

# MPX-1g FM-MPX Stereo/RDS Encoder

## Datasheet

### Highlights

- 1-channel MPX composite encoder
- FM-RDS encoder
- FM-Stereo encoder

# FM-MPX Stereo/RDS Encoder



The MPX-1g is designed for MPX generation and rebroadcasting – ideal for broadcasters and operators of FM networks. It is a flexible device that can be used as an FM/RDS encoder and/or a stereo encoder. Additionally, the MPX-1g can be upgraded with extensions such as MPX/Audio over IP decoders, MPX over IP encoders, SAT receivers and FM/DAB tuners, enabling various backup and rebroadcasting applications.

## Dedicated to your use case

Combine modular elements to generate components of the whole FM-MPX composite signal depending on the use case:

- FM-RDS encoder
- FM-stereo encoder
- MPX rebroadcast
- MPX and  $\mu$ MPX distribution via IP or satellite
- Backup sources and alarm receiver with optional FM/DAB tuner

Activation of the components is purely software-based. This enables on-site device configuration, saving costs and rack space.

## FM-RDS encoder\*

- Support of international RDS standards
- Flexible regionalization and combination of multiple RDS data sources
- Scrolling RDS with up to 160 characters allowing marketing and program information to be displayed on radio devices
- Compatible with different RDS data interfaces for flexible integration into radio playout and automation systems
- Built-in RDS decoder for live view
- Synchronization of RDS and stereo pilot enables stable and undistorted RDS decoding at the receiver
- Compatible with ARCOS Config or ARCOS Network for RDS encoder fleet

\*optional



## FM-Stereo encoder\*

- Software-controlled digital signal synthesis and modulation control
- Pilot tone generation ensures reliable stereo decoding in all receivers and stable stereo reproduction
- Adjustable pre-emphasis and phrase offset compliant to international broadcast standards
- Integrated MPX limiter prevents overmodulation and protects transmitter
- Integrated channel separation enables better sound quality for listeners and professional broadcast operation

## Flexible in Application – Pay as You Grow

- Versatile in serving various use cases
- Upgradeable with hardware and software options according to your needs
- Substitution of RDS of an input MPX signal

## Versatile Input Source Support

- Support of various input sources available as upgrades
- Input sources include Audio over IP, MPX over IP, FM/DAB and SAT

## IP Streaming

- 2wcom provides robust network connections by combining multiple proven technologies to deliver your audio even in stressful conditions.
- Unicast, multiple unicast, and multicast for maximum network control
- Proven multimedia transport protocols such as UDP, RTP and RTSP

## Advanced Streaming Robustness – Unmatched Broadcast Resilience

- PRO MPEG Forward Error Correction (FEC) and dual streaming for resilient, redundant streams
- Secure and reliable streaming over unpredictable networks with Secure Reliable Transport (SRT)\* and Reliable Internet Stream Transport (RIST)
- Manage packet size, buffering, and Quality of Service (QoS) for a robust streaming performance
- Multiple redundancy options and source switching for uninterrupted streaming including Dual Streaming

## Perfect Audio Latency Management – Ensuring Precise Synchronization

- SPN (Synchronous Playout Network)\*: Uses NTP (Network Time Protocol) to synchronize output signals across devices, preventing timing drifts (for example, at transmitter sites) with a precision of < 20 ms (also for  $\mu$ MPX sources)
- SFN (Single Frequency Network)\*: Uses 1PPS or GPS for a precision of < 10  $\mu$ s, enabling SFN operation for FM broadcasting (also for  $\mu$ MPX sources)

\*optional



## Complex Backup Solution for various Use Cases

- Automatic switching between 1 main source and 3 backup sources
- The automatic configuration mode allows the definition of the device according to the type of input source
- Flexible configuration of the MPX-1g as an MPX decoder or as an RDS/Stereo encoder for all sources possible
- Option to replace the RDS signal with internally generated RDS data or generate RDS and/or a stereo signal
- In case of a change in input source the configuration of the device will change accordingly
- Option to include alarm receiver feature to switch input sources in case an emergency signal (PTY31) is detected

## Reliable and Uninterrupted Operation

- 2 dedicated IP interfaces for data transmission, along with an extra IP interface for control, allow a dependable IP streaming experience.
- All 3 IP interfaces can be flexibly configured for either data transmission or control.
- Redundant power supplies (90 – 260 VAC or 48 VDC) provide a fail-safe system, ensuring continuous operation even during a power supply failure.

## User-Friendly and Streamlined Access

- Modern and easy-to-use web interface
- Uniform operating concept across all 2wcom devices for maximum usability
- LCD menu for direct on-site access
- Audio monitoring via web interface or any web stream client with Live Listening
- Encoding audio signals from the optional FM/DAB tuner for monitoring purposes

## Smart Management and Seamless Integration

- Well-established APIs and physical control seamlessly integrate into your current infrastructure: Rest API, Ember+, SNMP, NMOS, and GPI
- Stay informed: Flexibly configurable alarm events and notifications over SNMP, GPO, and front panel LED
- Monitoring and alarm control of RDS and MPX parameters

## Verified IP Security

- High-level security within open IP infrastructures
- Thoroughly examined by independent audit authorities through whitelist/blacklist penetration tests



## Formats and Protocols

### RDS Signal

Standards	UECP 7.05, CENELEC, EN 50067, IEC 62106, (RDS 2.0 ready)
Coding	Differential and biphase
Modulation	double-sideband amplitude modulation (DSSC) with suppressed carrier
Center frequency	57 kHz $\pm$ 6 Hz
Bandwidth	$\pm$ 2.4 kHz
RDS level	0 – 8191 mVpp
RDS phase offset	-180° – 180°
Linear distortion	< 0.5 dB between upper and lower sidebands
SNR	> 80 dB
Carrier suppression	> 85 dB

### RDS Synchronization

Mode	Synchronized to external pilot or internal stereo encoder
Fallback	Automatic switchover to internal oscillator
Frequency	19 kHz $\pm$ 2 Hz
Level external	< 9 Vpp

### RDS Features

RDS functions	PS, PI, TP, TA, PTY, PTYN, MS, DI, RT, CT, AF 64 lists, EON, EWS, ODA, TMC, TDC, IH, RP, PIN, SLC, LINKAGE, EPP, ECC, FFG, SPS
Data sets	16



## Stereo MPX Signal

Channel separation	L/R > 70 dB at 1 kHz; L/R > 60 dB at 20 Hz – 15 kHz; M/S > 60 dB
Frequency response	20 Hz – 15 kHz < 0.15 dB
Pilot rejection	> 70 dB
SNR	> 80 dB
THD	< 0.05 %
Pilot frequency	19 kHz ± 1 Hz
Pilot magnitude	2.5 kHz – 10 kHz
Pilot phase	-5 – +5° in steps of 0.1° – adjustable to 38 kHz-subcarrier
Preemphasis	off, 50 µs, 75 µs
Limiter	Peak: 50 – 100 kHz; Power: -3 – +3 dB according to BS.412-9

## MPX

Format	PCM raw
Bit depth	12, 13, 14, 15, 16, 20, 24 bit
Bitrates	2.4 – 4.6 Mbit/s (without FEC)
Sample rates	132, 192 kHz

## FM MPX Signal

Signal	FM MPX digital or analog
Frequency response	20 Hz – 90 kHz: < 0.05 dB
Stereo separation	> 55 dB
Harmonic distortion	< 0.0025 dB
SNR (CCIR-weighted)	> 75 dB
SNR (A-weighted)	> 90 dB

## µMPX (optional)

Bitrates	320, 384, 448, 576, 800 kbit/s (without FEC) Note: 800 kbit/s only possible with µMPX v4
Sample rates	192 kHz

## FM µMPX Signal

Signal	analog
Frequency response	40 Hz – 15 Hz: < 0.15 dB
Stereo separation	> 36 dB at 500 Hz > 50 dB
Harmonic distortion	> 56 dB or < 0.16 % at 500 Hz > 70 dB or < 0.035 %
SNR (CCIR-weighted)	> 69 dB
SNR (A-weighted)	> 78 dB

# Specifications



## Audio (optional)

Codecs (included)	Linear PCM, G.711, G.722 Linear PCM (AES67) Opus, Ogg Vorbis MPEG 1/2 Layer 2, 3 MPEG-2/MPEG-4 AAC-LC, MPEG-4 HE-AAC v1 & v2, MPEG-4/MPEG-D xHE-AAC MPEG-4 AAC-LD/ELD/ELDv2 Enhanced aptX (E-aptX)
Sample rates	16, 22.05, 24, 32, 44.1, 48, 132, 192 kHz

## Streaming

IP protocols	TCP, UDP unicast, multiple unicast & multicast
Audio over IP formats (optional)	RTP (RFC 3550, RFC 3551, RFC 3640, RFC 2250) SMPTE ST 2110 (optional) MPEG-TS
Web streaming (optional)	Icecast/Shoutcast Client
Transmission robustness	SRT, RIST Pro-MPEG FEC #3 release 2 Dual Streaming $\mu$ MPX FEC Adaptive bitrate switching, source switching concept, management of packet size, buffers, QoS

## Synchronization

Internal	free-running
External	1PPS, PTP, PTPv2, NTP, digital reference input
Decoder synchronization between different devices	< 20 ms using SPN via NTP (optional) < 1 $\mu$ s using SFN via 1PPS or PTP (optional)
Sample rate converter	16:1 to 1:16

## Interfaces

### Audio

Digital (in)	2x AES/EBU, 110 $\Omega$ balanced integrated XLR female, shared with analog in (configurable)
Digital (out)	2x AES/EBU, 110 $\Omega$ balanced integrated XLR male, shared with analog out (configurable) up to 192 kHz sampling rate for MPX
Analog (in)	1x L/R, < 20 $\Omega$ balanced integrated XLR female, shared with digital in (configurable)
Analog (out)	1x L/R, < 20 $\Omega$ balanced integrated XLR male, shared with digital out (configurable)

# Specifications



Analog MPX (in)	2x integrated 50 $\Omega$ BNC socket
Analog MPX (out)	2x integrated 50 $\Omega$ BNC socket
Analog reference level	+6 dBu max. +18 dBu (input/output)
Digital reference level	-9 dBFS
Adjustable gain	20 – +6 dB
Harmonic distortion	< 0.05 % / < -66 dB (40 Hz – 10 kHz)
Dynamic range	16 Bit: > 89 dB; 24 Bit: > 130 dB
Frequency response	Depends on sample rate. For example: 48 kHz: 0.1 dB; 20 Hz – 22.5 kHz

## Interface Extensions

FM/DAB tuner (optional)	2x 75 $\Omega$ F-type
FM/DAB tuner (optional)	50 $\Omega$ BNC socket
SAT tuner (optional)	2x 75 $\Omega$ F-type

## Ethernet

Connector	3x RJ45 (1x Control, 2x Data)
Type	Auto-switching 10/100/1000 BASE-T

## Synchronization

1PPS input	75 $\Omega$ BNC socket
GPS (optional)	75 $\Omega$ BNC socket
10 MHz output (optional)	50 $\Omega$ SMA socket, from GPS module
1PPS output (optional)	75 $\Omega$ BNC socket, from GPS module

## Serial and GPIO

DTE 1+2	2x 9 pole D-Sub male connector for serial RS-232C data communication
USB	USB 2.0 interface for service, configuration, and firmware updates
GPIO	26 pole D-Sub male; combined connector for inputs (GPI) and outputs (GPO)

## Front Panel

Headphone	6.3 mm / 1/4" socket, < 10 $\Omega$
LEDs	Power, Input, Output, Warning
Operation	Display and Jog Wheel
Display	LCD, graphical, 264x64 pixel

## General Data

### Integrated Web GUI

Languages	English
Web technologies	HTML5, Java Script

# Specifications



## Device

Power consumption	< 20 W
Case dimensions	19", 1 RU, depth: 310 mm, width: 424 mm, front panel: 484 mm
Weight	< 5 kg
Material	Steel plate, aluminum-zinc coated
Operating temp. range	0 – +45 °C
Storage temp. range	-40 – +70 °C

## Power Supply

Standard AC	1x internal IEC power connector voltage range 90 – 260 VAC (nominal 100 – 240 VAC) frequency range 47 – 63 Hz (nominal 50 – 60 Hz)
Dual internal (optional)	2x internal redundant power supplies (AC or DC) automatic switchover and prioritization AC: 90 – 260 VAC (nominal 100 – 240 VAC), 47 – 63 Hz (nominal 50 – 60 Hz) DC: -40 – -60 VDC (nominal -48 VDC)
Dual hot-plug (optional)	2x hot-swappable redundant power supplies (AC or DC) automatic switchover and prioritization AC: 90 – 260 VAC (nominal 100 – 240 VAC), 47 – 63 Hz (nominal 50 – 60 Hz) DC: -40 – -60 VDC (nominal -48 VDC)

# Options



## MPX-1g Base Unit Variations

To customize your device, start by selecting a base unit variation, then choose from our range of hardware and software options to fit your needs. Each unit includes one audio channel by default. You can choose from the following base unit variations:

Article no.	Name
VER66001	Base unit MPX-1g with 1x internal AC power supply
VER66002	Base unit MPX-1g with 2x internal AC power supplies
VER66003	Base unit MPX-1g with slot for 2x hot-plug power supplies Note: 2x hot-plug power supplies AC/DC not included. Please order 2x hot-plug power supplies AC (VER45851) or DC (VER45852).

## Hardware Options

Please note that hardware options are installed at the factory in Flensburg, Germany, and can only be retrofitted independently in individual cases.

Article no.	Name	Description
VER66028	Dual satellite tuner (*)	DVB-S/S2/S2X Dual tuner module <ul style="list-style-type: none"><li>QPSK, 8PSK, 16APSK, 32APSK</li><li>Supported symbol rates: 1 MSym/s – 45 MSym/s</li></ul> (*) Excludes option FM/DAB tuner (F-type) (VER66022).
VER66022	FM/DAB tuner (F-type) (*)	FM/DAB multi-band tuner for rebroadcasting, monitoring and control <ul style="list-style-type: none"><li>Dual tuner with 75 Ω F-type connector input</li><li>Alarm messages via SNMP or relay</li><li>Can be combined with FM (RDS)/DAB (PAD) databridge (VER66023)</li></ul> (*) Excludes option Dual satellite tuner (VER66028) and requires option MPX/audio decoder (VER66016).

# Options



VER63419	FM/DAB tuner (BNC) (*)	<p>FM/DAB multi-band tuner for rebroadcasting, monitoring and control</p> <ul style="list-style-type: none"> <li>• Dual tuner with 50 <math>\Omega</math> BNC connector input</li> <li>• Alarm messages via SNMP or relay</li> <li>• Can be combined with FM (RDS)/DAB (PAD) databridge (VER66023)</li> </ul> <p>(*) Requires option MPX/audio decoder (VER66016).</p>
VER65120	Internal SSD storage	128 GB internal SSD storage
VER45851	Hot-plug AC power supply	<p>Power supply with automatic switch over in case of failure.</p> <ul style="list-style-type: none"> <li>• 90 – 260 VAC (nominal 100 – 240 VAC),</li> <li>• 47 – 63 Hz (nominal 50 – 60 Hz)</li> </ul>
VER45852	Hot-plug DC power supply	<p>Power supply with automatic switch over in case of failure.</p> <ul style="list-style-type: none"> <li>• 40 – -60 VDC (nominal -48 VDC)</li> </ul>



## Software Options

Please note that software options can be retrofitted remotely.

Article no.	Name	Description
VER66024	Automatic backup switching between encoder and decoder (*)	Enables automatic backup switching between MPX encoder and RDS / Stereo decoder mode. (*) Requires options Stereo encoder (VER66011), RDS coder (VER66010) and MPX/Audio decoder (VER66016).
VER66012	RAVENNA, AES67, PTP (*)	According to the RAVENNA technology of audio over IP interoperability. (*) Requires option MPX IP-encoder (VER66018) or MPX / Audio decoder (VER66016).
VER68013	SFN (single frequency network)	Synchronization of MPX streams for FM-SFN networks accurate to the microsecond. <ul style="list-style-type: none"> <li>• 1PPS input</li> <li>• Accuracy: &lt; 1 <math>\mu</math>s</li> </ul> Price per unit.
VER66025	SPN (synchronized playout network)	Output synchronization via NTP time server. <ul style="list-style-type: none"> <li>• Accuracy 20 ms</li> </ul> Price per unit.
VER66010	RDS coder	RDS standards: UECP 7.05 compliant, CENELEC EN50067 <ul style="list-style-type: none"> <li>• RDS coder with UECP fully dynamic data via IP or serial interface</li> <li>• RDS configuration and monitoring via web interface, ARCOS Config (basic functions) or ARCOS network of RDS encoder fleet</li> <li>• Up to 16 datasets available</li> <li>• Scrolling PS to show messages of up to 160 characters</li> <li>• built-in RDS decoder for live view / RDS lab</li> <li>• enables replacement of RDS data in the MPX/composite signal</li> </ul>
VER66011	Stereo encoder	MPX-Stereo Encoder <ul style="list-style-type: none"> <li>• Software-controlled signal synthesis and modulation control.</li> <li>• Configurable filter settings for monitoring or rebroadcast (optional: VER66017).</li> </ul>
VER66017	MPX limiter (*)	Calculation and adjustment of modulation power and peak deviation. (*) Requires option Stereo encoder (VER66011).



Article no.	Name	Description
VER66019	SRT/RIST decoder	SRT functionality for decoder according to SRT standard of the SRT Alliance (including UDP). RIST functionality for decoder according to IETF standard "RIST Simple Profile" and RFC 4585. Price per activated channel.
VER66020	SRT/RIST encoder	SRT functionality for encoder according to SRT standard of the SRT Alliance (including UDP). RIST functionality for decoder according to IETF standard "RIST Simple Profile" and RFC 4585. Price per activated channel.
VER	HLS decoder	Adds HLS, HTTP Live Streaming Decoder function. Price per activated stereo channel.
VER69013	μMPX decoder – MPX decompression (*)	Algorithm to decompress the full MPX/composite signal, including pilot and RDS from IP to MPX. (*) Requires option MPX / Audio decoder (VER66016).
VER69014	μMPX encoder – MPX decompression (*)	Algorithm to compress the full MPX/composite signal, including pilot and RDS to IP. (*) Requires option MPX IP-encoder (VER66018).
VER66016	MPX/audio decoder	Audio over IP (optional SAT) as input source for the optionally available stereo encoder. MPX over IP (optional SAT) as MPX rebroadcast source for the optionally available RDS encoder.
VER66018	MPX/audio encoder	Enables the device to encode one of the following signals. Encoding one of the following signals automatically excludes the other option. <ul style="list-style-type: none"> <li>• Encoding of the internal generated MPX signal for IP transmission in PCM or optional μMPX format.</li> <li>• Encoding of the audio from the optional FM/DAB tuner.</li> </ul>
VER66023	FM (RDS)/DAB (PAD) databridge (*)	Enables forwarding of <ul style="list-style-type: none"> <li>• dynamic RDS data from the FM tuner</li> <li>• dynamic PAD data and signaling data from the DAB tuner to the RDS encoder for retransmission</li> </ul> (*) Requires option FM/DAB tuner (F-type) VER66022 or FM/DAB tuner (BNC) VER63419.
VER66029	Watermarking detector	Watermarking detection based on Kantar Media's SNAP technology. Separate watermarking license agreement by Kantar Media required.