relevant when using a Single Frequency Network – more about that later.)

MicroMPX only needs one-way communication (from the encoder to the decoder, typically from the studio site to the transmitter site). This means that it can be sent over connections such as satellite links. It has several redundancy mechanisms to handle network or IP link problems: it can add recovery data to recover lost packets and send the same data over multiple connections so that as long as one of the connections works, the signal keeps playing. It is also possible to use multiple encoders that send their data to one decoder, to handle problems on the encoder end.

One encoder can feed any number of decoders (depending on the available bandwidth), and network multicasting or broadcasting is possible.

With MicroMPX, you can encode the full MPX signal in one location, and just spread it from there to all your transmitters, which will all get the same signal at the same time.

WARNING: Sending MicroMPX over an unreliable connection such as the public internet may work perfectly fine, but it can also cause dropouts. If possible, use a reliable connection, or redundant connections.

Getting Started

The DB94 series are provided with preliminary settled µMPX licenses.

In order for the normal operation of the DB94 to be guaranteed, you will need fulfill the following conditions:

1. Standard Ethernet 10/100M connection;
2. Correctly assigned Network configuration and device settings.

To make sure that all the conditions are fulfilled please, follow the instructions below.

CONNECTION

1. Install the unit on its operation place;
2. Using the provided power cable, connect the unit to the power supply network;
3. Connect the antenna cable to the RF antenna input connector located on the rear panel of the device;
4. Connect the DB94 to the TCP/IP network using direct network cable.

NETWORK SETTINGS

After connecting the network cable the Led 'LAN' located on the rear panel must be ON or flashing. The next and most important step for configuration is the adjustment procedure of the Network Communication. The settings shown below are Default Network Settings:

DHCP	Enabled
IP	Assigned by DHCP
Mask	Assigned by DHCP
Gateway	Assigned by DHCP
DNS	Assigned by DHCP
HTTP Port	80

NETWORK DISCOVERY

This is a network setting that defines whether your computer can see (find) other computers and devices on the network and whether other computers on the network can see your computer. By default, Windows Firewall blocks network discovery but you can enable it.

1. Open Advanced sharing settings by clicking the Start button, and then on "Control Panel". In the search box, type "network", click "Network and Sharing Center", and then, in the left pane click "Change advanced sharing settings";
2. Select your current network profile;
3. Click "Turn on network discovery", and then click save changes.

NOTE: If you're prompted for an administrator password or confirmation, type the password, provide confirmation or contact your system administrator.

If you have already enabled this function on your computer DB94 will be automatically added to the Device list section. The device will be ready for usage and no additional adjustments will be required except user name and password.

NOTE: If the port is different than the default one (80), it is necessary to specify it, for example: http://192.168.1.2:9000

ATTENTION: Depending on Internet Protocol Settings, the assigned IP address may not be visible outside your local network, thus the device may be accessed only within that network. Consult with your network administrator for the appropriate IP settings.

NETWORK SECURITY RECOMMENDATIONS

1. It is not recommended the DB94 to be directly connected to the Internet. This may lead to unregulated access and/or problematic operation of the device. To ensure secure connection, we recommend the device to be installed behind a router with an active firewall.
2. If remote access to the device is needed, we recommend using VPN to the router or the port of the relevant service (WEB, SNMP, Application, etc.) to be properly NAT forwarded.
3. If NAT forward is used, it is highly recommended random ports of your choice to be used. Not the standard ones (80 for WEB, 161 for SNMP, etc.).
4. Using DMZ connection is not recommended.
5. Make sure to change the standard access credentials (usernames and passwords, SNMP communities).

For detailed information as regards the recommendations listed above or need of further instructions, please contact your network administrator.

LAN PORT

For normal operation it is necessary the device to be connected to a local network or Internet by cable with RJ-45 connector.

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MicroMPX Decoder Configuration

CONNECTING TO A FM TRANSMITTER & CALIBRATING

How to connect the decoder to the transmitter depends on several things. If the transmitter has a digital MPX input (MPX over AES/EBU), that is the preferred way of connecting it. And most of the steps below can be skipped in that case.

For analog MPX inputs, the transmitter might have an XLR MPX input, or a BNC MPX input. The sound card may also have a balanced (XLR or other) output or an unbalanced (usually RCA or minijack) output. If both sides support balanced I/O, that's the preferred way of connecting it. Otherwise there are lots of convertors available, for example from XLR to and from RCA, from RCA to BNC etc. You only have to connect one channel, since it's an MPX signal (basically a data signal).

After connecting it, you need to adjust the level such that the output of the transmitter complies to your local laws (75 kHz modulation – or sometimes a bit more, mainly). MicroMPX has a test tone generator, both for sine waves that can be used to setup the level and if needed boost the high frequencies a bit if there is some high frequency rolloff, and a square wave generator that can be used to compensate for tilt in low frequencies, typically caused by a highpass filter (DC removing filter) in many sound cards, and sometimes even in older transmitters.

Step 1: Select an approx. 1000 Hz tone, and adjust the level (either the MicroMPX output level or the transmitter input gain) to match the maximum allowed modulation.

Step 2: Switch to a 30 Hz or so square wave, and adjust the RC slider until the modulation is as close as possible to that same maximum level. Go down to 15 or 10 Hz to adjust it more accurately. Normally, you should be within at most 1-2 kHz of the allowed maximum once this is done, more than that indicates some issue.

Step 3: Check how much the level drops at for example 50 or 60 kHz. And adjust the Highs RC slider – CAREFULLY because it's very easy to overdo it. Having too little highs causes no real problems except some loss in stereo separation and RDS level, but having too much can cause overshoots.

IMPORTANT: when using the tilt correction or Highs RC correction in the MicroMPX decoder, its output level MUST be set below 0dB, or digital clipping could occur. Check the waveform display to make sure the waveform never exceeds the lines on top and bottom.

WEB Interface

DB94 series are controlled trough a build in WEB Server and a standard web browser can be used to monitor its status or to make some adjustments. To operate the device you need to know its IP Address. In case you are not aware of it, you can hear it through the headphones when you turn on the device. Alternatively, use the Network discovery feature at Local networks. Then open a new WEB Browser and enter the device IP address in the address field then press [Enter].

NETWORK DISCOVERY

This is a network setting that defines whether your computer can see (find) other computers and devices on the network and whether other computers on the network can see your computer. By default, Windows Firewall blocks network discovery but you can enable it.

1. Open Advanced sharing settings by clicking the Start button, and then on “Control Panel”. In the search box, type “network”, click “Network and Sharing Center”, and then, in the left pane click “Change advanced sharing settings”;
2. Select your current network profile;
3. Click Turn on network discovery, and then click save changes.

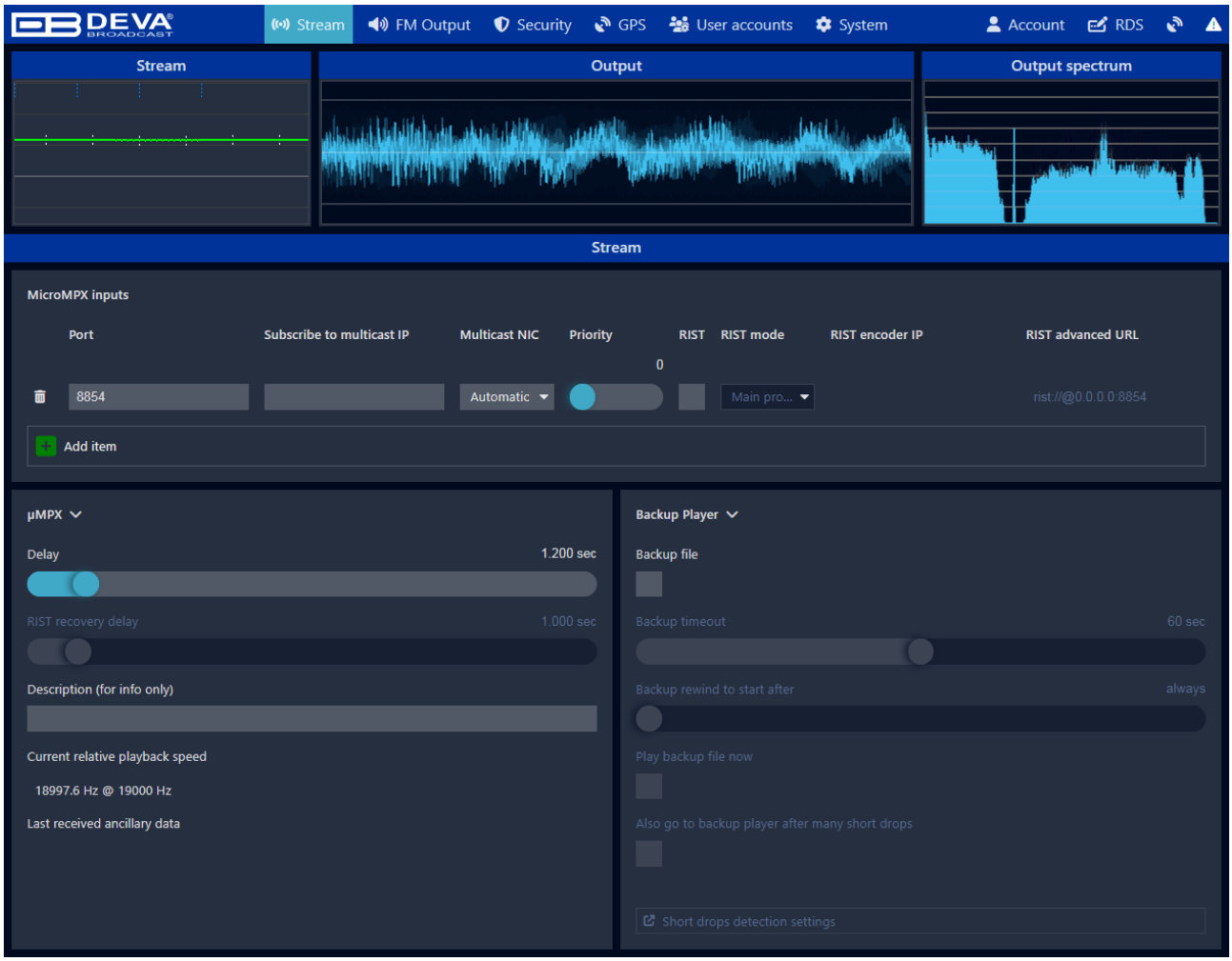
NOTE: If you’re prompted for an administrator password or confirmation, type the password, provide confirmation or contact your system administrator.

If you have already enabled this function on your computer DB94 will be automatically added to the Device list section. The device will be ready for usage and no additional adjustments will be required except user name and password.

ACCESS

DB94 provides you with a protected access to the device settings. To make the necessary adjustments to the device, please log in as an ADMINISTRATOR. The default values being username: **admin**, password: **pass**.

STREAM



Upon opening the WEB interface, the main Stream window will appear. The page contains information on the MicroMPX Inputs as well as visual interpretation of the Stream, Output and Output spectrum.

You can prepare a file with emergency audio to be played in case you have a connection drop out.

The MicroMPX decoder expects a 192 kHz mono file that contains MPX data, normalized to 0dB, in WAV or FLAC format. The file is transmitted as-is, so it needs to be pre-emphasized and it must contain stereo and RDS signals.

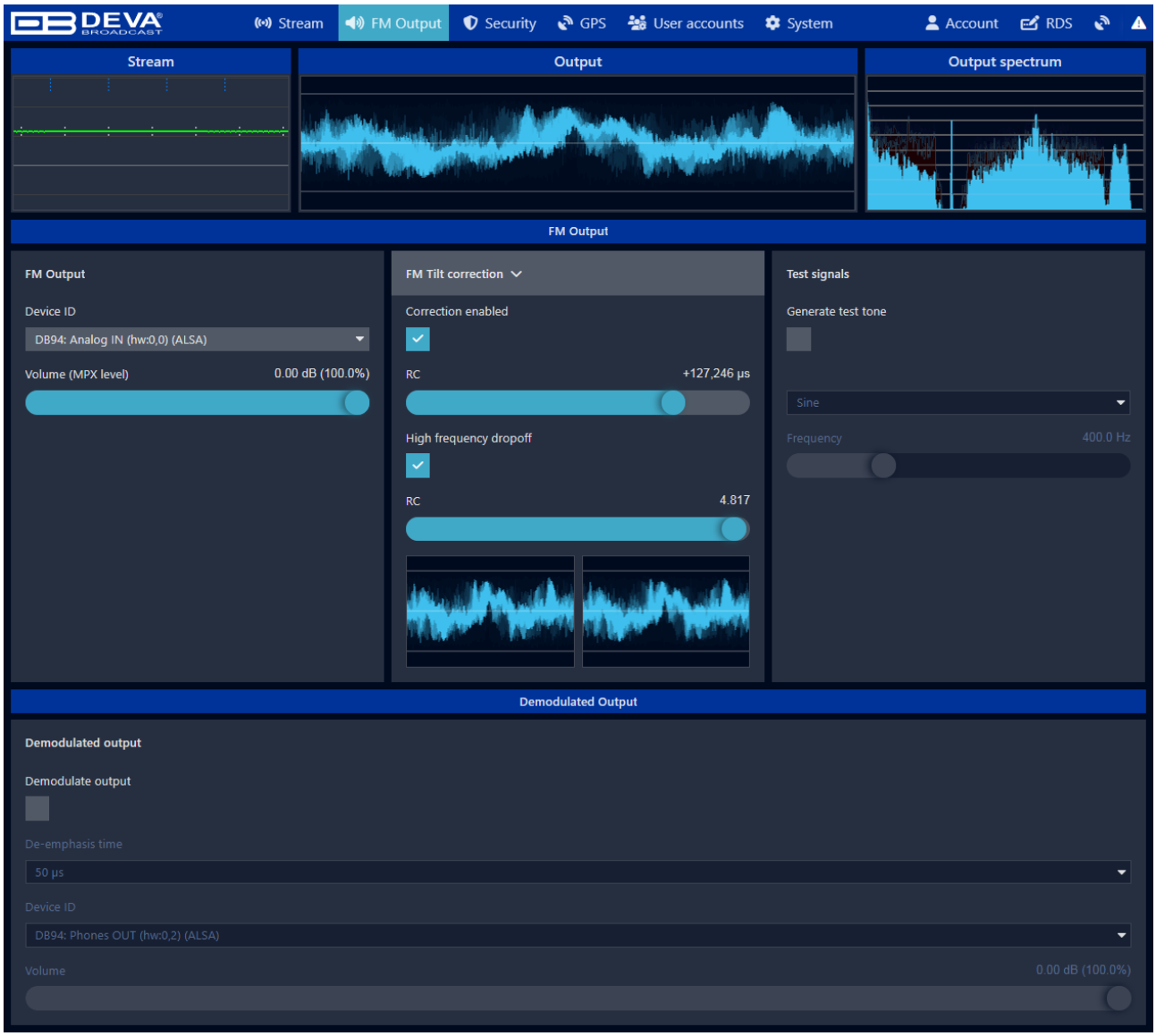
MPX files can be generated by recording the output of an FM processor (or even the received signal from a tuner that doesn't demodulate the MPX signal). Or you can use a program like Thimeo WatchCat (https://www.thimeo.com/watchcat/) to generate an MPX file from an audio file.

Backup player

- Through this screen are applied all needed settings to the alternative sources.

The backup player will start only after Backup timeout time of no usable MicroMPX data elapses. If a few packets arrive and then the signal disappears again, it will continue the backup file playback where it left off, unless the backup player hasn't been used in Backup rewind to start after time. In that case it will start at the beginning. If you always want it to start at the beginning (for example if you have a loop of jingles as backup file), you can set that time to 0.

FM OUTPUTS



FM Output and Demodulated output settings are applied in this section of the WEB Interface.

For FM Output, you can change **Device ID**, **MPX level volume**, **FM Tilt correction**, **RC High frequency dropoff** and **RC**.

You can also generate a test tone. To enable the mode: Select the “Test tone Mode” to activate it. Then configure tone settings.

Demodulated Output

- These settings provide all the needed adjustments to the algorithm which DB94 demodulates and manipulates the signal.

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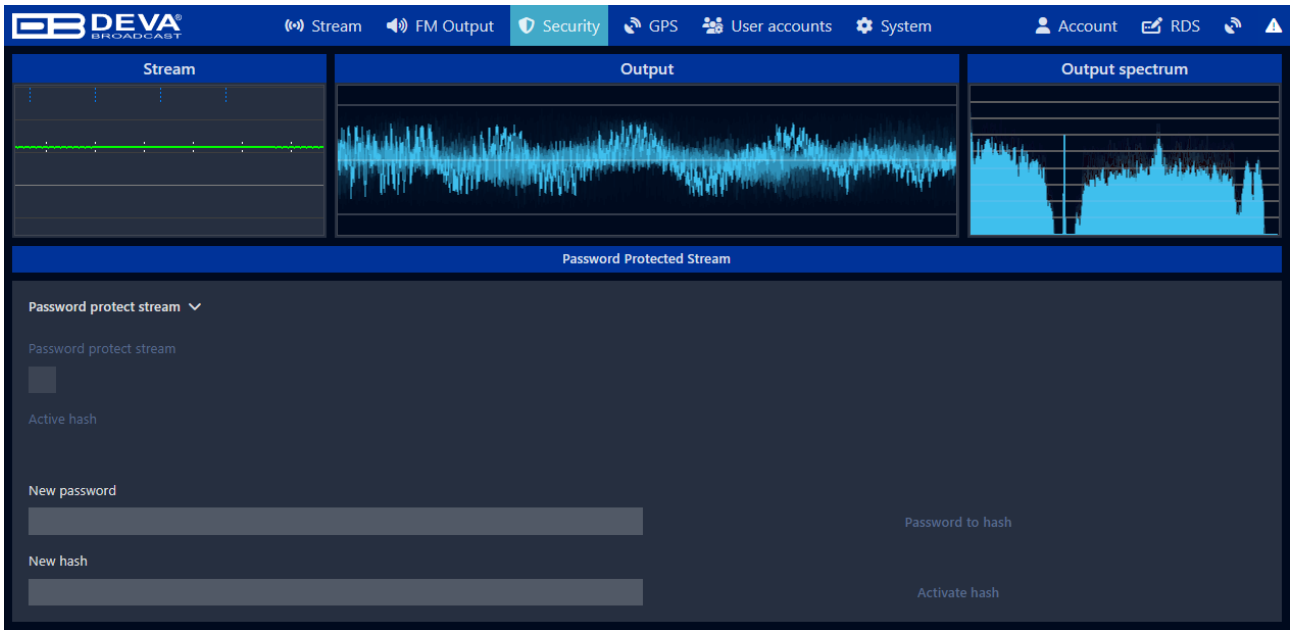
SECURITY



Allows you to password protect the stream.

IMPORTANT: If you're streaming over a public internet connection and other people could potentially send data to the same IP:PORT combination, they could overrule your stream.

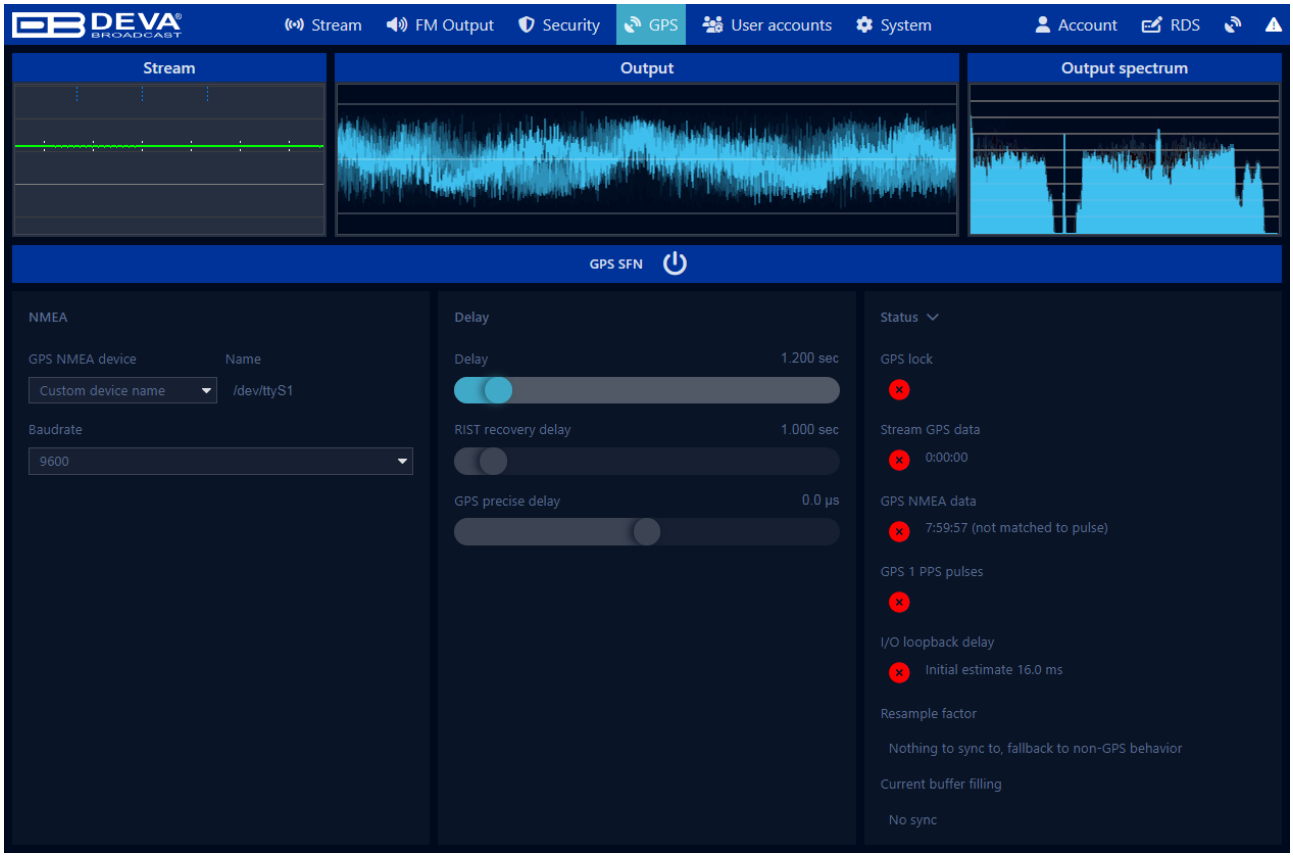
You can use a hashcode to protect against that. Only streams coming from an encoder which uses the same hashcode will decode as valid audio. A hashcode can be typed in directly, or generated from a "password". Note that if someone has access to the web interface, they can copy the hashcode and override your stream (but they could do that anyway if they have access).

The hashcode must be identical in the encoder and all the decoders, any mismatch will cause the decoder to go silent, and you'll get lots of error messages because the packages that arrive will be decoded incorrectly and contain garbage. So if you turn this on, it must be enabled in both the encoder and all the decoders.

You can either generate the hash from a password (which can be easy to remember, so you can type it in on all units and hit "Password to hash"), or you can copy the hash itself, which is probably more difficult to remember, but it also means that if you forget the password and you have a network of 200 decoders and you want to add one, you don't need to set a new password on the other 200 units.

GPS

APPLICABLE FOR THE DB94-SFN MODEL ONLY



MicroMPX will normally keep your decoders in sync within a few milliseconds, which is good enough for seemless RDS AF switching. But if you have a Single Frequency Network (multiple transmitters at the same frequency with overlapping reception areas) and you want to control exactly where the signals add up instead of interfere with each other, you need accurate timing. Typically, a precision of less than a microsecond is required (one millionth of a second).

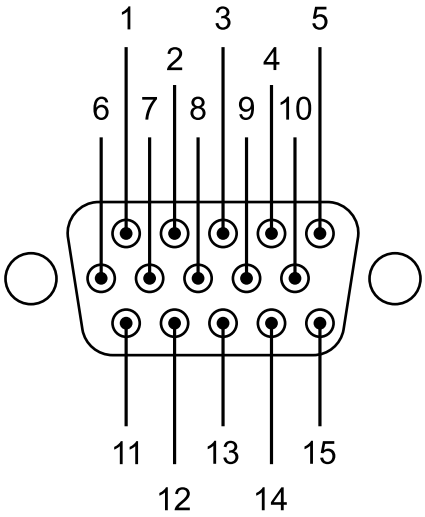
To do this, the MicroMPX encoder needs to add timestamps to the audio, and all the decoders need to precisely synchronize when they play the audio using a GPS clock.

For each decoder, you need a GPS receiver with PPS (Pulse Per Second), NMEA support.

Decoder

For the decoder, we sell a GPS receiver that is fully compatible with the DB94 series. Alternatively, you can use your own – the GPS receiver must be able to send NMEA data to a COM port and a 1PPS pulse signal to the DB94 device.

Connecting a third party GPS receiver



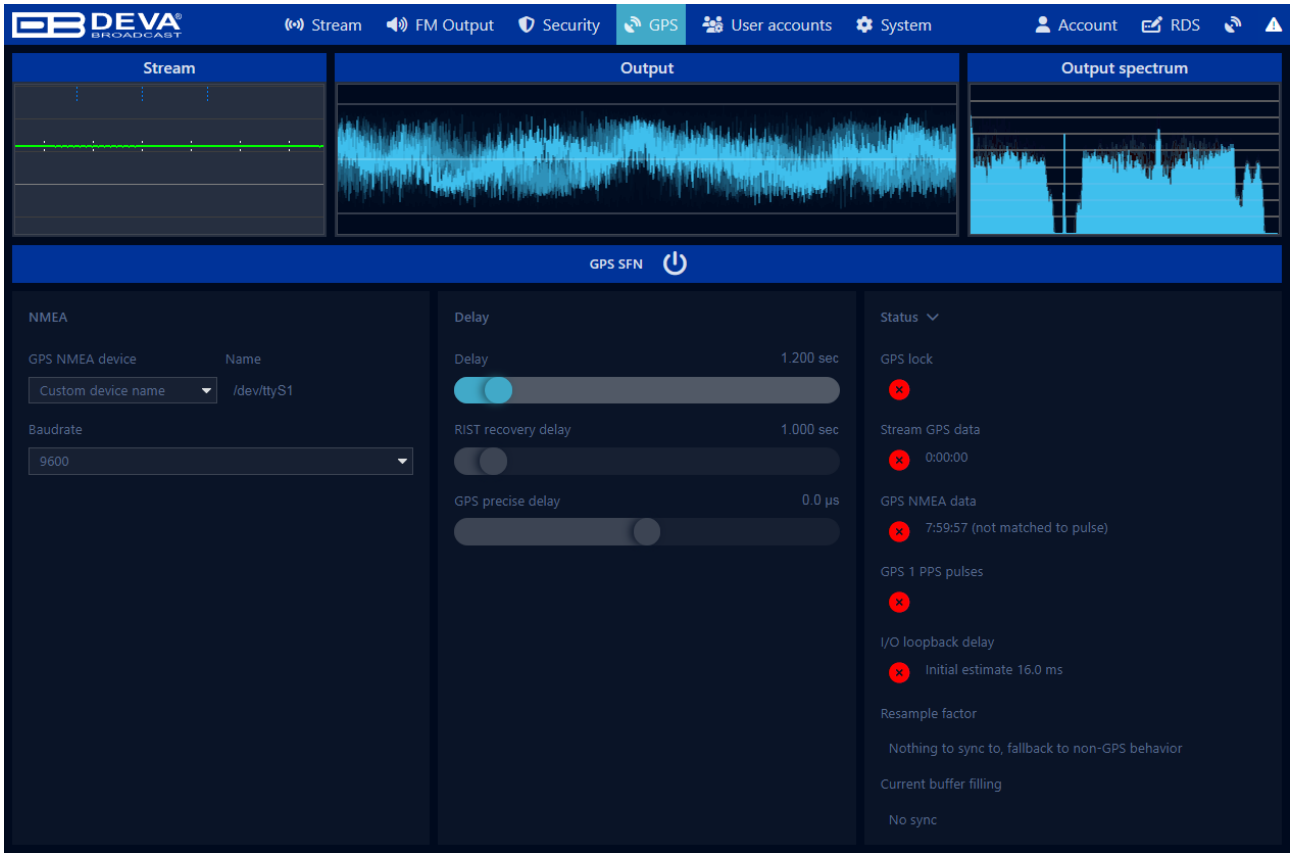
DB15 HD, Male

Pin	Function	Direction
1	GPI2	Opto isolated Input
2	**GPS RX**	**GPS Communication Output**
3	**5V GPS**	**GPS +5V, Fuse protected (0.5A)**
4	GPO3	Solid State Relay
5	GPO1	Solid State Relay
6	GPI3	Opto isolated Input
7	GPI1	Opto isolated Input
8	**GPS TX**	**GPS Communication Input**
9	**PPS IN**	**GPS PPS (Pulse Per Second) Input**
10	GPO2	Solid State Relay
11	GPICOM	Common GPO rail
12	GP5V	+5V (Out), Fuse protected (0.5A)
13	**GPS GND**	**GPS Ground**
14	GPGND	GPIO Ground
15	GPOCOM	Common GPO rail

5V GPS & **GPS GND** – power supply for the GPS module. **NOT TO BE USED FOR GPIO**.
GPS TX – Input - RS232 NMEA0183 serial communication with the GPS module.
GPS RX – Output - RS232 NMEA0183 serial communication c GPS module
PPS IN – Input - PPS (Pulse Per Second) signal from the GPS module

Connect the GPS receiver to the DB94-SFN. Then connect the DB94 with the GPS receiver cable provided with the DEVA GPS Receiver set.

Then, go to GPS in the decoder web interface and enable the SFN synchronization:



Initially, the GPS timestamps from the encoder, the timestamps of the GPS receiver on the decoder and the time (in samples) between 1PPS pulses will be displayed. If enabled, the I/O loopback delay will show an estimated delay time in milliseconds.

If the 1PPS pulses and loopback delay values don't appear after a few seconds or if they jump wildly, you may have swapped the left and right channels, so try swapping them. The right output channel (the one that contains the audio used for loopback delay measurements) sounds like a constant beep, so if you hear that where you expect your MPX signal, the output channels are probably swapped.

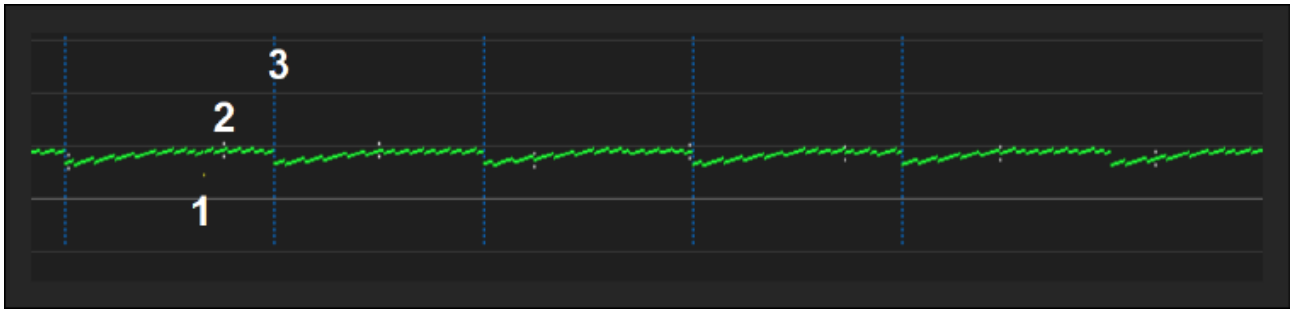
After about 30 seconds, the I/O loopback delay will light up and show an exact time (the measurment is accurate with a precision of 0.01 microseconds).

As soon as the GPS signal is recognized and synchronized to the signal from the encoder (so make sure that the encoder is sending GPS timestamps), the GPS lock icon will light up as it did in the encoder. As soon as that's the case, usually within 2 minutes, if you have multiple decoders that are configured identically and show a GPS lock, the audio is synchronized. The offset in the delays of the decoders should now be constant within about 0.5 microseconds.

To fine-tune where the signals interfere and where they boost each other, you can use the "GPS precise delay" slider. Make sure though that the main "Delay" slider is set to the same setting for all decoders.

Understanding the MicroMPX Decoder stream info display

The MicroMPX Decoder web interface has a display that shows a lot of information about incoming stream packets.



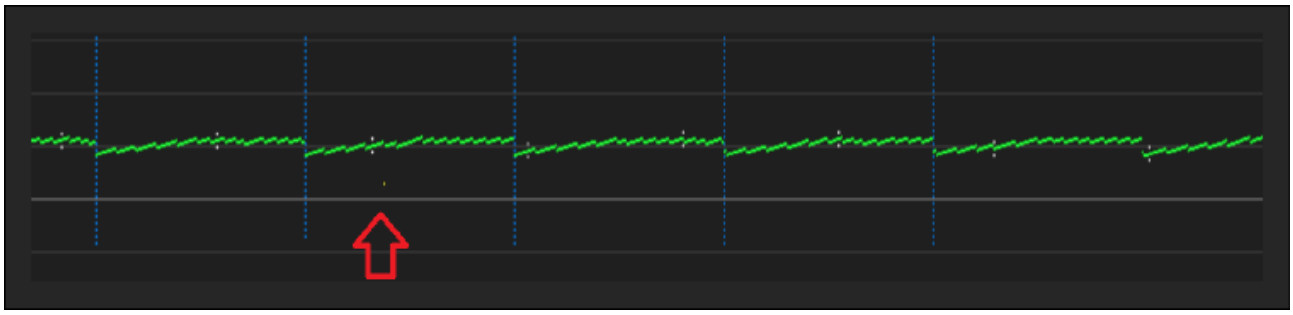
The green pixels indicate that a packet was received without issues. The distance between each green pixel and the brightest horizontal line indicates how much time was left when the packet was decoded, before a drop would have been caused. The thinner horizontal lines indicate seconds, so all the green packets here arrive between about 0.6 and 1.0 seconds before it's too late – which corresponds with a Delay setting of about 1 second.

Yellow pixels **(1)** indicate a packet that was restored using recovery packets (drawn in blue, **3**). In this case a single packet was lost, so as soon as the first recovery packet has arrived it could be reconstructed and decoded. At that point, based on where the yellow dot is drawn, about 0.4 seconds of time were remaining for decoding it in time.

As you can see here, after a sequence of blue (recovery) packets, the green pixels have a bigger delay, which is caused by the rate limiter: Because it takes some time to send all the recovery packets, the packets for the next block of audio are delayed a bit. Increasing the rate limiter maximum speed will reduce these drops – but as described before, increasing it too much may cause dropouts.

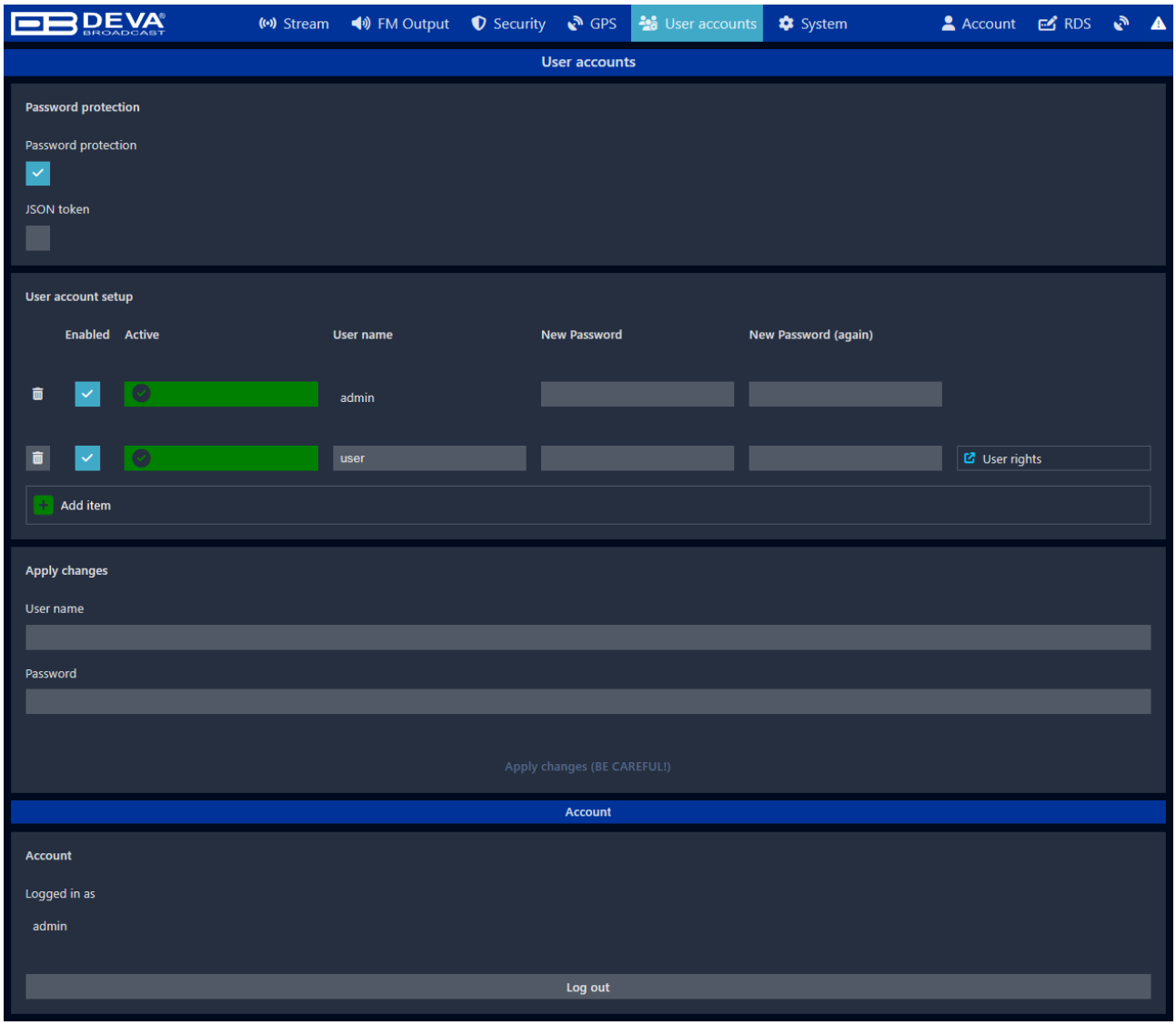
White pixels above and below the green line **(2)** indicate keyframes.

If the decoder plays silence, the background of this display (at that point in time) is colored red.



If you see occurrences like this, you can see that the yellow packet was recovered only just in time, and that could be a reason to increase the Delay a bit. Or reduce the forward error correction span setting.

USER ACCOUNTS



DB94 provides you with protected access to the device settings. You can choose between two types of log in.

as Administrator

– It will give you full control over the device's settings;

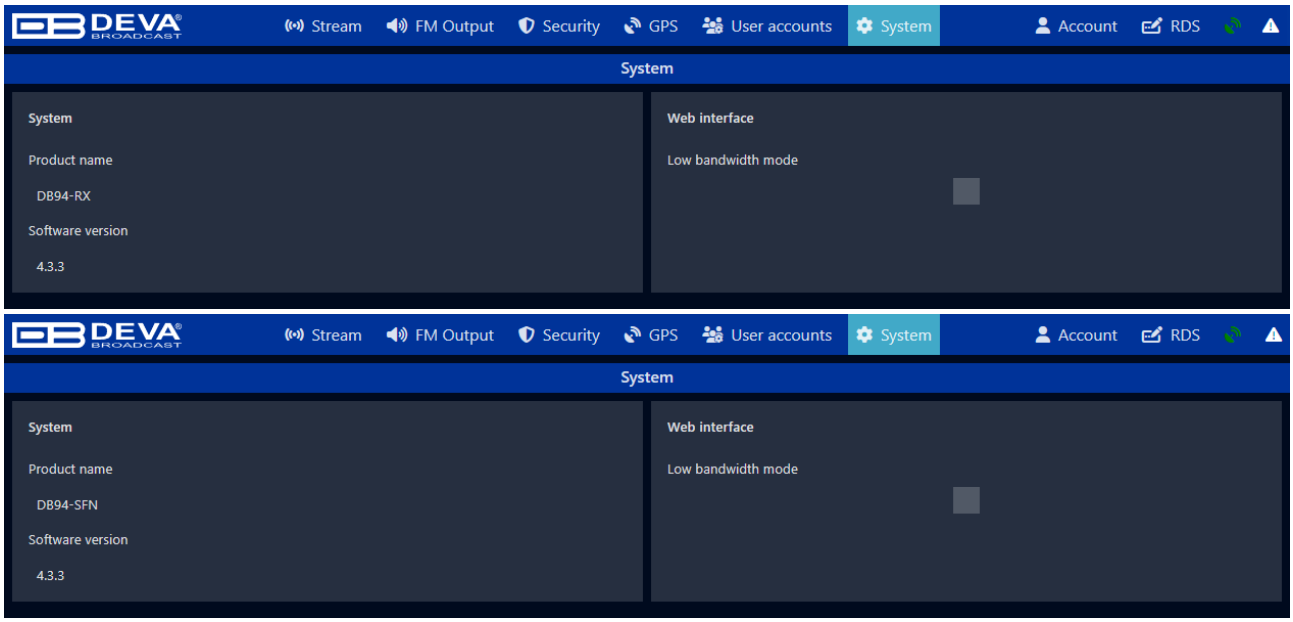
as User

– that will allow you to just monitor the device, while all the settings remain locked.

In order for the security of DB94 to be enhanced, new username and password could be set from the Security section.

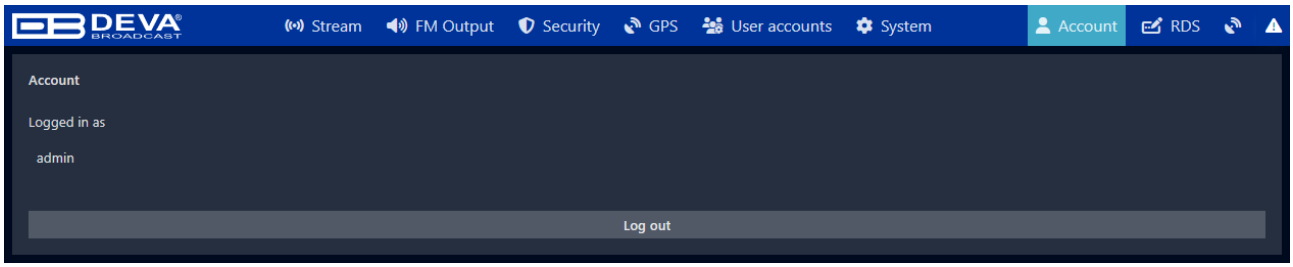
You can also generally disable the password protection option or select JSON token.

SYSTEM



Contains information on the current System status.

ACCOUNT



Information on the account with which you are logged-in.

RDS

Allows you to override the incoming RDS. Bear in mind that removing the RDS signal may lead to loss of loudness.

APPENDIX A - Possible problems and solutions

This section describes some issues that you might run into, plus and information on how to solve them.

PEAK CONTROL IS NOT PERFECT

Make sure that the input level and gain on the encoder are set such that peaks in the input signal reach exactly 0 dB (100%) on the waveform display. A warning will be shown if the level is too low. **NOTE** that setting it too high is bad as well, because values above 100% cannot be encoded, so the level must match exactly.

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WARRANTY TERMS AND CONDITIONS

I. TERMS OF SALE: DEVA Broadcast Ltd. products are sold with an understanding of "full satisfaction"; that is, full credit or refund will be issued for products sold as new if returned to the point of purchase within 30 days following their receipt, provided that they are returned complete and in an "as received" condition.

II. CONDITIONS OF WARRANTY: The following terms apply unless amended in writing by DEVA Broadcast Ltd.

A. The Warranty Registration Card supplied with this product must be completed and returned to DEVA Broadcast Ltd. within 10 days of delivery.

B. This Warranty applies only to products sold "as new." It is extended only to the original end-user and may not be transferred or assigned without prior written approval by DEVA Broadcast Ltd.

C. This Warranty does not apply to damage caused by improper mains settings and/or power supply.

D. This Warranty does not apply to damage caused by misuse, abuse, accident or neglect. This Warranty is voided by unauthorized attempts at repair or modification, or if the serial identification label has been removed or altered.

III. TERMS OF WARRANTY: DEVA Broadcast Ltd. products are warranted to be free from defects in materials and workmanship.

A. Any discrepancies noted within TWO YEARS of the date of delivery will be repaired free of charge, or the equipment will be replaced with a new or remanufactured product at DEVA Broadcast Ltd. option.

B. Parts and labor for factory repair required after the two-year Warranty period will be billed at prevailing prices and rates.

IV. RETURNING GOODS FOR FACTORY REPAIR:

A. Equipment will not be accepted for Warranty or other repair without a Return Material Authorization (RMA) number issued by DEVA Broadcast Ltd. prior to its return. An RMA number may be obtained by calling the factory. The number should be prominently marked on the outside of the shipping carton.

B. Equipment must be shipped prepaid to DEVA Broadcast Ltd. Shipping charges will be reimbursed for valid Warranty claims. Damage sustained as a result of improper packing for return to the factory is not covered under terms of the Warranty and may occasion additional charges.

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PRODUCT REGISTRATION CARD

• All fields are required, or warranty registration is invalid and void

Your Company Name_____

Contact_____

Address Line 1_____

Address Line 2_____

City_____

State/Province_____ ZIP/Postal Code_____

Country_____

E-mail_____ Phone_____ Fax_____

Which DEVA Broadcast Ltd. product did you purchase?_____

_____

_____

Product Serial #_____

Purchase date_____/_____/_____ Installation date_____/_____/_____

_____
Your signature*

*Signing this warranty registration form you are stating that all the information provided to DEVA Broadcast Ltd. are truth and correct. DEVA Broadcast Ltd. declines any responsibility for the provided information that could result in an immediate loss of warranty for the above specified product(s).

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