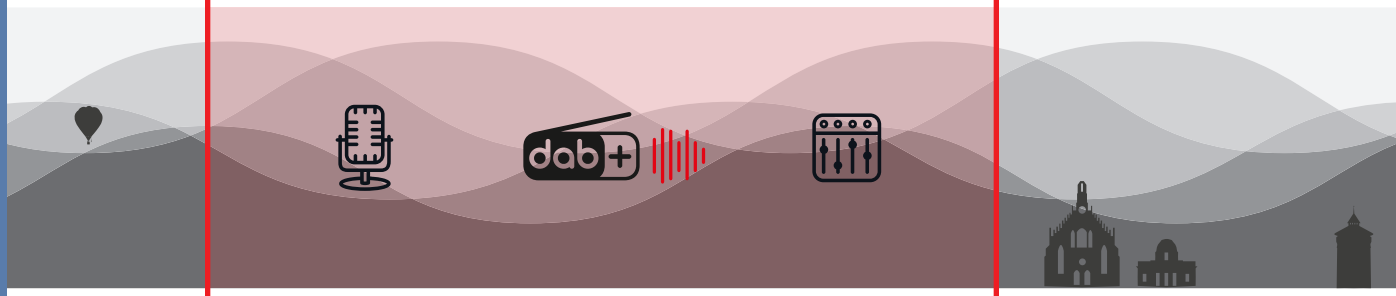
DAB/DAB+ systems



[Encoder | MUX | Switch]

Audio
Video
Technologies

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General

As a leading manufacturer of DAB systems, we offer complete solutions for DAB headends in a wide variety of variants - according to your requirements.

We have been developing DAB systems since 1993, at that time as Philips Kommunikations Industrie AG.

The first STI-based DAB Headend with dynamic reconfiguration was a joint development with Deutsche Telekom, Rohde & Schwarz and the Fraunhofer Gesellschaft.

Digital Audio Broadcasting as the successor of analogue radio offers significant advantages: In addition to the much more efficient distribution option, various data services such as SlideShow for album covers, SPI(EPG), TPEG for extended traffic information etc. can also be transferred in addition to the noise-free audio programs.

The multiplexing of a single frequency typically allows the creation of 15 to 20 audio programmes, so that a wide range of programmes is available within an ensemble.

Hardware-based DAB/DAB+ Audio Encoders can be installed separately and directly from the program providers. By avoiding multiple coding in the input, the best possible audio quality is achieved. Even a transmission over the Internet is secured and cost-efficiently possible.

Program providers who are also ensemble providers and broadcast several programs can set up software-based Audio Encoders directly on the Ensemble Multiplexer or use single or multi-channel hardware Audio Encoders.

The central system of a DAB headend is the Ensemble Multiplexer. Four different systems are available - from the simple and inexpensive Small Scale DAB multiplexer to professional DAB multiplexers on DSP base or based on the Fraunhofer ContentServer.

Program providers who have the highest requirements for availability can expand a DAB Headend partially or fully redundant. Necessary redundancy switches that guarantee trouble-free operation are available as hardware or software solution, as well as ETI/EDI interface converters that enable connection to DAB systems that do not yet have IP-based EDI interfaces.

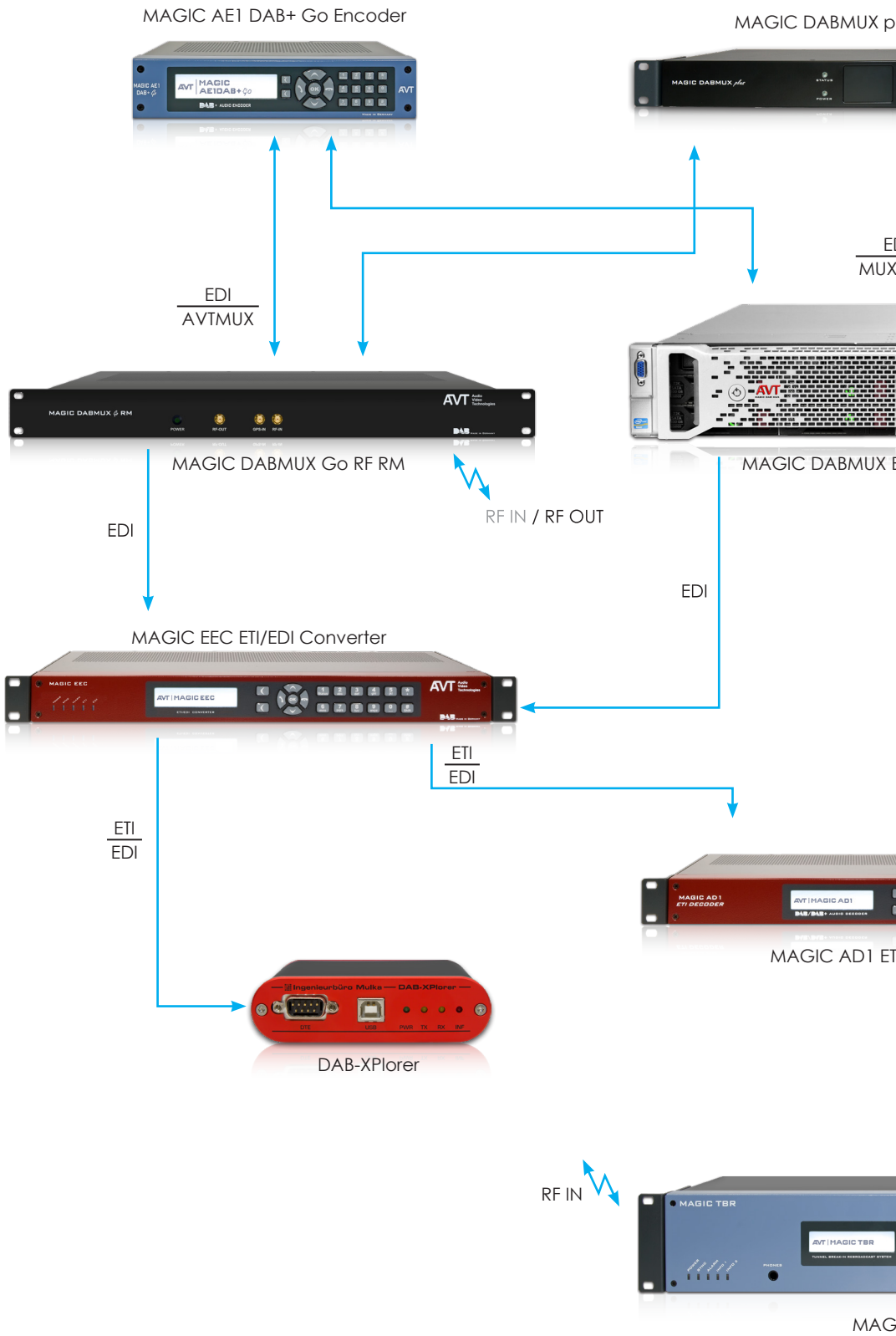
The EDI/ETI Monitoring Decoder can be used to monitor an ensemble multiplex. This provides an overview of all important parameters of an ensemble that are relevant to the transmitter and alerts via SNMP, for example, if a malfunction occurs in the DAB headend.

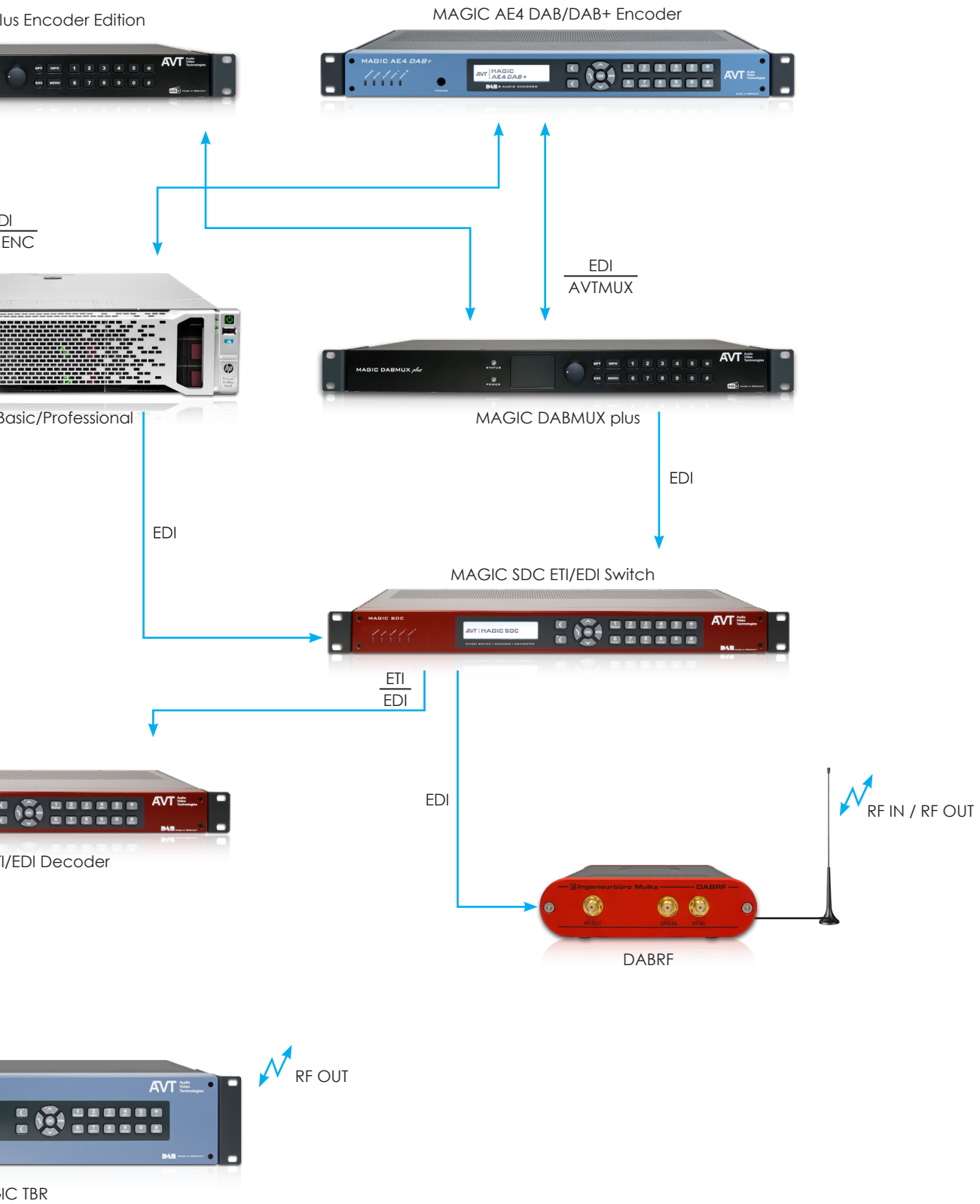
For more in-depth analysis of the DAB signal, a wired ETI/EDI analyser with integrated ensemble recorder and player is available as well as a system that can evaluate the received DAB RF signal in detail.

At the latest when the old analogue FM technology is transferred to DAB - as has already been done in Norway - road tunnels that use FM-based emergency announcement systems must also be converted to DAB.

The DSP-based, highly available and maintenance-free tunnel break-in system with integrated modulator and remodulator offers a voice break-in for up to two independent ensembles. An announcement is simultaneously made audible on all programs - regardless of which program the driver is listening to.

Overview


MAGIC AE1 DAB+ Go Encoder
MAGIC DABMUX p
EDI
AVTMUX
EDI
MUX
MAGIC DABMUX Go RF RM
MAGIC DABMUX E
RF IN / RF OUT
EDI
EDI
MAGIC EEC ETI/EDI Converter
ETI
EDI
ETI
EDI
MAGIC AD1 ET
DAB-XPlorer
RF IN
MAG


lus Encoder Edition
MAGIC AE4 DAB/DAB+ Encoder
DI
ENC
EDI
AVTMUX
Basic/Professional
MAGIC DABMUX plus
EDI
EDI
MAGIC SDC ETI/EDI Switch
ETI
EDI
I/EDI Decoder
EDI
RF IN / RF OUT
DABRF
RF OUT
IC TBR

DAB/DAB+ Audio Encoder

In this product catalogue we will use some symbols for the systems' features and their availability. Below you will find a description of all features.

Included A blue symbol shows that the feature is available in the standard delivery version for the product described.

Option A greyish-blue symbol shows that the feature is optionally available (associated with costs).

Not available A light grey symbol shows that the feature is not supported by the product described.

DAB **DAB+** DAB/DAB+

The device supports DAB (ISO/MPEG 1/2 Layer 2) and/or DAB+ (MPEG4 HE-AAC v2).

UECP UECP

The Universal Encoder Communication Protocol (UECP) is supported.

PAD Programme-associated data

The system supports all available PAD services of the service/Ensemble Multiplexer, which are fed to the encoder remotely.

L-PAD Local PAD

The system allows local feeding of the PAD services Dynamic Label and Slideshow.

SNMP SNMP

SNMP protocol v1 and v2c for integration into a network management system is supported.

VLAN VLAN

VLANs (Virtual Local Area Networks) can be set up in the system configuration.

n x LAN LAN interface(s)

The device has n x Ethernet interfaces.

n x AES **n x ANA** AES/ANA

The device has n x digital AES/EBU and/or n x analogue stereo audio interfaces.

AES/ ANA AES/ANA

The device has an analogue and a digital stereo audio interface, which can be switched between.

AES67 AES67

The AES67 upgrade allows the use of additional audio channels over IP via AES67, the lowest common denominator of similar technologies, e.g. Dante and Ravenna.

Web stream Webstream Inputs

Audio Input via Icecast/SHOUTcast (MP3 or FLAC, 16-bit, 48 kHz).

GPIO GPIO

Programmable TTL interfaces and Relay contacts are available.

DEC Listening Decoder

The system has a Listening Decoder.

Ember+ Ember+

Ember+ protocol is available

Overview: Technical data

	MAGIC AE1 DAB+ Go	MAGIC AE4 DAB/DAB+	MAGIC DABMUX plus Encoder Edition
Feature			
Coding algorithms	1 Encoder MPEG4 HE-AAC v2 ETSI TS 102 563 ISO/MPEG 1/2 Layer 2 DAB EN 300401 (FhG-Licence)	1-4 Encoders MPEG4 HE-AAC v2 ETSI TS 102 563 ISO/MPEG 1/2 Layer 2 DAB EN 300401 (FhG-Licence)	1-14 Encoders MPEG4 HE-AAC v2 ETSI TS 102 563 (FhG-Licence)
Coding modes	Mono, Mono + SBR Stereo, Stereo + SBR Stereo + SBR + PS	Mono, Mono + SBR Stereo, Stereo + SBR Stereo + SBR + PS	Mono, Mono + SBR Stereo, Stereo + SBR Stereo + SBR + PS
Sampling frequencies	24, 48-kHz 16, 32-kHz	24, 48-kHz 16, 32-kHz	24, 48-kHz 16, 32-kHz
Data rates	8-kbit/s ... 384-kbit/s	8-kbit/s ... 384-kbit/s	8-kbit/s ... 192-kbit/s
Network interfaces	1 x LAN Fast Ethernet 3 IP addresses VLAN support	2 x LAN Fast Ethernet 6 IP addresses VLAN support Optional: Dual LAN module	3 x LAN GbE 9 IP addresses VLAN support Optional: Dual LAN module
Audio input	XLR, analogue, electr. balanced digital AES/EBU with SRC	XLR, analogue, electr. balanced digital AES/EBU with SRC	Webstream Icecast/SHOUTcast (MP3/FLAC, 16-bit, 48 kHz)
AES67-Channels (Stereo) *Software Upgrade*	Optional: RX: 1 (1 Stream) TX: -	Optional: RX: 4 (1 Stream) TX: 1 (1 Stream)	Optional: RX: 14 (14 Streams) TX: 2 (2 Streams)
Ravenna module	-	Optional: 32 channels I/O	on request
Audio level	-3 ... +9 dBu	-3 ... +9 dBu	-3 ... +9 dBu
Synchronisation	NTP, AES/EBU	NTP, AES/EBU	NTP, PTPv2
Protocols **Output**	Unicast, Multicast, Simulcast (1 Stream to 4 destinations) UDP (VDL) AVTMUX with Secure Streaming Optional: EDI(ETI),EDI(STI), FhG MUXENC	Unicast, Multicast, Simulcast (1 Stream to 2 destinations per program) UDP (VDL) AVTMUX with Secure Streaming Optional: EDI(ETI),EDI(STI), FhG MUXENC	Unicast, Multicast, Simulcast (14 Streams to 2/ optional 4 destinations per program) UDP (VDL) AVTMUX (on request) Optional: EDI(ETI), EDI(STI) FhG MUXENC (on request)
PAD/SI	Local services via FTP: Dynamic Label MOT SlideShow TA (TTL/UECP) PTy (UECP)	Local services via FTP: Dynamic Label MOT SlideShow TA (TTL/UECP) PTy (UECP)	Local services via FTP or API: Dynamic Label MOT SlideShow TA (UECP) PTy (UECP) Ember+
GPIO	4 x TTL/2 x Relay	8 x TTL/8 x Relay	Ember+
Monitoring	SNMP v1/v2c	SNMP v1/v2c	SNMP v1/v2c
Power supply	external 12V power supply Optional: redundant power supply via external box	integrated 100 – 230 V AC Optional: external 5V power supply for redundant power	integrated 100 – 230 V AC Optional: external 12V power supply for redundant power
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Power consumption	max. 12 W	max. 15 W	max. 30 W
Dimensions (H x W x D)	1U x ½ x 19" x 21 cm	1U x 19" x 25 cm	1U x 19" x 23 cm

MAGIC AE1 DAB+ Go Audio Encoder

MAGIC AE1 DAB+ Go

DAB | DAB+ | UECP | PAD | L-PAD | SNMP | VLAN | 1 x LAN

AES | ANA | Web stream | AES67 | GPIO | DEC | Ember+

- MPEG4 HE-AAC v2 DAB+ Encoder (ETSI TS 102 563)
- ISO/MPEG 1/2 Layer 2 DAB Encoder (ETSI TS 103 466)
- Audio via IP to Ensemble Multiplexer
- LAN interface for audio, PAD, control
- AVTMUX with Secure Streaming
- PAD via LAN
- VLAN support
- Support of all data rates
- XLR inputs (analogue and digital)
- 16/32-kHz and 24/48-kHz sampling frequencies
- SNMP v1/v2c, GPIO contacts
- Configuration via web browser
- Optional EDI (ETI/STI), FhG MUXENC
- Optional: AES67 Software Upgrade
- Optional: redundant power supply via external box

The high quality and professional DSP-based hardware audio encoder **MAGIC AE1 DAB+ Go** is realized as a fanless ½ x 19'' device and offers excellent audio quality thanks to the licenced Fraunhofer DAB+ and DAB algorithms.

The supplied **Windows software** allows the configuration of up to 100 systems. Alternatively a comfortable configuration and monitoring of the encoder is carried out via a HTML5 web browser.

Both **analogue** and **digital** audio interfaces are available for the input of the audio signal. Optionally, a stereo channel via LAN is available with the **AES67 software upgrade** (SAP/SDP File Support).

For the feed of PAD (Program Associated Data), a PAD inserter is integrated, which allows an easy input of Dynamic Labels (DLS / DLS+) and Slideshows (SLS / categorised SLS). The insertion of additional information can be done via FTP.

In addition, a traffic announcement (**TA**) can be triggered very easily via UECP or a GPIO contact.

Finally, the Audio Encoder allows direct transmission of the program type (**PTy**) like Rock, Pop etc. via UECP.

In addition to browser control, the transmission can also be monitored via the supplied Windows PC software or via SNMP. Alternatively, an alarm can also be issued via a GPIO contact.

Up to **three IP addresses** can be assigned to the integrated network interface, so that a network separation for different applications is possible. The system also supports VLANs.

Communication between multiplexer and encoder is carried out via the **AVTMUX** protocol, which enables the control, monitoring and PAD transmission of the encoders from the multiplexer.

Safe transmission is guaranteed via **Secure Streaming**.With this method, which has also proven effective in the field of classical audio transmission, all IP packets are transmitted twice - with a delay. Due to the low bit rates with DAB+, the necessary doubling of the data rate usually uncritical. In addition, different routes can be implemented in the transmission path by using suitable addressing. At the multiplexer (**MAGIC DABMUX Go** and **MAGIC DABMUX plus**) all IP packets are reassembled correctly in time and duplicate received packets are rejected.

The system can also be used directly with the Open Source Multiplexer **ODR DabMux**. The ODR-extension „SourceCompanion" is available free of charge on the GitHub platform.

To mount two systems next to each other in a 1U 19" rack, the optional **Dual Mounting Kit** can be used.

With the **Audio Backup Upgrade**, automatic switching between the audio interfaces is possible in the event of an input failure.

MAGIC AE1 DAB+ Go – Rear side

MAGIC AE4 DAB/DAB+ Audio Encoder

MAGIC AE4 DAB/DAB+

DAB | DAB+ | UECP | PAD | L-PAD | SNMP | VLAN | 2 x LAN

4 x LAN | AES/ ANA | Web stream | AES67 | GPIO | DEC | Ember+

- Quad DAB/DAB+ encoder
- MPEG4 HE-AAC v2 (ETSI TS 102 563)
- ISO/MPEG 1/2 Layer 2 (ETSI TS 103 466)
- Audio via IP to Ensemble Multiplexer
- AVTMUX with Secure Streaming
- Control Decoder
- 4 x AES/EBU stereo inputs
- 1 x Analogue Stereo Input
- Headphone interface, analogue and digital output for monitoring
- Support of all data rates
- 24/48-kHz and 16/32-kHz sampling frequencies
- Configuration via HTML5 web browser
- 2 x LAN interfaces with VLAN Support
- SNMP v1/v2c
- GPIO Contacts
- Optional: EDI (ETI/STI), FhG MuxEnc
- Optional: AES67 Software Upgrade
- Optional: Dual LAN module
- Optional: 5V redundant power supply

The **MAGIC AE4 DAB/DAB+** Encoder offers in the standard version one DAB/DAB+ hardware audio-encoder and can optionally be upgraded with three further encoders. Each of the four channels are independent and can be configured independently as a DAB or DAB+ encoder. The system is realized in a compact, fanless and DSP-based design.

For the feed of PAD (Program Associated Data), per encoder a PAD inserter is integrated, which allows an easy input of Dynamic Labels (DLS / DLS+) and Slideshows (SLS / categorised SLS). The insertion of additional information can be done via FTP or via a modern JSON/XML based API.

The audio programs can be supplied via the four digital AES/EBU stereo interfaces. An analogue stereo interface is also available. Optionally the audio input can be achieved with the **AES67 software upgrade** (SAP/SDP File Support). In the future, a **RAVENNA module** will also be available.

With the **Audio Backup Upgrade**, automatic switching between the audio interfaces is possible in the event of an input failure.

The PAD is fed in via the Ensemble Multiplexer, which scans the PAD via the return path of the transmission protocol on the encoder. All PAD services supported by the multiplexer can be used.

Alternatively, it is also possible to feed **PAD services** directly into the Encoder. **Dynamic Label** and **MOT SlideShow** are supported.

In addition to PAD, service information such as the Program Type (PTy) and Traffic Announcement (TA) can also be transmitted via UECP for each program. The triggering of a traffic announcement can be easily implemented via a TTL contact.

As transmission protocols with reconfiguration capability and PAD insertion, the system supports the proprietary standards **AVTMUX**, **FhG MuxEnc**, **AVTVDL** and **ODR DabMux**.

The EDI (ETI/STI) standard also allows the system to be connected to almost any Ensemble Multiplexer from other manufacturers. In this case, however, reconfiguration and PAD feeding from the multiplexer is not possible, since EDI cannot transfer control information.

Two network interfaces are available as standard. Up to **three IP addresses** can be assigned to each Ethernet interface. With the **Dual LAN module**, MAGIC AE4 can be extended by two further LAN interfaces, so that in total four LAN interfaces are available.

In addition, the system supports VLANs for services such as audio & PAD, SNMP, UECP and NTP, making it easy to separate the subnets for audio transmission, data transfer and management.

For monitoring, but also for assessing the quality of the encoded audio signal, a **Control Decoder** is also integrated, which enables direct monitoring of the uncoded and encoded signal.

The monitoring can be done either via the headphone interface on the front or via the analogue and digital audio interfaces on the rear panel.

A comfortable configuration and monitoring of all four encoders is carried out via a HTML5 web browser.

In addition, the device can be integrated into a network management system via SNMP.

Finally, eight **TTL** inputs/outputs and eight **relays** can be freely programmed, e. g. for alarming.

MAGIC AE4 DAB/DAB+ – Rear side

MAGIC DABMUX plus Encoder Edition

MAGIC DABMUX plus Encoder Edition

DAB | DAB+ | UECP | PAD | L-PAD | SNMP | VLAN | 3 x LAN
5 x LAN | AES/ ANA | Web stream | AES67 | GPIO | DEC | Ember+

- 14 x DAB+ encoder
- MPEG4 HE-AAC v2 (ETSI TS 102 563)
- Audio input optionally via AES67 or web-stream
- Audio via IP to Ensemble Multiplexer
- Support of all data rates
- 24/48-kHz and 16/32-kHz sampling frequencies
- Configuration via HTML5 web browser
- 3 x LAN interfaces with VLAN support
- Ember+
- SNMP v1/v2c
- Expansion slot for Dual LAN module
- For future extensions:
  - 2 x USB 2.0
  - 1 x SD card slot
- Optional: EDI(ETI) or EDI(STI)
- Optional: Service Monitor
- Optional: 12V redundant power supply

The DSP-based system **MAGIC DABMUX plus Encoder Edition** allows the encoding of **up to 14 DAB+ programmes** in a 19“ x 1 U unit. Audio input is either via AoIP **AES67 streams** or as **Icecast/SHOUTcast web streams** (MP3 or FLAC format, 16 bit, 48 kHz). If web streams are used, a maximum of 13 programmes is available.

The output signal can be sent via unicast or multicast to up to two locations as a simulcast stream.

With the **EDI option**, the output format EDI(ETI), EDI(STI-D) can be set individually for each programme. In addition to the separate programme output signals, an output in EDI(ETI) or EDI(STI-D) format is available which can transport all programme contents of the system in a common data stream.

For the feed of PAD (Program Associated Data), per encoder a **PAD inserter** is integrated, which allows an easy input of Dynamic Labels (DLS / DLS+) and Slideshows (SLS / categorised SLS). The insertion of additional information can be done via FTP or via a modern JSON/XML based API.

The system is synchronised either via **NTP** or, with AES67 audio feed, via **PTPv2**.

If AES67 is used, two AES67 stereo outputs (4 channels) are automatically available for monitoring purposes.

The optional **Service Monitor** upgrade allows monitoring of any encoder stream via the web interface.
In addition, the Service Monitor offers the possibility to decode PAD.

As standard, the system has **three GbE interfaces**, so that a physical separation between management, AES67 and web stream feed is easy to realise.

If required, the expansion slot can be equipped with the **Dual LAN module** (2 x Fast Ethernet), so that five Ethernet interfaces are then available. Up to 3 IP addresses can be assigned per Ethernet interface. In addition, a VLAN can be configured per IP address.

A **redundant power supply** is optionally available for maximum reliability.

Monitoring and configuration is possible via an **HTML5-compatible web browser.** All available encoders can be clearly displayed in a dashboard.
The audio levels of all programmes as well as the DAB-specific parameters such as sampling rate, mode, data rate, etc. are displayed. In addition, warnings and alarms for the input signals are visible.

With local input from PAD, the current dynamic label and the current picture of a slideshow are also displayed individually for each programme.

A **detailed log file** is also available directly in the browser.

The SNMP v1 / v2c protocol is integrated for connection to network management systems.

The **EMBER+ protocol**, which is widely used in the broadcast sector, is also supported.

Up to 10 workplaces can access the system simultaneously for configuration and monitoring. Three roles - admin, operator and guest - with different authorisations are implemented for user access.

MAGIC DABMUX plus Encoder Edition – Rear side

DAB Service & Ensemble Multiplexer

In this product catalogue we will use some symbols for the systems' features and their availability. Below you will find a description of all features.

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Option A greyish-blue symbol shows that the feature is optionally available (associated with costs).

Not available A light grey symbol shows that the feature is not supported by the product described.

PAD — Programme-associated data

The system has an integrated PAD inserter for Dynamic Label, Slideshow, etc.

NPAD — Non-programme-associated data

The system has an integrated NPAD inserter for SPI, TPEG, etc.

SI — Service Information

The system allows the insertion of service information, such as traffic announcements.

UECP — UECP

The Universal Encoder Communication Protocol (UECP) is supported.

n x EDI — n x EDI

The system allows to insert the contents of external EDI data streams.

ETI — ETI

The system has a 2-Mbit/s ETI input/output interface.

STI — STI

The system allows the insertion of contents of external STI (D+C) data streams.

AVTMUX — AVTMUX

External audio encoders can be controlled via the AVTMUX protocol. Secure Streaming is also supported.

MuxEnc — MuxEnc

External audio encoders can be controlled via the MuxEnc protocol.

Software Enc — Software Encoder

The system supports internal DAB/DAB+ Software Encoders.
Also available as a more economical backup software encoder if the main path is implemented with a hardware encoder.

SNMP — SNMP

SNMP protocol v1 and v2c for integration into a network management system is supported.

VLAN — VLAN

VLANs (Virtual Local Area Networks) can be set up in the system configuration.

DSP — Digital signal processor

The device is implemented on a signal-processor based hardware platform.

PC Server PC

The software multiplexer is implemented on a server PC under Linux (Ubuntu).

+Lizenz Licensing

The device is supplied with a software license plus a USB dongle license for general average purposes.

n x LAN n x LAN interfaces

The device has n x Ethernet interfaces.

RF RF modulator

The device has an integrated RF modulator for Band III. In addition, a GPS input for synchronisation is available.

Player Multimedia Player

The Basic/Professional license includes the free use of the Multimedia Player for two years.

Web stream Webstream Input

Audio input via Icecast/SHOUTcast (MP3 or FLAC, 16-bit, 48 kHz).

Ember+ Ember+

The Ember+ protocol is available.

AES67 AES67

The AES67 upgrade allows the use of additional audio channels over IP via AES67.

Server Specification

The Fraunhofer based Ensemble Multiplexer hardware is a standard Server PC (typically HP DL380p). But customers can also use their own preferred platform. To avoid problems, it is helpful to check your server PC specification.

The minimum server requirements are as follows:

- HP DL380p Server
- 1 x INTEL XEON 8-core processor
- 16 GB RAM
- 2 x 240 GB SSD (RAID)
- 4 x LAN GBit/s
- DVD ROM Drive
- Redundant Power Supply
- HP iLo Advanced 1 Year

	MAGIC DABMUX Go RF RM	MAGIC DABMUX plus
Feature		
DAB Spezification	ETSI EN 300401 V2.1.1	ETSI EN 300401 V2.1.1
Basis	DSP hardware	DSP hardware
Network interfaces	1 x LAN GbE 3 IP addresses VLAN support	3 x LAN GbE 9 IP addresses VLAN support
Extension interfaces	-	2 x USB 2.0 1 x SD Card Slot Optional: Ravenna module
Redundancy	no automatic adjustment	with automatic adjustment
Synchronisation	NTP GPS	NTP
Protocols	Unicast, Simulcast, Multicast	Unicast, Simulcast, Multicast
Input	AVTMUX with Secure Streaming for up to 20 encoders 2 x EDI subchannel extraction	AVTMUX with Secure Streaming for up to 25 encoders 4 x EDI subchannel extraction
Output	EDI(ETI)	EDI(ETI)
Software Encoder	-	optional: up to 14 Encoders via AES67 or Webstream
Reconfigurationen	manual, scheduler	manual, scheduler, external (SNMP, Ember+)
Configuration	Web browser HTML5	Web browser HTML5
PAD Inserter	via Audio Encoder Optional: Integriert via FTP+API	via Audio Encoder Integriert via FTP+API
NPAD Inserter	2 Channels (optional 4)	4 Channels
SI	TA (UECP), PTy, Announcements Optional: Service Linking	TA (UECP), PTy, Announcements, Service Linking
Supported DAB data services	Dynamic Label (+), SPI, TPEG, MOT SlideShow	Dynamic Label (+), SPI, TPEG, MOT SlideShow
Monitoring	SNMP v1/v2c	SNMP v1/v2c
Power supply	integrated 100 – 230 V AC Optional: 2nd 100 – 230 V AC power supply	integrated 100 – 230 V AC Optional: 12V power supply
Mains frequency	50/60 Hz	50/60 Hz
Power consumption	max. 15 W	max. 30 W
GPS input (SMA)	Impedance: 50 Ω GPS antenna with 25 dBi amplification required	-
RF output (SMA)	Level: –40 dBm … –3 dBm @ 50 Ω	-
RF input (SMA)	Impedance: 50 Ω	-
Dimensions (H x W x D)	1U x 19" x 18 cm	1U x 19" x 23 cm

LTIPLEXER

MAGIC DABMUX Basic	MAGIC DABMUX Professional
ETSI EN 300401 V1.4.1/V2.1.1	ETSI EN 300401 V1.4.1/V2.1.1
Server PC Ubuntu Linux	Server PC Ubuntu Linux
4 x LAN GbE (optional: 8 x LAN) multiple IP addresses VLAN support	4 x LAN GbE (optional: 8 x LAN) multiple IP addresses VLAN support
-	-
with automatic adjustment	with automatic adjustment
NTP	NTP
Unicast, Simulcast, Multicast	Unicast, Simulcast, Multicast
MUXENC with Secure Streaming	MUXENC with Secure Streaming
Optional: EDI subchannel extraction	2 x EDI subchannel extraction
EDI(ETI/STI)	EDI(ETI/STI)
optional: DAB/DAB+/Surround	optional: DAB/DAB+/Surround
manual, scheduler, external (SNMP, RPC)	manual, scheduler, external (SNMP, RPC)
Web browser	Web browser
yes	yes
yes	yes
all	all
all available services (acc. to list on page 32)	all available services (acc. to list on page 32)
SNMP v1/v2c/v3	SNMP v1/v2c/v3
2 x integrated 100 – 230 V AC	2 x integrated 100 – 230 V AC
50/60 Hz	50/60 Hz
typical 100 W	typical 100 W
-	-
-	-
-	-
2U x 19“ x 85 cm	2U x 19“ x 85 cm

MAGIC DABMUX Go RM Ensemble Multiplexer

MAGIC DABMUX Go RM

PAD | NPAD | SI | UECP | 2 x EDI | ETI | STI | AVTMUX | MuxEnc | Ember+
Software Enc | SNMP | VLAN | DSP | PC | +Lizenz | 1 x LAN | RF | Player

MAGIC DABMUX Go RF RM

PAD | NPAD | SI | UECP | 2 x EDI | ETI | STI | AVTMUX | MuxEnc | Ember+
Software Enc | SNMP | VLAN | DSP | PC | +Lizenz | 1 x LAN | RF | Player

- DSP-based Ensemble Multiplexer
- 1 x GBit Ethernet
  3 IP addresses
  VLAN Support
- Configuration via web browser
- PAD insertion via Audio encoder (FTP,API)
- NPAD inserter for TPEG and SPI (EPG)
- Support of all other NPAD services
- Simplified program logo insertion
- Synchronization via NTP/GPS
- SNMP v1/v2c
- Manual reconfigurations
- Scheduled reconfigurations
- Ember+ and DHD SetLogic
- Connection of up to 20 encoders possible
- Optional: 2nd power supply
- Optional:
  RF modulator + GPS synchronization
- Optional:
  1-way/ 2-way redundancy switching

With the increasing interest in digital radio, even local radio, community radio and university radio stations ask for economic solutions for their program distribution via DAB+.

Our already existing professional Ensemble Multiplexers **MAGIC DABMUX Basic** and **MAGIC DABMUX Professional**, which are realised on a Server PC, offer almost all imaginable possibilities and display the DAB standard almost completely. Due to the high complexity and to cost reasons these systems are too complex for smaller program providers.

The also available Open-Source Version **ODR-DabMux** is free of charge, but requires a PC with Linux operating system and independent training and maintenance. Furthermore, the integrated FDK-AAC DAB+ Audio Encoder offers only a restricted Audio quality only in comparison with our professional Audio Encoders.

In interaction with our high-quality **MAGIC AE1 DAB+ Go** Audio Encoder and the new **MAGIC DABMUX Go RM** an economic alternative is available now.

MAGIC DABMUX Go RM is an only DSP-based Ensemble Multiplexer and provides high availability at an excellent performance.

Up to 20 program providers can be connected via external Audio Encoders. An installation of the Encoders directly in the studio avoids effectively an interference in Audio quality because of Codec cascading.

Special value was set on the easy configuration of the Ensemble Multiplexer, so that even users without DAB expert knowledge are able to set up the system. The configuration, operation and monitoring are effected via a HTML5-compatible web browser.

The highly compact DAB Ensemble Multiplexers facilitate a very simple Multiplex generation in accordance with standard ETSI EN 300 401. All features such as re-configuration (manually and scheduled), extraction of Sub Channels of other Multiplexers, integration of PAD and NPAD data services, creation of Service Information etc. are integrated.

Audio Services can be supplied via the AVTMUX or the EDI(ETI/STI) protocol from external Multiplexers. As output signal both Multiplexer variants supply an EDI signal for transmission to the transmitters. With the integrated modulator, you can alternatively activate a power amplifier directly. This possibility is particularly of interest if you have only one transmitter site. The synchronisation is effected via NTP or via the integrated GPS receiver.

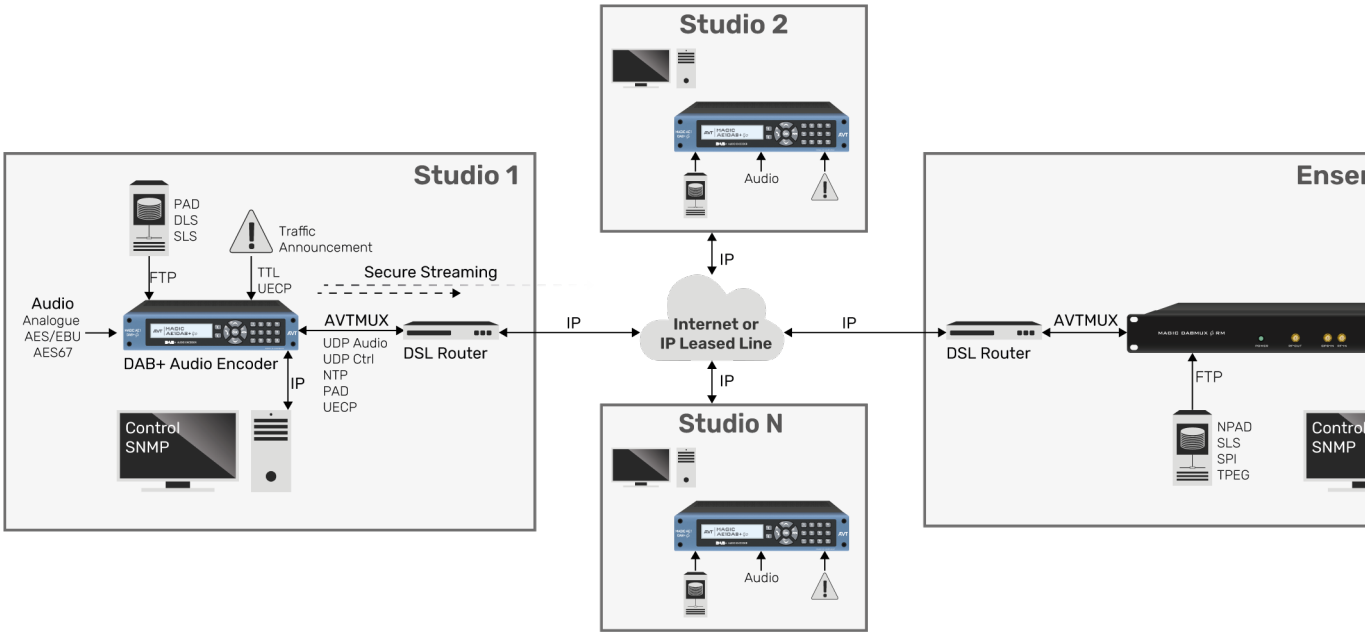
Ember+ and DHD SetLogic are available for signalling announcements. In general, all announcements (except OE announcements) are supported according to ETSI TS 101 756.

An external alarm can also be triggered via SNMP. The system has a GBit Ethernet network interface, which allows the configuration of up to three IP addresses as well as VLANs.

The MAGIC DABMUX Go RF RM version also has an RF input and output. The RF output can be used for test setups, the RF input is intended for future applications.

MAGIC DABMUX Go Web Browser Application

Example application



Options

- **Emergency Warning Break-In Upgrade**

The EWB upgrade, besides setting the correct announcement flag, enables the simultaneous replacement of all audio content by an emergency announcement. This ensures that the announcement is audible even with older receivers. One additional MAGIC AE1 DAB+ Go or MAGIC AE4 Audio Encoder is required as emergency audio source.

- **Cable Upgrade**

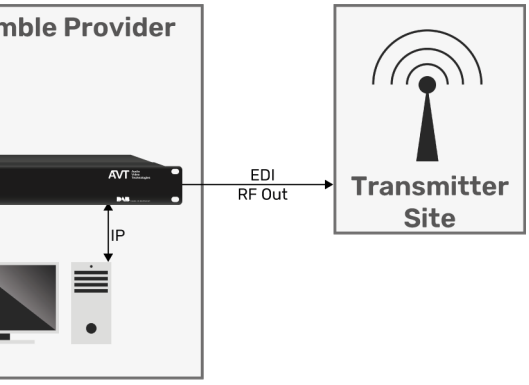
An additional operating mode for cable networks is offered with the Cable Upgrade. The EDI input signal is analyzed. The EDI output signal can be reformatted, the protection level and the service label can be changed.

- **Redundant power supply**

A second integrated power supply is optional available as redundancy.

- **DAB System Manager Upgrade**

The DAB System Manager Upgrade allows you to manage and monitor all AVT DAB Headend System components via an HTML5-enabled browser.
More information can be found in the corresponding chapter.



- **MAGIC DABMUX plus Upgrade**

The system can be extended with the features of the MAGIC DABMUX plus multiplexer via software upgrade:

- Output: 4 x EDI (ETI) Simulcast
- Automatic Encoders and Multiplexer Redundancy
- 4 x integrated NPAD inserter
- 4 x EDI input incl. automatic service extraction
- Support of Service Linking, Dynamic Linkage Set Activation
- Integrated PAD inserter: SLS,DL(+)
- Connection of 25 encoders (with redundancy)

- **Switch Redundancy Upgrade**

The upgrade extends a redundant multiplexer system with seamless EDI redundancy switching for 2-way distribution of the EDI signal.
The function requires the MAGIC DABMUX plus Software Upgrade.

- **Redundancy+ Upgrade**

The upgrade enables a 1-way EDI distribution. The two redundant multiplexer systems monitor each other so that only one of the two systems sends the EDI signal at a time. Both the source and destination IP address can be configured identically for both multiplexers.
The function requires the MAGIC DABMUX plus Software Upgrade as well as the Switch Redundancy Upgrade.

MAGIC DABMUX plus Ensemble Multiplexer

MAGIC DABMUX plus

PAD | NPAD | SI | UECP | 4 x EDI | ETI | STI | AVTMUX | MuxEnc | AES67 | Web stream

Software Enc | SNMP | VLAN | DSP | PC | +Lizenz | 3 x LAN | RF | Player | Ember+

- 19" x 1 U housing
- DSP hardware, no PC is required
- Coloured display
- 3 x GBit Ethernet
  9 IP addresses
  VLAN
- 2 x USB 2.0
- 1 x SD card slot
- EDI, optional ETI module
- Internal wide range power supply
- Redundant power supply via external 12V power supply
- Up to 25 external Encoders supported
- Up to 14 integrated encoders possible
- Synchronisation via NTP
- AVTMUX protocol with Secure Streaming for remote sites
- EDI input for subchannel extraction
- EDI input for Audio Encoder
- PAD Inserter for DLS(+) and SLS/ catego-rised SLS or alternatively PAD insertion via Audio encoder (FTP)
- NPAD inserter for TPEG and SPI (EPG)
- Support of all other NPAD services
- Full remote control of all encoders
- HTML5 web browser interface
- SNMP v1, v2c
- Redundancy support
- Ember+ and DHD SetLogic
- Optional Service Monitor

MAGIC DABMUX plus can be used for small-scale solutions as well as for high-end systems. The device is realized as a 19“ x 1U system with integrated power supply and a redundant 12V power supply. The reliable signal processor-based system has three Gbit Ethernet interfaces which allow the configuration of up to three IP addresses per interface as well as VLANs. The system also provides 2 x USB 2.0 interfaces and an SD card slot for further applications. Via a module slot, the system can optionally be expanded with an **ETI E1/2-Mbit** or a **Dual LAN module**. The system has a graphical, coloured display, but a more comfortable control, monitoring and very simple configuration is possible via a **HTML5-compatible web browser**.

Up to 25 program providers can be connected via **external Audio Encoders.** An installation of the Encoders directly in the studio avoids effectively an interference in Audio quality because of Codec cascading.
Optionally, integrated Audio Encoders with AES67 or Webstream input are available. In this case, 14 programs using only AES67, or a maximum of 13 internal programs using web streams can be input.
External and integrated encoders can be used in combination.

The unit also supports automated operation in **redundant headends**. As an alternative to using the MAGIC SDC, **integrated seamless EDI/ETI redundancy switching (1-way or 2-way feed)** is now also optionally possible.

In addition, the system offers dynamic reconfigurations (manual or scheduled), an integrated PAD/NPAD inserter, subchannel extraction via EDI with simplified selection through analysis of the incoming signal, announcement support, service linking support, simplified provision of the program logo via SPI (EPG), audio encoder and multiplexer redundacy, etc.

Ember+ and DHD SetLogic are available for signalling announcements. In general, all announcements (except OE announcements) are supported according to ETSI TS 101 756.

The **Service Monitor Upgrade** allows monitoring all subchannels in the ensemble via the web interface.

As a special feature, the **Emergency Warning Break-In** upgrade of DAB is optionally supported, which in addition to emergency signalling also enables the replacement of all audio content by an emergency announcement. This ensures that the announcement is audible even with older receivers.

MAGIC DABMUX plus – Rear side

MAGIC DABMUX plus Options

- **Emergency Warning Break-In Upgrade**

The EWB upgrade, besides setting the correct announcement flag, enables the simultaneous replacement of all audio content by an emergency announcement. This ensures that the announcement is audible even with older receivers. One additional MAGIC AE1 DAB+ Go, MAGIC AE4 or an integrated Audio Encoder is required as emergency audio source.

- **Cable Upgrade**

An additional operating mode for cable networks is offered with the Cable Upgrade. The EDI input signal is analyzed. The EDI output signal can be reformatted, the protection level and the service label can be changed.

- **ETI Module**

The system can be optionally expanded with an ETI 2-Mbit module via a module slot. In the event of a device failure, the ETI input is connected to the ETI output via a relay.

- **Dual LAN Upgrade**

Optionally, the system can be extended by two additional Fast Ethernet interfaces. The assignment of the functions is configurable. The system then has a total of 5 LAN interfaces.

- **Redundant power supply**

With the optional 12V adapter, a redundant power supply is available.

- **Switch Redundancy Upgrade**

The upgrade extends a redundant multiplexer system with seamless EDI/ETI* redundancy switching for 2-way distribution of the EDI/ETI* signal.

*) Available only when the system is equipped with an ETI module.

- **Redundancy+ Upgrade**

The upgrade enables 1-way EDI/ETI* distribution. The two redundant multiplexer systems monitor each other so that only one of the two systems sends the EDI signal at a time. Both the transmit and destination IP address can be configured identically on both multiplexers.

If an ETI module is equipped, the output of the backup system is connected to the input of the main system. Switching to the ETI level is in most cases seamless. In case of a power failure of the main system, the signal of the backup system is looped through via a bypass relay.

The function requires the Switch Redundancy Upgrade.

*) Available only when the system is equipped with an ETI module.

- **DAB System Manager Upgrade**

The DAB System Manager Upgrade allows you to manage and monitor all AVT DAB Headend System components via an HTML5 web browser.
More details can be found in the corresponding chapter.

Options

- **AES67 2-channels Upgrade**

When using the integrated encoders, audio can be fed in via AES67. A licence is required for each stereo input (2 channels).

With the first AES67 licence, two AES67 stereo outputs (4-channels) are automatically enabled for monitoring purposes. Via the web interface, each AES67 audio input can be comfortably monitored.

The AES67 implementation is compatible with DANTE/RAVENNA/LIVEWIRE streams supporting SAP. A maximum of 14 stereo inputs is possible.

- **Webstream Input Upgrade**

When using the integrated encoders, the audio feed can be provided via Icecast and SHOUTcast webstreams in MP3 or FLAC format (16-bit, 48 kHz). A licence is required for each stereo input (2-channels).

Currently, a maximum of 13 stereo inputs are possible.

- **DAB+ FhG Audio Encoder Upgrade 1-Program**

The upgrade allows the use of an integrated DAB+ encoder licensed by FhG. This ensures the best possible audio quality even at low bit rates.

Up to 14 encoders can be activated per multiplexer.

For the audio input, corresponding AES67 or Webstream licenses are required.

- **Service Monitor Upgrade**

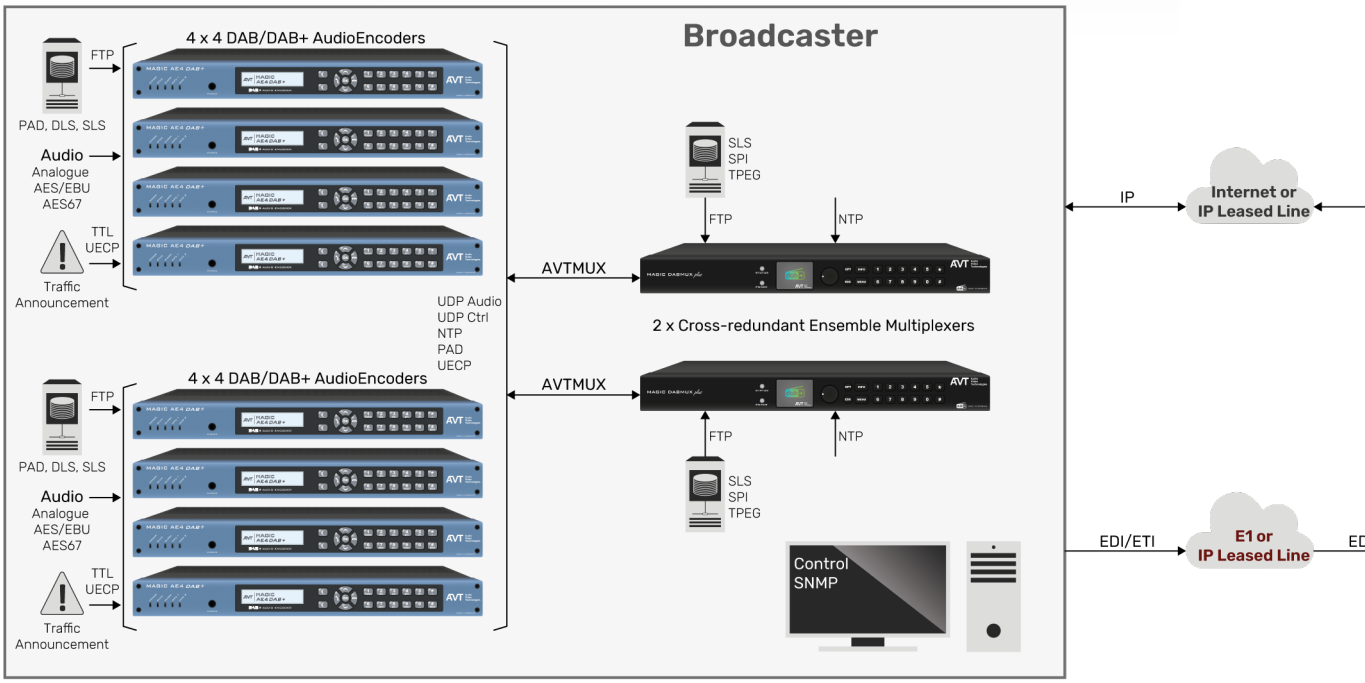
The decoder upgrade allows monitoring all subchannels in the ensemble via the web interface.

In addition, the Service Monitor offers the possibility to decode PAD (Dynamic Label Plus, Slideshow and categorised Slideshow).

Furthermore, the most important service information is displayed (Announcements and Service Linking).

MAGIC DABMUX plus Web Browser Application

Example application

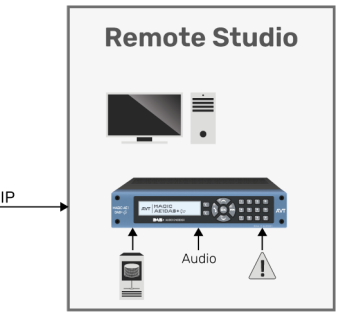


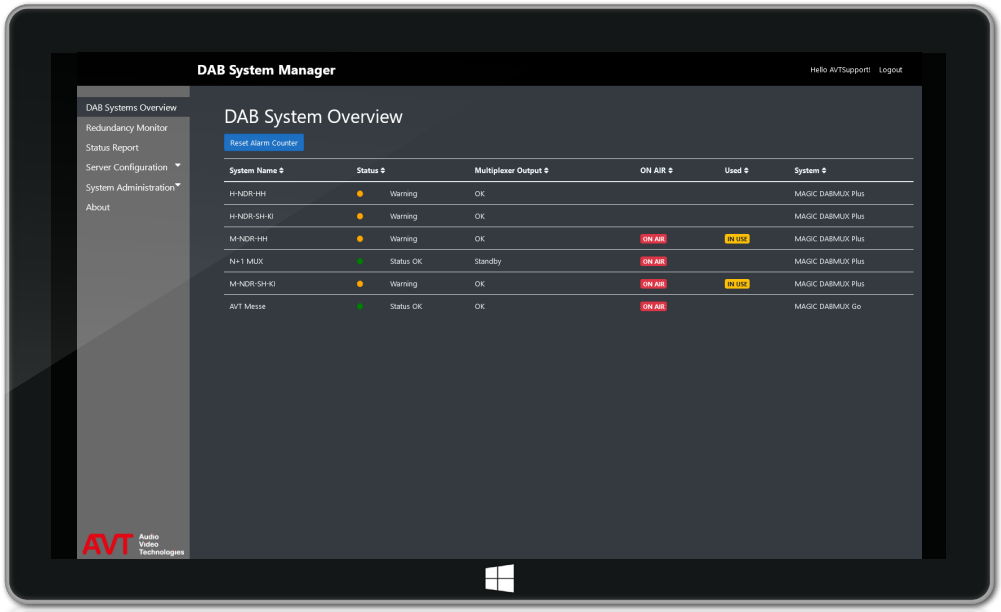
DAB System Manager

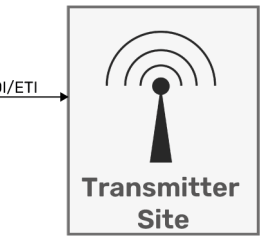
The DAB System Manager upgrade allows the management and monitoring of all AVT DAB Headend System components via an HTML5-compatible browser. Currently the systems MAGIC DABMUX Go and MAGIC DABMUX plus, the MAGIC AE4 DAB/DAB+ Encoder as well as the MAGIC EEC/SDC family are supported. The integration of the MAGIC AE1 DAB+ Go will be added in a later release.

Key features are:

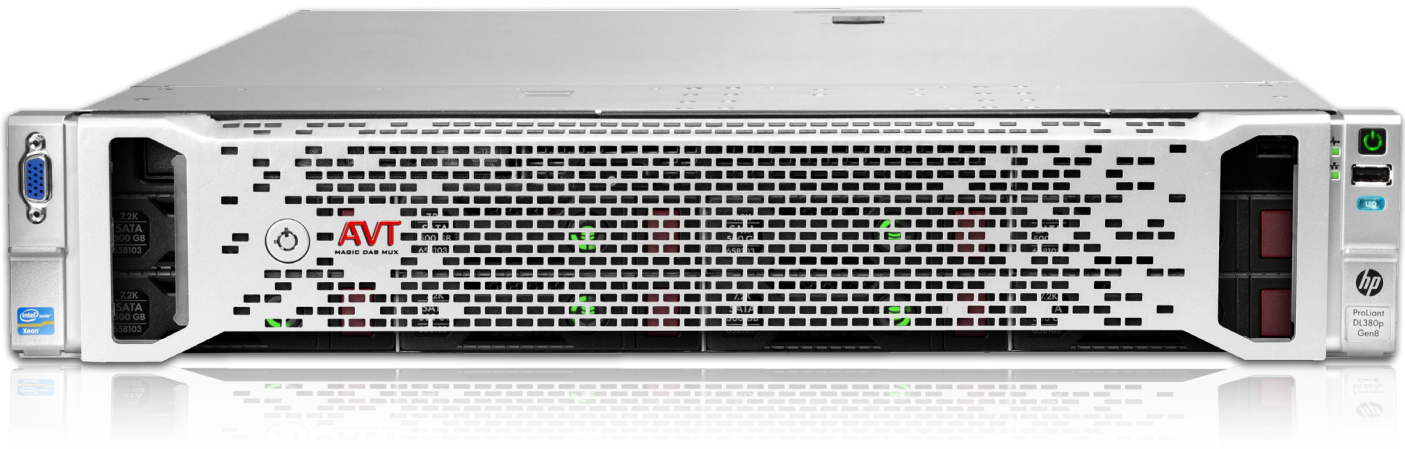
- Common system monitoring
- Redundancy view with manual main/backup path switching
- Common log file of all system components using an SQL database
- Email alerting
- Unlimited number of users with assignable rights
- Central firmware upgrade of all components
- Central export of configurations







MAGIC DABMUX Basic & Professional Multiplexer



Based on Fraunhofer ContentServer technology

MAGIC DABMUX Basic

PAD	NPAD	SI	UECP	EDI	ETI	STI	AVTMUX	MuxEnc
Software Enc	SNMP	VLAN	DSP	PC	+Lizenz	4 x LAN	RF	Player*

MAGIC DABMUX Professional

PAD	NPAD	SI	UECP	2 x EDI	ETI	STI	AVTMUX	MuxEnc
Software Enc	SNMP	VLAN	DSP	PC	+Lizenz	4 x LAN	RF	Player*

- Server-PC-based Service & Ensemble Multiplexer
- Support of almost all features contained in the DAB standard
- Multiple redundancy
- Standard STI (D+C) (STI to one multiplexer)
- Extended STI (D+C) (STI to multiple multiplexers)
- Synchronization via NTP
- Connection of external audio encoders
- Support of internal software audio encoders
- Support of DAB Surround
- Journaline®

* Multimedia Player licence included for two years free of charge

The Ensemble Multiplexers **MAGIC DABMUX Basic** and **Professional** are based on the Fraunhofer ContentServer technology and offer a highly available professional DAB Digital Radio platform (Eureka 147 DAB).

The system supports all possible content and signalling options offered by DAB.

For integration into transmission networks, the system relies on modern IP technology, which enables a simple and cost-effective connection of all DAB system components such as encoders and Monitoring Decoders.

The multiplexer is only synchronized via NTP from a GPS-synchronous NTP server and can distribute the NTP to all remote audio encoders.

Thanks to the FhG MuxEnc protocol used, secure transmission between remote audio encoders and the multiplexer over long distances is possible without packet loss. In addition, this enables configuration, PAD transmission and monitoring of the remote hardware encoders. Alternatively, the encoders can also be connected via EDI if required.

In addition to the MAGIC hardware encoders, software encoders can also be used which can be operated on the Ensemble/ Service Multiplexer. This option can be more efficient if many programs are already located at the location of the multiplexer. The connection of the audio sources is realized via external AXIA Livewire nodes.

Of course, it is possible to mix local software and remote hardware encoders.

The software multiplexer and the software encoders run on a server PC based LINUX Ubuntu platform.

Pre-installed complete systems (preferably HP servers**) or just the licences, which can be installed on own server PCs (compliant with specifications) are available.

The system can also be used as a service multiplexer to generate a pre-multiplex of all audio and data services locally.

The multiplexed data stream is then transmitted to the Ensemble Multiplexer via IP using the STI interface (Service Transport Interface). The STI standard offers the great advantage

that reconfigurations are transparently forwarded to the Ensemble Multiplexer so that a service provider can perform reconfigurations independently.

Each system variant offers the basic possibility of redundant operation with one or even several redundant multiplexers.

Both systems offer the unique option of optional DAB surround sound coding.

The multiplexer is operated via a web browser.

Options for both system variants

- The DCP MONITORING upgrade provides a detailed network analysis of the input signals (EDI and FhG MuxEnc). This option is especially useful when using remote audio encoders.
- The option ETI/STI/EDI/RDI ANALYSER/CONVERTER additionally allows a bit-accurate analysis (and conversion) of the mentioned formats.
- DAB Software Audio Encoder
- DAB+ Software Audio Encoder

Further options are available depending on the variant.

** The multiplexer hardware is based on standard server architecture. This server is for reference only and it is subject to change depending on actual server model availability from server manufacturers.

MAGIC DABMUX Basic Multiplexer

The **Basic** version of the Ensemble Multiplexer comprises all standard features for a classic DAB Ensemble including data services such as **Slideshow** and **Journaline®**.

The **license** for operating the multiplexer is delivered on a **USB dongle**.

Alternatively, a hardware-dependent **software license** can also be provided - but not both variants at the same time. The latter is reserved exclusively for the MAGIC DABMUX Professional version.

The Basic version includes a 24-month license for free use of the **Multimedia Player**.

Specific package options

- DATA Upgrade (TPEG and DL/DL+ via UECP)
- DATA PRO Upgrade (TPEG, DL/DL+ via UECP, BWS, TII/Region Editor and Live Socket API)

In addition, all functions of the Professional version are optionally available.

The BASIC Features in detail [1]

- Firewall Professional
- Automatic leap second handling
- System checks (continuous self-monitoring)
- System config backup (at console)
- SNMP interface
- Security Summary (network config overview)
- Unlimited simultaneous multiplex output configuration definitions
- Broadcast scheduler (weekly/calendar)
- Announcement support (via UECP, HTML interface, FHT, LTP)
- AFS - Alternative Frequency Editor
- Support of external Audio Encoders (FhG MuxEnc)
- Dynamic Labels
- Dynamic Labels Plus (DL Plus), Intellitext
- Journaline®
- MOT Sildeshow
- EPG - Electronic Programme Guide
- Support for multiple transmission priority classes
- Import via file FTP upload
- RSS/atom sources (Journaline®) import

[1)] Details of the features are given in the appendix p. 42 ff.

MAGIC DABMUX Professional Multiplexer

The **Professional** version of the MAGIC DAB-MUX Ensemble Multiplexer offers all available functions of the Basic version.

The license for using the multiplexer is delivered in this variant as a hardware-dependent **software license** as well as a **USB dongle**.

The big advantage is that it is possible to activate redundant server hardware with the USB dongle within a few minutes in case of system failure.

In addition, the USB dongle can be used - but only for test purposes - to try out new releases and test new configurations in parallel to the actual on-air system.

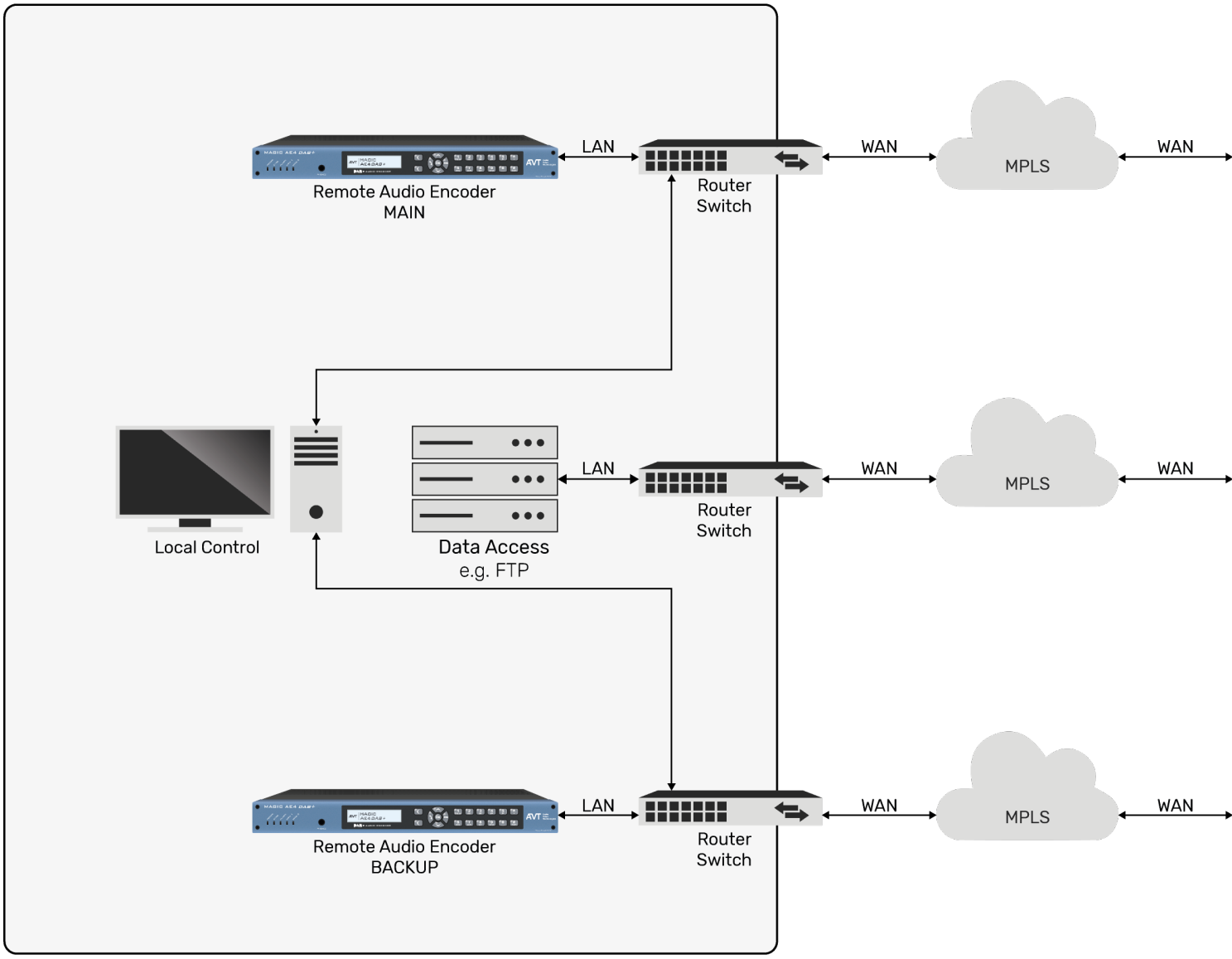
The Professional version also includes a 24-month license for free use of the **Multimedia Player**. **Remote & Recording** can also be used free of charge for two years.

The PROFESSIONAL Features in detail [1]

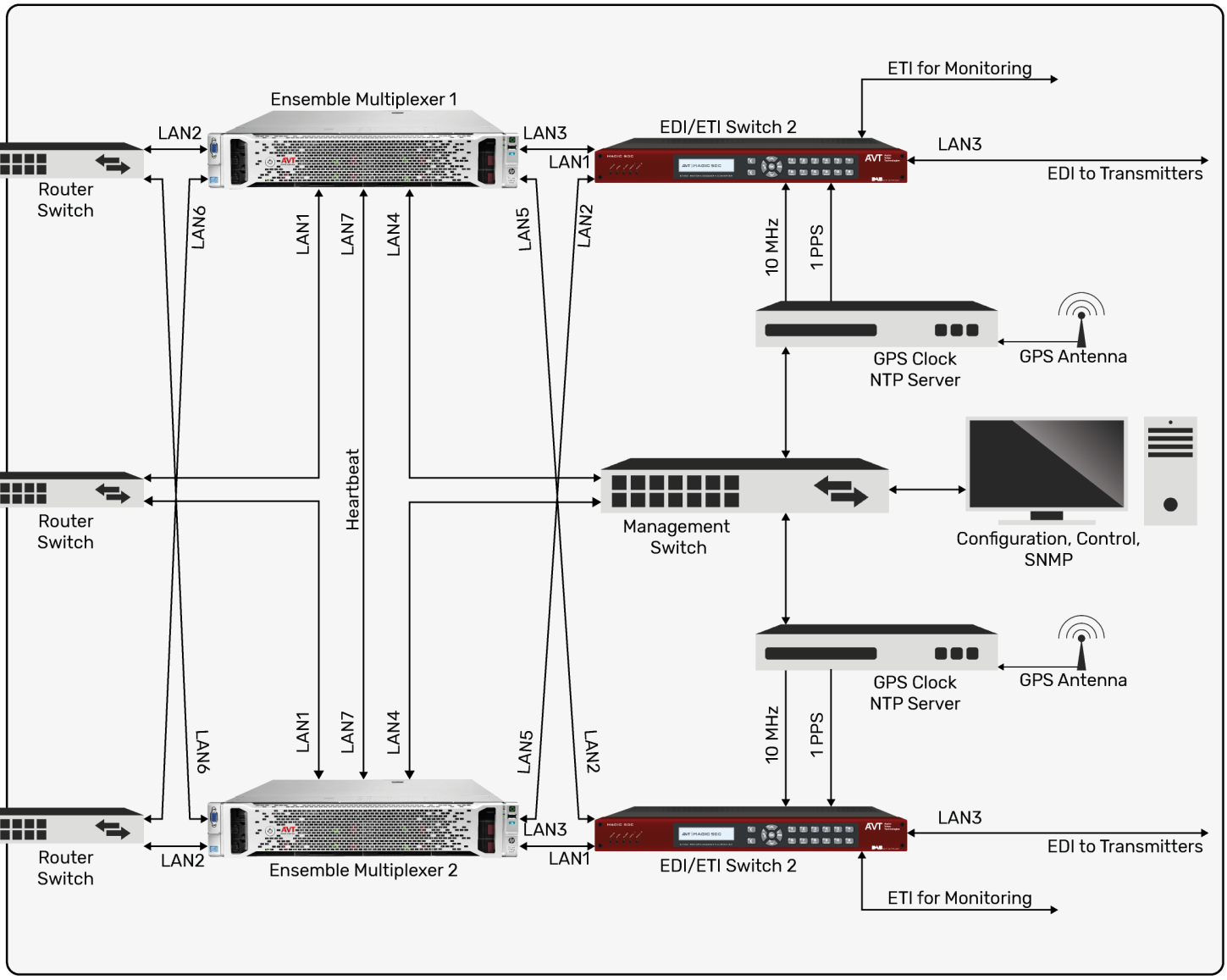
- Support for serial devices (GPS receiver, modem etc.)
- System configuration remote up-/download
- Email reports
- Remote System Update
- DCP Monitor
- Redundancy Group Feature
- Audio Cross Redundancy
- STI-C Input/Output
- Extended STI-C (xSTI-C)
- 2 x EDI (ETI or STI-D) Inputs for subchannel extraction
- TII & Region Definitions Editor
- Extended Broadcast Information
- Multiplexer output Live Monitoring/statistics
- Multiplexer output EDI/ETI/Subchannel Recording
- Live Audio input Analogue/Digital/Livewire/ RAVENNA/AES67
- Audio input as MP3/WAV, Playlist
- Silence/Clipping detection and configuration
- Local Audio backup source
- Audio Input Amplification/MP3 Normalization
- Dynamic changes to the program type (PTy)
- Dynamic change of the currently active service link set
- Dynamic change of announcement signalling
- Other Ensemble Announcements (not available)
- Service Information Signalling
- Announcements for services, provided by a service multiplexer
- Surround Sound Option incl. SX Pro
- MOT Broadcast Website/Transparent file transfer
- TMC – Traffic Message Channel
- IP Insertion
- TDC – Raw Data
- DAB – FIC data keying (FIDC, SI, CA)
- Import via HTML interface (Web-GUI)
- Import of existing RSS/Atom sources (Dynamic Labels/Text Messages)
- Import from existing RSS/Atom sources (Journaline)
- Import via HTTP/FTP Mirroring
- Import via Live Socket connection (API)
- Import of UECP, Zenon, radio house telegram, line protocol (Dynamic Label/Text Messages & Journaline)
- Automatic time-controlled mirroring option
- Data import via secure connections
- JSON/XML-RPC Import
- JSON/XML-RPC Administration
- Streaming Audio source
- EWF – Emergency Warning Function
- DCP Monitoring (Network analyzer)
- Webstreaming Upgrade
- Audio Backup Upgrade

Fully redundant DAB Headend

Service Provider



Ensemble Provider



MAGIC EEC ETI/EDI Converter

MAGIC EEC

EDI | ETI | 2 x ETI | SNMP | VLAN | 2 x LAN | 4 x LAN | DSP

- ETI → EDI and EDI → ETI conversion
- 2 x LAN interfaces
- Optional: Dual LAN Upgrade
- Monitoring Output
- SNMP v1/v2c
- HTML5 web interface
- VLAN support
- GPIO contacts
- Graphical display
- Optional: redundant power supply
- Optional: redundancy switching

The **MAGIC EEC** allows the conversion from ETI to EDI and EDI to ETI signals.

Typical applications are Ensemble Multiplexers, which cannot generate an ETI signal anymore (e. g. Fraunhofer ContentServer), but which must be fed to the transmitter via E1 lines with ETI or Ensemble Multiplexers, which only have ETI inputs/outputs (e. g. Rohde & Schwarz DM001), but which are to be fed via IP lines with EDI.

The system has **two LAN interfaces** by default. These are freely programmable in terms of functions, configuration, monitoring, SNMP and EDI input/output.

The **ETI interface** has one G. 703/G. 704 input/output each.

The system is configured via the **HTML5 Web Interface** or the included **PC software** and displays the status of the ETI or EDI input data streams and all system parameters in a very clear manner.

All events are stored in the device in a log file, which can be retrieved or alternatively stored in a network folder via the PC software.

MAGIC EEC supports SNMP v1/v2c protocol for connection to up to four independent network management systems.

In addition, alarm messages can be output via eight potential-free and programmable contacts. Alternatively, eight programmable TTL GPIO contacts are available.

Options

- **Monitoring output**

A **second ETI module** can be optionally equipped, which means that an additional unrestricted ETI output is available. This can be used, for example, as a monitoring output or to supply a redundant Ensemble Multiplexer.

- **SDC Upgrade**

The optional SDC upgrade allows a MAGIC EEC system to be upgraded to a full-featured MAGIC SDC Switch & Converter.

- **Dual converter mode**

With this upgrade MAGIC EEC has two independent ETI/EDI converters. For the Dual Converter mode you need a MAGIC EEC with monitoring output (second ETI module).

- **Dual LAN Upgrade**

Optional extension with two additional Ethernet interfaces. The assignment of functions such as EDI, SNMP etc. is freely configurable. However, a second EDI module can then no longer be assembled.

- **Redundant power supply**

With the optional 5V adapter a redundant power supply is available.

- **N+1 Redundancy Upgrade**

The N+1 redundancy upgrade adds an additional EDI input to the system to enable non-seamless redundancy switching in the event of errors in the EDI input signal of the main path. This option provides a cost-effective N+1 redundancy solution using our MAGIC DABMUX Go or MAGIC DABMUX plus in an N+1 multiplex setup.

This feature is only available in EDI → ETI conversion mode.

MAGIC EEC with redundant power supply – Rear side

MAGIC SDC ETI/EDI Switch & Converter

MAGIC SDC

EDI | ETI | 2 x ETI | SNMP | VLAN | 2 x LAN | 4 x LAN | DSP

- Seamless switch for redundant Ensemble Multiplexers
- Switching EDI or ETI inputs
- Output signal EDI or ETI
- Up to 4 x LAN interfaces
- EDI/ETI monitoring output
- HTML5 web interface
- SNMP v1/v2c
- VLAN support
- GPIO contacts
- Graphical display
- Optional: EDI Redundancy Upgrade
- Optional: redundant power supply

MAGIC SDC enables trouble-free switching of a redundant DAB multiplexer system. To achieve this, continuous time information must be transmitted to a downstream DAB transmitter. Jumps, for example in the time stamp, or even missing time stamps cause a considerable loss of the transmission, since the transmitter would have to synchronize completely again.

With the MAGIC SDC, the output signal of each DAB multiplexer is permanently monitored. If an error is detected in a multiplex, the system automatically switches to the redundant input. The timestamp can be regenerated in the output signal of the switch, so that a continuous timestamp is guaranteed at the transmitter. The switching criteria as well as the switching behaviour (monostable, bistable) can be freely defined by the user.

The system can be used as a classic ETI switch for E1 G. 703/G. 704 lines or optionally as an EDI switch for IP networks.

If the EDI option is available, the system also enables conversion from EDI to ETI and vice versa, so that DAB multiplexers that no longer support a native ETI can still be integrated into the existing ETI infrastructure.

The system is configured via the **HTML5 Web Interface** or the included **PC software** and displays the status of the ETI/EDI input data streams and all system parameters in a very clear manner. The software can also be used to manually switch the input for e. g. service purposes. All events are stored in the device in a log file, which can be retrieved or alternatively stored in a network folder via the PC software.

MAGIC SDC supports SNMP v1/v2c protocol for connection to up to four independent network management systems.

The two or four available LAN interfaces are freely programmable in terms of configuration, monitoring, SNMP and EDI input/output.

MAGIC SDC is available in **different versions**. The system can be delivered with either **four LAN interfaces and one ETI input/output** or with **two LAN interfaces and two ETI inputs/ outputs**. A **pure EDI version** is also available.

Options

- **Dual LAN Upgrade**

With the Dual LAN Upgrade, the system can be expanded by two additional LAN interfaces, so that a total of four LAN interfaces are available. The assignment of functions such as EDI, SNMP etc. is freely configurable. In addition, an ETI module can be equipped.

- **ETI Module**

With the ETI module, the system can be extended by an ETI input/output. In addition, either a second ETI module or the Dual LAN module can be equipped.
  - ETI switching if two ETI modules are installed
  - EDI/ETI switching and converting if the EDI upgrade is available

- **EDI Upgrade**

With the EDI upgrade, the system can be extended by an EDI input/output.
  - EDI switching
  - EDI/ETI switching and converting if an ETI module is available

- **EDI Redundancy Upgrade**

Automatic switching of two connected SDC systems via the EDI outputs that send to the same destination. Only one system's EDI data stream is active at a time. Both systems monitor each other for packet loss.
The EDI upgrade is required for this functionality.

- **Redundant power supply**

Optionally a redundant power supply can be used, the 5V DC table power supply is included in this hardware upgrade.

MAGIC SDC with 2 x ETI modul and redundant PSU – Rear side

MAGIC DABMUX plus Monitoring Decoder

MAGIC DABMUX plus Monitoring Decoder

DAB | DAB+ | PAD | NPAD | SI | EDI | SNMP | 3 x LAN | Ember+

AES67 | Ravenna | ETI | 5 x LAN

- DAB & DAB+ Monitoring Decoder
- Up to 50 x EDI inputs for monitoring
- Up to 25 x audio programs (decoding + monitoring)
- 1 x ETI Module (optional)
- 1 x Ravenna Module (optional)
- 1 x Dual LAN Module (optional)
- Monitoring of the audio signal
- Integrated level monitoring
- 3 LAN interfaces for EDI, control and AES67
- Ember+, SNMP v1/v2c
- Monitoring of all service information
- PAD & NPAD Monitoring
- TA monitoring, PTy evaluation
- Service logo extraction
- Integrated error memory with date and time
- Comfortable configuration and monitoring software

The **MAGIC DABMUX plus Monitoring Decoder** enables monitoring of the DAB transmission signal at any location in the EDI distribution network. Depending on the configuration, up to 50 EDI streams are being monitored and checked for errors. An ensemble can be fully decoded, with up to 25 programs being decoded and monitored simultaneously.

By default, the system allows the use of one EDI input and one decoder incl. service monitor as well as simultaneous DLS and SLS decoding for all programs.

The system is based on our reliable DSP-based hardware platform which is also used in the MAGIC DABMUX plus multiplexer.

The comfortable **web interface** displays all monitored EDI streams in an overview. With the service monitor incl. **webstream decoder** the selected program can be listened to directly in the browser. Additionally an output via AES67 is available.
All decoded programs can be displayed with audio levels and **PAD** (Slideshow and Dynamic Labels).

Relevant information are monitored on different levels simultaneously:

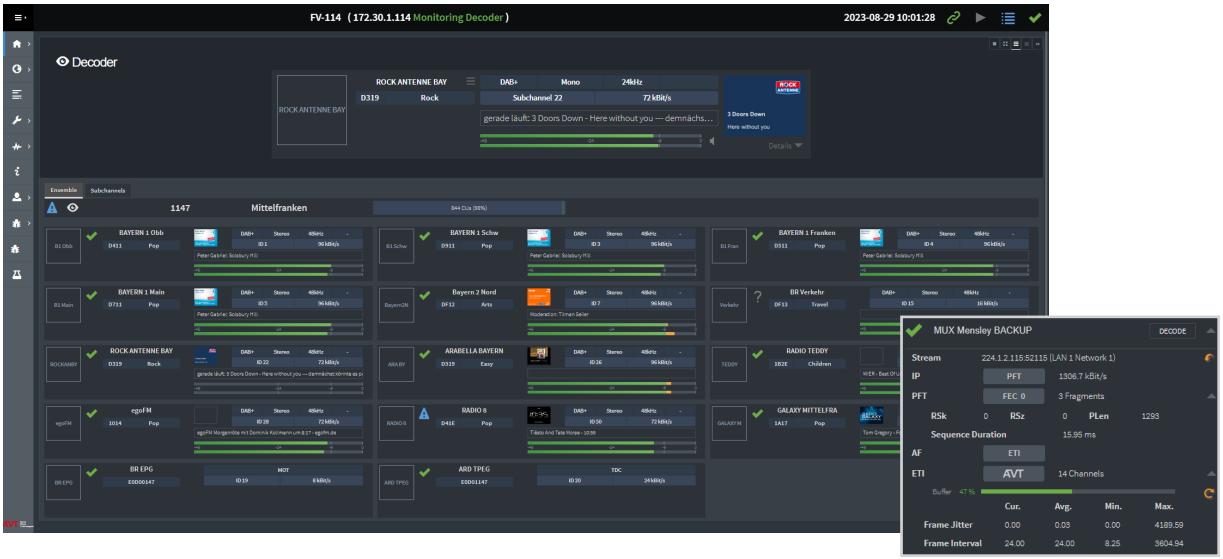
- EDI input monitoring for all (up to 50) EDI streams
- **Ensemble** and **Service Information** (ID, label, time, ensemble, load) for the currently selected input.
- Audio and PAD decoding for the currently selected service/subchannel.
- Service logo extraction for each program.

Statistics, ensemble events, warnings and errors are stored in the **log file** of the device. The log entries can be filtered to display only relevant information.

Integration into a network management system is also possible via SNMP. Optionally, the system can also be monitored externally via the AVT **DAB System Manager**.

In addition, the following modules are optionally available (only one module can be equipped):

- **ETI-Module** for monitoring <u>one</u> ETI signal in addition to the EDI signals. The ETI signal is forwarded transparently
- **Ravenna-Module** for up to 64 stereo streams
- **Dual LAN Module** for EDI streams



MAGIC DABMUX plus Monitoring Decoder with optional ETI Module and redundant power supply – rear view

DAB-XPlorer DAB Analyser

DAB-XPlorer

DSP | DAB | DAB+ | USB | ETI | EDI | RDI | RF | GPS

- Modular system consisting of hard- and software tools
- Hardware ETI interface and receiver hardware available
- Analysis of DAB multiplex on ETI, EDI and RDI signal
- Measuring of Synchronicity in SFNs
- Recording of ETI/EDI files from on-air signals via RDI
- ETI analysis on Bit level
- Transmitter setup
- SFN test
- Test of transmitter components
- Receiver test

The DAB-XPlorer is used for the analysis of data streams in DAB networks. The Ensemble Transport Interface (ETI) according to ETS 300 799 and the Receiver Data Interface (RDI) according to EN 50255 are supported.

The DAB-XPlorer allows a continuous real-time monitoring of the transport streams and indicates every alarm during the transmission.

Additionally, in parallel to the analysis, a simultaneous recording and playback of complete data streams is possible.

If you use this analysing tool with its fast localisation of errors in the transport stream, the operating effort in the DAB programme transmission network will be considerably reduced.

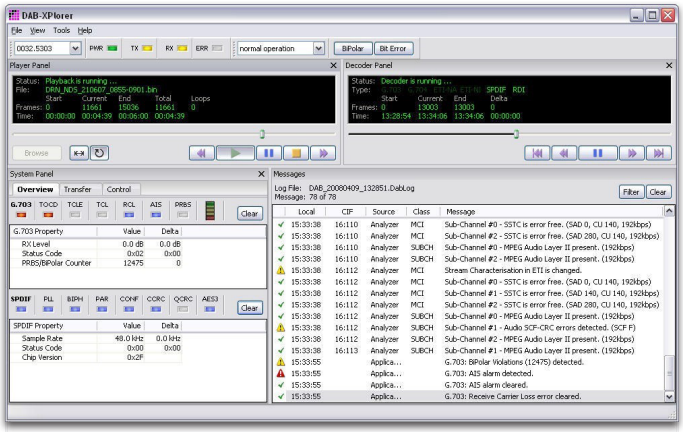
Preferably, it is used between Ensemble Multiplexer and COFDM sender.

Because of its dimensions and its light weight, the DAB-XPlorer is especially suitable for mobile use. The robust aluminium die-casting housing withstands even the rough field conditions

The DAB-XPlorer is available in two versions:

- USB Software Dongle for EDI input/output
- External USB Adapter for G.703 and SPDIF signals, integrated in a robust aluminium die-casting housing. The adapter is powered via the USB interface. The systems can be controlled via a Windows user-friendly graphical user interface (GUI).

The DAB-XPlorer software application is



modular. The following tools are available:

- Ensemble Viewer
- ETI-XPlorer
- FIC-XPlorer
- Message Viewer
- Option: DAB+ Decoder / FEC / Streaming (EDI)
- Option: FIC-XTractor
- Option: PRBS-Analyzer
- Option: Recorder / Player / Timeshift Buffer
- Option: RDI-ETI-Converter
- Option: GPS-Campaign-Converter
- Option: Triggered Recorder

DAB-XPlorer – Rear side

DABRF Receiver & Analyser

DABRF

DSP | DAB | DAB+ | 1 x LAN | ETI | EDI | RDI | RF | GPS

- Test receiver and modulator rolled into one
- RF recording with 1.6 MHz bandwidth
- Can be combined with software components of the DAB-XPlorer family
- COFDM modulator for simultaneous generation of up to four DAB blocks
- GPS receiver integrated
- Gigabit Ethernet interface
- Recording and analysing DAB signals
- Capturing of ETI files from on-air signals
- Coverage measuring
- SFN analysis
- COFDM modulator for receiver testing

The DABRF device was developed as core component of the tunnel break-in system, MAGIC TBR, that, in the event of a disaster, allows to supply a street tunnel with live warning messages via digital radio.

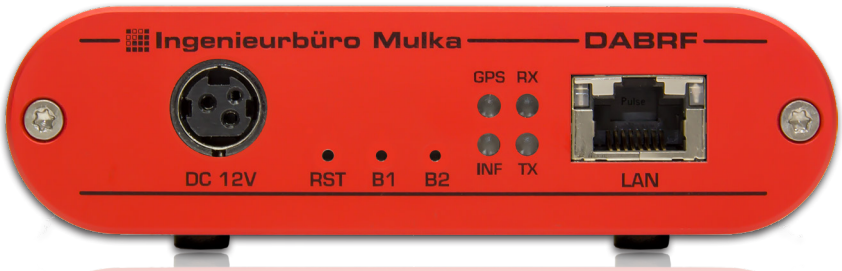
All digital signal processing functions are implemented in one powerful DSP and one FPGA. A Gigabit Ethernet interface and 512 MByte internal memory enable a wide-band connection between the DABRF and a PC or other external system components. The so created device is versatile and suitable for other applications as well.

In particular the DABRF replaces the established DAB test receiver, UEB400-DXP, within the DAB-XPlorer family. The DABRF offers great extensions of the powerful analysis tools of the DAB-XPlorer suite. It supports the already known functions:

- Recording of ETI data streams from a received on-air signal
- Multiplex analysis
- Coverage measuring with bit error rates and RF level,
- SFN analysis

Additionally, it will enable the following new functions to be realized by software extensions:

- RF recording in form of I/Q samples at a bandwidth of 1.6 MHz
- Replay of the recorded RF signal with a high dynamic range
- Simultaneous COFDM modulation of up to four different ETI or EDI data streams to four DAB blocks laying within a 37 MHz wide RF band
- Advanced RF analysis of the received signal, i.e. MER, inband spectrum, constellation diagram, channel impulse response etc.



DABRF – Rear side

MAGIC TBR Tunnel Break-In Rebraodcast System

MAGIC TBR

DSP | DAB | DAB+ | RF | GPIO | SNMP | 2 x LAN | AES | ANA | VLAN | PAD

- DAB Receiver/Demodulator
- DAB Modulator/Repeater
- No GPS for synchronisation necessary
- An emergency announcement replaces all DAB/DAB+ programs at the same time
- Status Dashboard
- Flash Memory for announcements and PAD (Dynamic Label and Slideshow)
- 2 x analogue Audio inputs/outputs
- 4 x digital Audio inputs/outputs
- Headphones output
- 2 x Ethernet interfaces (for control, monitoring, SNMP and optional VoIP)
- Programmable GPIOs (8 x TTL, 8 x Relays)
- Clock inputs for future extensions
- Optional: Break-In via VoIP
- Optional: additional RF module for second Ensemble
- HTML5 web interface

The **MAGIC TBR Tunnel Break-in Rebroadcast** system is a DAB+ repeater and at the same time a Voice Break-in system in a 19“ housing with only 2U, realized on a signal-processor based hardware platform.

The standard system has **a demodulator/ modulator module** for one Ensemble. If required the system can be equipped with a further module for a **second Ensemble**. Both Ensembles are completely independent from each other – a separate break-in is also possible.

To cover all possible encoder scenarios for replacing all audio programs within an ensemble during an emergency announcement, three encoders per ensemble are integrated (with an extension module corresponding six encoders).

The entire multiplex is completely replicated and replaced frame-synchronously.

This technique was developed by the company Ingenieurbüro Mulka and applied for a European patent.

From the view of a DAB radio a continuous signal is received in terms of data rate, sampling frequency, error protection, but also CIF Counter, time etc. In this way it is guaranteed that the DAB receiver does not loose the synchronisation or even re-scans the DAB band.

If a driver hears another medium (e. g. CD) the receiver can be automatically switched to DAB mode by means of a suitable alarm signalling (if this is supported by the receiver).

The integrated flash memory allows the storage of prepared slideshows and dynamic labels as well as periodic repeating **Information- and Emergency Announcements**. These announcements can be activated automatically via a scheduler.

In parallel, PAD data in the form of a Slideshow and/or as Dynamic Label can be transmitted so that the respective information can also be presented visually.

The complete Ensemble can be decoded and monitored via a Service Monitor.

In the standard operation mode the system functions a classic **repeater**. The DAB Ensemble is received by an antenna outside the tunnel, is filtered digitally and processed. Via the tunnel antenna the signal is broadcasted again.

A **GPS signal** is not required for this function. However, inputs are available for future extensions.

During the repeater operation the received Ensemble is analysed permanently to always have the current Multiplex Configuration Information (MCI) available – even after reconfigurations.

MAGIC TBR equipped with two RF modules – Rear side

Feature List MAGIC DABMUX Basic & Professional

- **Support for serial devices (GPS receiver, modem, etc.)**
  Permits to connect serial devices to the ContentServer. These devices can e.g. be Meinberg GPS16x/GPS17x GPS receivers, some APC uninterruptible power supplies, serial data feeds (e.g. fed into a transparent data channel) or some modems.

- **System configuration remote up-/download**
  Permits to create new backups of the current system configuration, and to restore previous backups. In addition, system configuration backup files can be downloaded or uploaded via the Web interface. A system configuration includes all system and broadcast related settings of the ContentServer, including network and redundancy group settings, Content Provider definitions, Multiplex configurations and schedules.
  In case of a hardware failure of a ContentServer, a previously downloaded system configuration can be used to quickly set up the replacement hardware with exactly the same settings.

  Note: Uploaded content files such as Journaline and EPG XML files or Slideshow images are not part of the backup files and may need to be re-uploaded after restoring a backup on a new hardware; however, content to be mirrored or downloaded by the ContentServer from external servers is automatically restored.

- **E-mail reports**
  Permits to automatically send e-mails to the administrator(s) of the ContentServer in case of system errors or warnings, e.g. if a hard disk fails, a network error is detected or data provision of a Service Multiplexer fails. The e-mails include a reference to the affected system as well as an error description. New e-mails are generated whenever the system error level changes, e.g. from OK to warning, from warning to error, or from critical error to OK. The type of system checks that potentially may trigger an e-mail report can be configured.

  In addition, it is also possible to configure e-mail reports for individual Content Providers. I.e. an e-mail report is sent directly to an external Content Provider if its data upload fails or if audio provision via an internal or remote Audio Encoder fails. This type of notification is particularly valuable for live insertion of data (including audio sources) and import methods that run automatically without manual user interaction (such as RSS feeds).

- **Remote System Update**
  Permits to update or upgrade the ContentServer system to the latest software release conveniently via the Web interface and without a need for physical access to the ContentServer.

  The new system image can either be uploaded manually from the local PC via the Web interface, or be copied by the ContentServer directly from an external FTP/http server by providing the download-URL. Once the new system image is correctly stored on the ContentServer, the update procedure can be triggered as a second step at any time. The full system configuration and any uploaded content is preserved during the update process; however, the update will temporarily interrupt the generation of the broadcast signal. After the update process has finished, broadcast signal generation will resume.

- **DCP Monitor**
  Permits to monitor any incoming DCP/IP based streams from external Audio Encoders (MuxEnc protocol), incoming streams from Service Multiplexers (EDI/ETI or STI/EDI) and the outgoing multiplex stream (EDI). The monitor shows long-term statistics including diagrams representing the network delay over time. The monitor is very helpful if there are issues on contribution (or distribution) networks. It can also monitor the output of the ContentServer's Redundancy Peers to detect discrepancies within the Redundancy Group.

- **Redundancy Group Feature**
  Permits to operate two or more ContentServers as a Redundancy Group with frame synchronous output.

  A Redundancy Group ensures that if one ContentServer hardware fails the output of another Redundancy Peer can continuously be forwarded to the distribution network. Downstream devices can switch on any frame-boundary without interrupting the transmission signal. In addition, this feature also permits maintenance tasks such as updating the ContentServer software or hardware maintenance without service interruption.

  ContentServers operating as a Redundancy Group can either be co-located at the same site (hardware redundancy) or can be operated at different locations (site redundancy). The flexibility of the Redundancy Group approach permits to use more than two Redundancy Peers within a Redundancy Group.

  In a Redundancy Group, the system configuration takes place centrally through a virtual IP address that is automatically always used by the ContentServer currently holding the role of Redundancy Authority. Any system or broadcast configuration changes are automatically forwarded to all members of the Redundancy Group, and multimedia content uploaded to the Redundancy Authority is automatically forwarded to all members of the Redundancy Group. In addition, scheduled or manually triggered dynamic reconfigurations are performed simultaneously and frame-synchronously by all members of the Redundany Group, as are configuration changes announced and negotiated by external Service Multiplexers via STI-C or extended STI-C.

  The output of all members of a Redundancy Group is either fed directly to transmitters for built-in switching, or will more typically - particularly for SFN (single frequency network) scenarios - be processed by a special EDI switch that selects the Redundancy Peer whose output is forwarded to the distribution network.

  For multiplexers based on the ContentServer technology, this switching decision is further enhanced through special status and error signalling included in the EDI stream. The standard error level signalling contained in the EDI specification would not allow to distinguish between an EDI stream with a single audio stream carrying only silence versus another EDI stream from the same Redundancy Group where multiple audio streams carry only silence. Several downstream devices already incorporate this special and valuable ContentServer feature.

- **Audio Cross Redundancy**
  All members of a Redundancy Group exchange the audio streams encoded by their internal Audio Encod-

ers. So if e.g. audio provision to one ContentServer fails (e.g. because of a faulty audio cable), this ContentServer will automatically insert the encoded audio of one of its Redundancy Peers into its own multiplex output.

- **DAB - STI-C input/output option**
  Permits to connect DAB Service Multiplexers to DAB Ensemble Multiplexers.

  Service Multiplexers are responsible for generating a defined portion of the overall ensemble. This concept is especially useful if multiple broadcasters share an ensemble (with one or more services each), but still want to be able to dynamically configure „their" part of the ensemble without the need to coordinate with the other broadcasters or the operator of the Ensemble Multiplexer.

  At the Ensemble Multiplexer, every connected Service Multiplexer gets assigned a part of the ensemble capacity and other constraints (including permitted service identifiers or subchannel IDs). Each Service Multiplexer automatically downloads those constraints from the Ensemble Multiplexer.The Service Multiplexer can then freely (re-)configure within these constraints, for instance it can add part-time services for special events. Reconfigurations scheduled or manually triggered at the Service Multiplexer are automatically negotiated with the Ensemble Multiplexer and will then occur at the agreed time without service interruption. This process works with full support for Redundancy Groups, both on Service Multiplexer side as well as on Ensemble Multiplexer side.

  Each DAB ContentServer can either be a Service Multiplexer or an Ensemble Multiplexer.

  To make use of the STI-C feature, Service Multiplexers and Ensemble Multiplexers need to be based on the ContentServer technology.

  According to the DAB specification, DAB Ensemble Multipexers can accept inputs from multiple Service Multiplexers simultaneously, but each Service Multiplexer can only be connected to one single Ensemble Multiplexer. This prevents DAB network models such as multiple individual (regionalized) DAB broadcasts with shared services managed by a single Service Multiplexer. See the description of ‚xSTI-C' below for a solution.

- **DAB - xSTI-C (Extended STI-C)**
  Permits to connect a DAB Service Multiplexer to multiple individual DAB Ensemble Multiplexers simultaneously. This allows for example to centrally manage and create national programmes and data services, and to insert those simultaneously into several regional Ensemble Multiplexers that in addition to these national programmes add their own specific and locally encoded regional programmes.

  If changes to these national programmes are made at the Service Multiplexer (e.g. a new national service is added and the bit rates of all national programmes adjusted accordingly), then this change is automatically forwarded to all regional Ensemble Multiplexers and all ContentServers will then reconfigure to the new configuration at the same time without service interruption.

  xSTI-C is fully compatible with the Redundancy Group feature - both on Service Multiplexer side as well as on Ensemble Multiplexer side.

  To make use of the xSTI-C feature, Service Multiplexers and Ensemble Multiplexers need to be based on the ContentServer technology.

- **DAB - EDI (ETI or STI-D) Inputs for Subchannel Extraction**
  Permits to extract DAB subchannels and their signalling from the EDI based output signal of a DAB Service Multiplexer or a DAB Ensemble Multiplexer. The EDI signal can carry either ETI (DAB ensemble multiplex) or STI-D (DAB service multiplex) information.

  With subchannel extraction it is possible to extract just some of the DAB subchannels carried in the EDI input signal. For example, the multiplex signal of an adjacent DAB ensemble could serve as the EDI source, but only some of its services are extracted for later re-broadcast. However, a major drawback of this solution is that subchannel extraction is a static setup: it is necessary to manually configure which subchannels and what signalling has to be extracted, and same parts of the signalling may even have to be re-created statically at the ContentServer performing the subchannel extraction. In addition, many reconfigurations of the EDI input source (especially if the bitrate of extracted subchannels is changed) require time-synchronous manual reconfiguations at all ContentServers extracing subchannels from this EDI input source, which effectively prevents dynamic reconfigurations of the EDI input source.

  In contrast, if a Service Multiplexer is connected via STI-C (or xSTI-C), then the Ensemble Multiplexer extracts all services and signalling; this setup supports autonomous and dynamic re-configurations of the Service Multiplexer, without the need to manually re-adjust the configuration at the Ensemble Multiplexer.

- **DAB - TII & Region Definitions Editor (Name of feature updated: „Transmitter TII codes and offset delays")**
  Permits to configure the TII codes (Transmitter Identification Information) and offset delays of all modulators/transmitters centrally at the ContentServer. So if changes to these parameters are necessary, they do not have to be adjusted directly at each modulator/transmitter.

- **DAB - Extended broadcast info (Ensemble configuration, FIG Layout)**
  Shows parameters used within a DAB Multiplex, especially also parameters that are normally automatically determined by the ContentServer (e.g. subchannel identifiers).

  This information is useful in setups with Service Multiplexers and Ensemble Multiplexers to manage the DAB identifiers (e.g. subchannel identifiers). It is also helpful for documentation purposes as it shows the detailed configuration and signalling parameters of a multiplex as a single document.

- **Multiplexer Output Live Monitoring/Statistics**
  Permits to monitor what Dynamic Label/DL+, Text Messages, Slideshow or Journaline content is currently broadcast.

  For Dynamic Labels, it is useful to verify if e.g the DL+ tagging by the DL+ source is done correctly and to get live statistics on the sequenceof DL/TM transmissions and segments (timing, repetitions, etc.).

  For Slideshow, it is possible to see all slide parameters and verify their correctness, as well as obtaining transmission statistics.

  This feature is especially helpful if a receiver's reaction to Dynamic Label/DL+/TM/slides and Journaline is not as expected. It then helps to determine whether the problem is already at content creation side.

Feature List MAGIC DABMUX Basic & Professional

- **Multiplexer Output EDI / ETI / Subchannel Recording**
  Permits to make a recording of the ETI output signal to a file for a pre-defined amount of time (e.g. 10 minutes), and to then download the recorded file through the Web interface, e.g. to upload it to WorldDAB's ETI library or for verification and documentation purposes.

  It can also be used to provide recordings to receiver manufacturers to test/debug certain DAB features.

- **Audio input live analogue/digital/Livewire**
  Permits to feed raw (not encoded) audio sources with proper GPS clock synchronisation to the ContentServer over regular IP network („Audio-over-IP"). If a studio is already deploying Livewire audio-over-IP functionality, the ContentServer can automatically subscribe to those streams available on the local network and feed them to the internal audio encoder(s). Besides Livewire, also the AES67 standard as well as Ravena based streams are supported.

  To feed legacy analogue (XLR) and/or digital (AES/EBU) input streams to the ContentServer, a Livewire node with one or several analogue/digital inputs is connected via IP network to the ContentServer.

- **Audio input as mp3/wav, playlist**
  Permits to upload audio files to the ContentServer along with an optional playlist defining the file order. This can be useful e.g. to play pre-recorded audio at certain times (e.g. a two hours radio play for a student's radio).

  It can also be used as backup-audio. If audio provision to an audio encoder fails (e.g. only silence is provided), then the ContentServer can play uploaded audio instead. See the description of the ‚Local Audio Backup Source' feature.

- **Silence/clipping detection and configuration**
  Permits to detect if provided audio is too loud (clipping) or silent.

  Thresholds for clipping and silence levels, as well as a grace periods for silence detection can be defined individually per audio source.

  Together with „Audio input as mp3/wav" it is then possible to switch to previously uploaded audio content if the live audio source fails and silence is detected. See the description of the ‚Local Audio Backup Source' feature.

- **Audio Backup Upgrade**
  Allows to define audio service components with locally uploaded mp3/wav/playlist files (see ‚Audio input as mp3/wav' feature) as a backup content source for any externally provided live-audio source (feeding an internal audio encoder) or for externally connected audio encoders (if local encoder licenses are available). Once the external audio source fails to provide data or if silence is detected for a certain amout of time, the ContentServer's built-in audio encoder will automatically start-up with the local audio content as source, to provide a continuous (backup) audio service to the listeners.

- **Audio input signal amplification/mp3 normalization**
  Sometimes the provided audio is too loud or too low in volume. It is then possible to adjust the audio level within some range, either attenuating or amplifying the audio source. The required volume adjustment level - if any - can be configured per audio source. Both the original audio level and the adjusted audio level can be monitored visually.

- **Dynamic changes of programme type (PTy)**
  Permits to dynamically change the signalled programme type (Pty) of a service. An external source can dynamically provide the PTy code (e.g. via UECP or via software/API shipped and provided as part of the ContentServer). So if e.g. a news programme provides live coverage of a sports event, the Pty code could be changed from „news" to „sport" at any time without the need to create a modified multiplex configuration.

- **Dynamic change of the currently active service linkage set**
  For some DAB transmission network setups it is possible that the service linking changes throughout the day, e.g. if adjacent DAB multiplexes usually carry the same content, but during advertisements or the news provide localized ads/news. In this case the service linking will usually tell the receiver that the audio of adjacent ensembles is the same as the audio on the tuned ensemble. But during advertisements (or local news), the service linking will indicate that the content is different.

  An external source can dynamically change which service linkage set is active.

- **Dynamic change of announcement signalling**
  Some radio stations only provide (traffic) announcements during the day.

  With this feature it is possible to tell the receiver at night (or during a concert) that no (traffic) announcements are provided. Using this feature, enabling or disabling of announcement support is possible without the need to create modified multiplex configurations.

- **DAB - Other ensemble announcements (* no yet available)**
  Permits to indicate that announcements for a DAB service are not carried on the tuned ensemble, but on another DAB ensemble. This could e.g. be used in a regional multiplex at night: if there are traffic events to report, the receiver could be told to tune to a national multiplex for these announcements. Another example is the multiplex-wide alarm announcement (part of the EWF - Emergency Warning Feature), where a DAB multiplex could tell the receivers to switch to a different DAB ensemble to present the emergency content currently carried on that other DAB ensemble.

- **DAB - Service information signalling**
  The DAB standard demands that part-time services (e.g. a football service that is only broadcast during football matches) are signalled as such. This way the receiver knows when a currently off-air service will become on-air for the next time. The DAB standard also requires that services added, removed or transferred to another DAB ensemble are signalled in advance. This feature permits to configure and signal such planned changes and to signal part-time services.

- **DAB - Announcements for services provided by a Service Multiplexer**
  For some setups, a national Service Multiplexer provides (via xSTI-C) national services to different regional Ensemble Multiplexers, but the traffic announcements are regional. So they are not carried within the national services.

  This feature permits to signal for the services of the national Service Multiplexer to tune to the regional traffic announcement channel in case of (traffic) announcements.

- **Surround Sound option incl. SX Pro**
  Permits to broadcast 5.1 Surround Sound via DAB instead of mono/stereo only. Surround Sound broadcast is backwards compatible to existing mono/stereo receivers: a standard receiver will play the stereo (or mono) portion of this audio signal, while a surround receiver will use the embedded hidden surround side-information to enhance the audio service to full and almost discrete quality multichannel audio.

  If Surround Sound is enabled, most of the bitrate is used for the stereo (or mono) signal, only some kbps are needed to get surround sound on surround capable receivers. If a native 5.1 source signal is provided, this information is used for the Surround Sound encoding, and the stereo/mono downmix is created internally by the ContentServer's built-in audio encoder. If a stereo source signal is provided, the built-in SX Pro technology will automatically and continuously analyse the sound source and place the ambient elements in the rear channels.

  This feature is only available with the internal audio encoders of the

  ContentServer: DAB+ encoders for DAB ContentServers, and HE-AAC v2 encoders for DRM ContentServers.

- **MOT Broadcast Website/Transparent File Transmission**
  Transparent File Transmission can be used for proprietary applications, e.g. to transfer a set of files and directories to the receiver. The MOT protocol ensures that the file set on the receiver is always consistent.

  The MOT Broadcast Website application is obsolete in the DAB standard V2.1.1, but is still supported by the ContentServer for legacy purposes.

- **TPEG Traffic Information**
  Permits to insert TPEG traffic information. TPEG can be considered the successor of RDS-TMC (traffic message channel) with many more capabilities than RDS-TMC.

- **TMC – Traffic Message Channel**
  Obsolete in the DAB standard V2.1.1, but still supported by the ContentServer for legacy purposes.

- **IP Insertion**
  Obsolete in the DAB standard V2.1.1, but still supported by the ContentServer for legacy purposes.

- **TDC – raw data**
  TDC - the Transparent Data Channel - allows to transmit proprietary information with or without data groups. In addition, the ContentServer allows access to and data insertion into virtually any protocol level to give broadcasters maximum freedom for transmitting proprietary data or future applications (in addition to supporting all current well-defined user applications).

- **DAB - FIC Data Insertion (FIDC, SI, CA)**
  Permits to insert individual signalling information into DAB's FIC signalling channel. This information can either be uploaded or provided in real-time from an outside source. This information is broadcast in addition to the signalling information describing the currently configured DAB broadcast signal.

- **Import via HTML interface (Web-GUI)**
  Can be used to e.g. provide static Dynamic Labels/Text Messages (e.g. name of the programme, contact information, station's greeting message), Announcement signalling and Journaline content conveniently via a Web form using a standard web browser. To access this interface, the Content Provider needs to connect to the dedicated port 24 (well separated from the ContentServer's administration interface) and authenticate via personal login/password.

- **Import from existing RSS/Atom sources (Dynamic Labels/Text Messages)**
  Permits to extract Dynamic Label/Text Message content form existing RSS/Atom sources. This can e.g. be used to extract news headlines from an already existing RSS feed of a radio station. Those messages can then be mixed with other sources for messages in a single service component.

  Besides providing the URL of the intended RSS/Atom feed (optionally along with login credentials, if required), the time between regular automatic updates can be specified.

- **Import from existing RSS/Atom sources (Journaline)**
  Permits to generate a Journaline sub-menu form an existing RSS/Atom feed. Optionally, the HTML formatting, image references, etc. can automatically be extracted and be imported from the content section of each RSS message. Many RSS/Atom feeds often only contain a headline and teaser text for each message, while the actual message content is carried on a referenced HTML page. Therefore the ContentServer can be ordered to follow those references (on a best-effort basis) and attempt to extract the full message content from those external HTML pages.

  The RSS/Atom based sub-directories can be mixed with content from other sources to form the full Journaline service component. Besides providing the URL of the intended RSS/Atom feed (optionally along with login credentials, if required), the time between regular automatic updates can be specified.

- **Import via HTTP/FTP mirroring**
  Permits to download content from an ftp or http server. Special rules at the ContentServer can be used to re-format the downloaded content, e.g. to extract a Dynamic Label/Text Message from a downloaded XML file.

- **Import via live socket connection (API)**
  Permits to feed real-time data, e.g. Dynamic Labels/Text Messages or Slides via a proprietary interface to the ContentServer. This interface provides minimum insertion delay, while supporting login-credentials, hand-shake and flow-control.

  Ready-to-use software for various platforms including the full source code and API documentation is shipped along with the ContentServer and available for download from the online documentation page.

  The command-line software can e.g. be run on another computer. It can either be called for each content element upload and will exit when the ContentServer is ready to accept the next content element (flow-control). Or it can be told to periodically check for a local

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file with a given name for changes, and whenever the content of this file is changes, the updated content is forwarded to the ContentServer. So if the current title/artist information (or a slide) is stored by third-party software to this file, then such information can be easily forwarded to the ContentServer.

These command-line tools can also be called directly by third-party software to update title/artist information or slides, or the ContentServer's underlying real-time API can natively be supported in third-party software.

- **Import from UECP, Zenon, Funkhaustelegramm, Leitungsprotokoll (Dynamic Label/Text Messages & Journaline)**
  Permits to e.g. use a feed based on the common UECP standard for in-house distribution of broadcast-related information (as also used for FM-RDS) to get Dynamic Label/DL+/Text Message content to the ContentServer via UDP/IP (or serial connection if supported).

- **Automatic Scheduled Mirroring option**
  Permits to tell the ContentServer to automatically update content at certain intervals. This feature is particularly useful in combination with RSS/Atom feed sources or http/ftp mirroring imports.

- **Secure data import connections**
  Permits to use encrypted and thus more secure transport protocols for data provision instead of/in addition to standard protocols (such as ftps instead of ftp).

- **JSON/XML-RPC import**
  An http based interface to provide Dynamic Labels/DL+/Text Messages, Slides, Journaline content, (traffic) announcement signalling, programme type (PTy) signalling and activation of service linkage sets via JSON or XML-RPC.

  The interface is particularly useful when integrating with third-party content/signalling sources, or if widely available standard command line tools or software plugins shall be used to communicate with the ContentServer. Login credentials are supported to ensure only authorized access to the ContentServer.

- **JSON/XML-RPC administration**
  An interface that allows management tasks to be triggered or carried out via JSON/XML-RPC. Those tasks include for example the change of the current on-air broadcast configuration by swtiching between existing multiplex configurations, or switching to a weekly schedule.

  The interface is particularly useful when integrating with third-party content/signalling sources, or if widely available standard command line tools or software plugins shall be used to communicate with the ContentServer. Login credentials are supported to ensure only authorized access to the ContentServer.

- **Webstreaming upgrade**
  Permits to use many RTP (real-time streaming protocol) or Icecast/SHOUTcast audio sources as inputs for the internal audio encoders. These streaming protocols are widely used on the Internet.

  For Icecast/SHOUTcast sources it is also possible to extract the contained title/artist information and to forward it as Dynamic Label/DL+/Text Message.

- **EWF - Emergency Warning Feature**
  Emergency Warning Functionality allows to use the digital radio platform (DAB/DRM) for instant mass-alertion of the public in cases of pending distasters through their standard radio sets. It allows the broadcaster or the responsible authority to order receivers to switch to the emergency broadcast (which is carried either within the same or on another ensemble). Receivers may even monitor the alarm signalling in the background and then switch-on automatically in cases of emergencies.

  While the EWF alarm signal needs to be carried in all transmissions covering the affected area, the actual emergency content only needs to be carried in a single multiplex/transmission covering the full affected area. The emergency content consists of the audio announcement, plus a Journaline based advanced text service, which provides detailed on-demand information and instructions in multiple languages simultaneously, and thus extends the reach of the emergency announcement to non-native speakers and hearing impaired users. It also allows the transmission of detailed information such as lists of locations for shelters sorted by region, which could otherwise not be made available over the audio channel (given that the information would be too detailed).

  Technically the EWF Emergency Warning Functionality is not a new application definition, but merely a combination of existing DAB/DRM features along with the how-to specification for both broadcasters and receiver manufacturers.

  The ContentServer supports both the signalling of alarm announcements and related alternative frequency information, as well as the encoding of the emergency content with audio and Journaline elements (along with instant dynamic reconfigurations of the on-air multiplex configuration if required).

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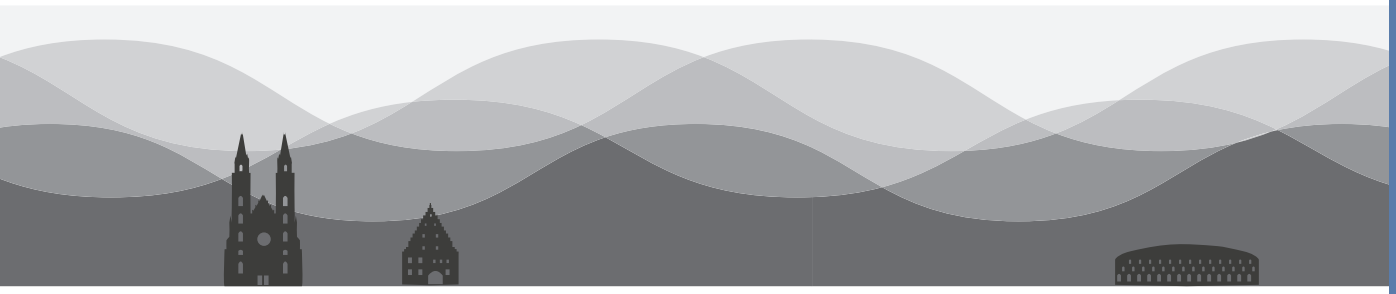

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