

## MultiFM Modulator with RDS and TMC



Up to 24 Stereo Multiplexes with RDS Signals and TMC

- FM modulation for RDS software tests of mobile radio receivers
- Efficient solution with only one device
- Digital modulation of up to 24 separate multiplexes
- Automation interface: TCP remote control
- Transmission of RDS signals: program information (PS, PTY), traffic information (TP, TA, EON) and more
- Optimal evaluation of channel list generation and Alternative Frequency function (AF)
- Traffic Message Channel information (TMC)
- TMC encryption according to ISO 14819-6
- Controlled error generation and fault tracing in the RDS data stream (e.g. inserted bit errors, bit errors with correct checksums etc.)
- Lowest priced solution for channel handover tests

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## Digital Modulation of Several FM Multiplexes with RDS Signals

Car radios are analogue radios: FM will most probably remain the most important transmission mode for mobile radio reception for a long time. In the meantime, administration and additional services for mobile radio receivers become more and more complex: Channel lists, alternative frequency handover, program and traffic information are essential parts of the Radio Data System (RDS). The radio must be able to receive and process this information most reliably. To evaluate the RDS functions' quality, you have to do substantial and complex tests that check how the radio software deals with errors in the RDS data stream.

For these tests, maintech offers as the most capable device of its class the MultiFM Modulator that is able to modulate up to 24 multiplexes – other devices usually feature two paths at most. The MultiFM Modulator provides best conditions to simulate a mobile operating of the radio receiver and to test its RDS software. Thanks to the simultaneous modulation of several signals, automatic frequency changes and channel handovers can be tested optimally. The handling of TMC information, essential for head units with integrated navigation function, can also be evaluated.

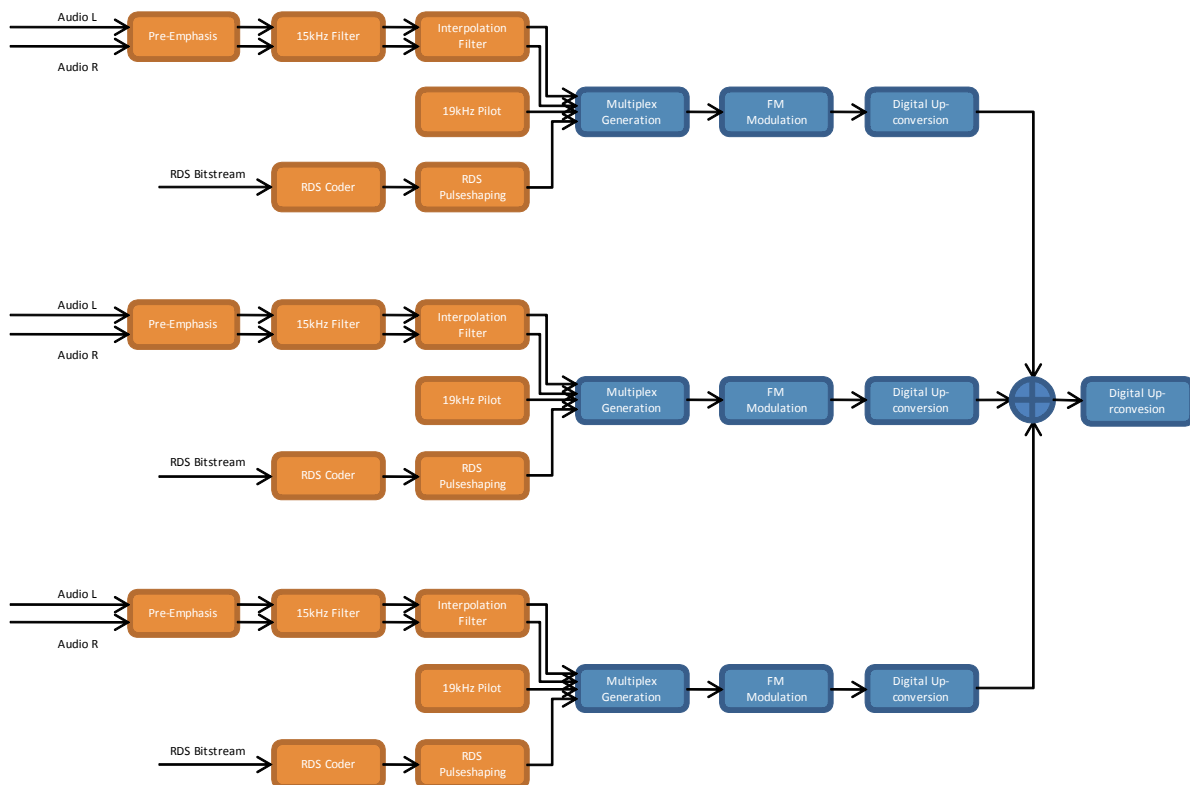
Time-consuming testing trips to locations with convenient radio transmitter conditions grow unnecessary; an acquisition of several expensive single devices generating only one FM signal each can be spared. Modulating up to 24 multiplexes, the MultiFM Modulator can make work easier for car radio manufacturers as well as for their customers (e.g. in specification of standard test cases, evaluation).

## Modulation of Several FM Carriers from PCM Data

- Standard-conforming FM modulation of up to 24 stereo multiplexes
- Output: VHF band (87,6-107,9MHz; Japan: 76-90MHz)
- Modulation of several carriers to signals with arbitrary frequency and attenuation
- Configuration on PC with a powerful and user-friendly software via RS232 / Ethernet
- RDS standard IEC-62106:2009

### Technical Data

Power supply	12V DC / 2A; power adapter included
Dimensions	204x130x55mm
Interfaces	RS232 (Service) / Ethernet
Antenna output	Coax 75Ω
Integrated output level (all carriers)	-10 dBm / +97dBμV (for direct receiver connection)
Signal-to-Noise ratio	55 dB (typical) 40 dB (minimal)



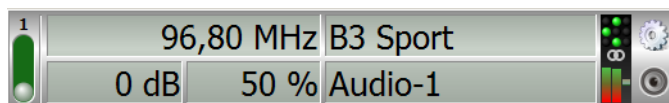
## Signal Generation Software

Featuring a variety of settings and modifications instead of not more than a limited selection of predefined data sets, the signal generator is optimally suited for substantial series of tests.

Chosen settings and test sequences can be saved as projects and loaded again at any time which ensures the comparability of the gathered data and guarantees best evaluation results.

The MultiFM Modulator software comprises different settings of the FM channels, audio sources and RDS sources. Value modifications effect the generation of the signal without delay. This enables prompt test executions.

The overview window allows quick and comfortable operating. Important settings can be monitored and modified directly. Inconsistent or interfering settings (e.g. too close frequencies) are marked optically.

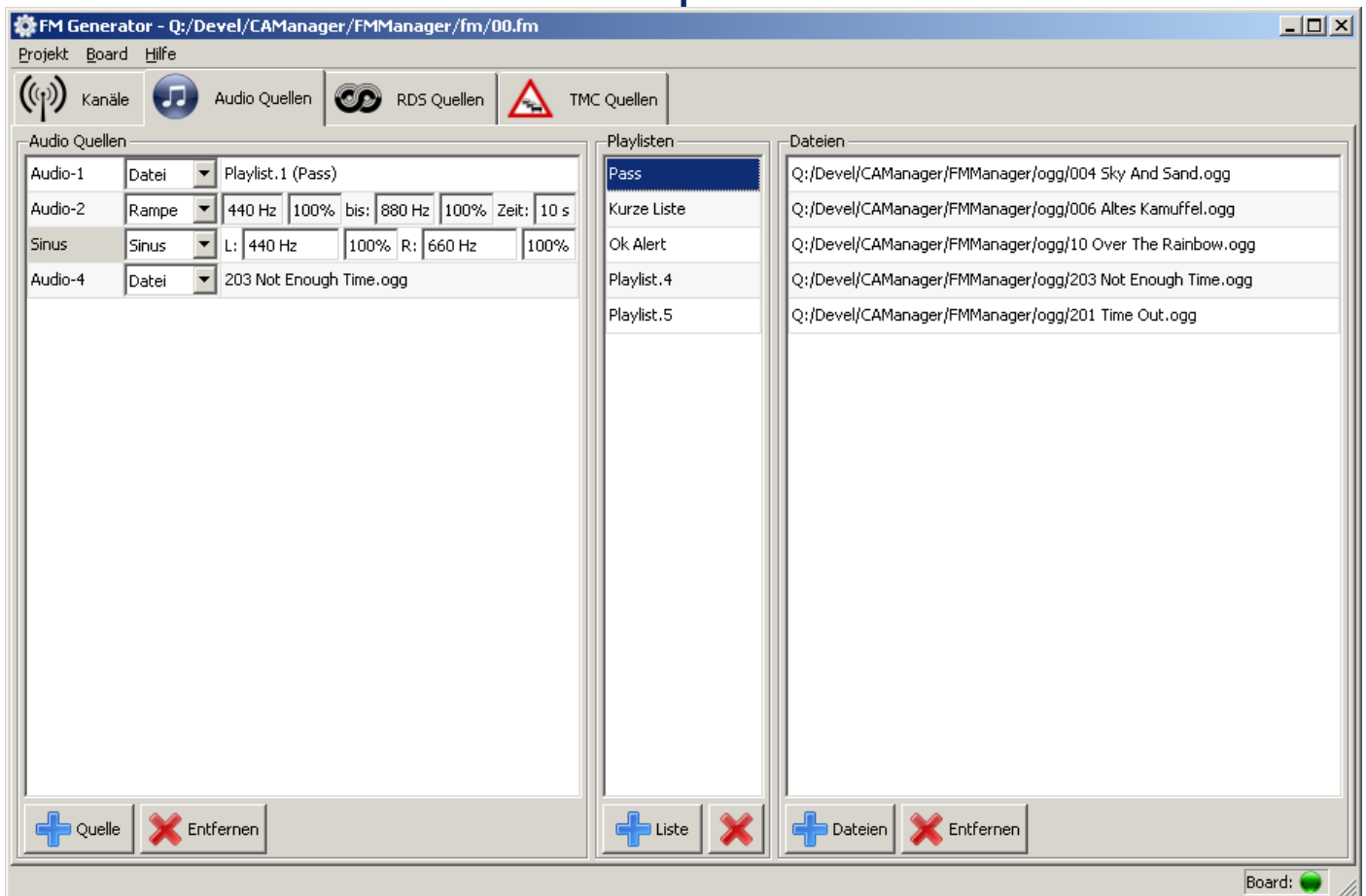


## FM Channel Settings

The MultiFM Modulator produces up to 24 standard-conforming stereo multiplexes. Adjustments:

- Frequency
- Signal attenuation
- Volume
- Preemphasis
- Frequency deviation
- Samplerate
- Mono or stereo





## Audio Sources

The MultiFM Modulator provides sinus and ramp signals that can be chosen arbitrarily to provide an audio source for the transmitted FM radio signal.

Recorded audio files and extensive playlists can be loaded on the different channels, too.

## RDS Sources

For feeding the stream with RDS data, there is a wide choice of selectable settings according to the RDS specifications.

Alternative Frequency input, timestamp and repetition rate are especially relevant inputs for testing the RDS software of mobile radio devices.

And last but not least, the software includes an extra error generator with different bit error generators (inversion, 0, 1) and selectable error rate. Group, PI or CRC can be sent error-free if required. This enables fuzzing tests for the RDS data handlers in the radio firmware.

## Transmitted RDS data sets:

- PS Program Service Name
- PTY Program Type
- PTYN Program Type Name
- PI Program Identification
- TP Traffic Program
- TA Traffic Announcement
- TMC Traffic Message Channel
- AF Alternative Frequency
- DI Decoder Information
- MS Music/Speech
- RT Radio Text
- CT Clock Time
- EON Enhanced Other Networks

## RDS Specifications1

Group	Repetition rate	0,1-900s
Program	PS	8 characters or scrolling PS: 80 characters (violation of standards)
	PTY	0 to 31
	PTYN	8 characters
	PI	0000 to FFFF
TP / TA	TP	On/Off
	TA	On/Off
TMC	TMC	On/Off
	Group 3A	Sending TMC identification
	Group 8A	Freely selectable number of event / location couples
AF	Number	Up to 25
	Frequency range	87,6-107,9MHz 153-279kHz 531-1602kHz
	Resolution	In steps of 100kHz

DI	Dynamic PTY	On/Off
	Compressed PTY	On/Off
	Artificial head	On/Off
	Stereo	On/Off
MS	MS	On/Off
RT	Input	2 alternating texts (up to 64 characters)
CT	Clock time	According to system time
	Offset	Arbitrary
EON	PI	0000 to FFFF
	PS	8 characters
	TP	On/Off
	TA	On/Off
	PTY	0 to 31
	AF	As stated above

The screenshot shows the 'RDS Quellen' (RDS Sources) tab in the FM Generator software. The interface is in German and displays various RDS parameters for a radio station named '4 Sport'.

**Grundeinstellung (Basic Settings):**

- PI: 0xd317
- PTY: 4 Sport
- Traffic:  TP  TA
- Audio:  Music  Speech
- Options:  dynamic PTY  compressed  artificial head  stereo

**Service Groups:**

- Gruppe 0: PS Program Service Name & AF Alternative Frequenzen (1449 Pakete 29.2% 0.30s)
  - PS: Antenne1
  - scrollen\*:  3 x | 2 Zeichen
  - AF: 0,3 s
- Gruppe 4: UTC clock-time and date (8 Pakete)
  - Zone: 1 h |  Zeit +- | 0 min
  - Datum: 01.03.1900 | 2010-04-07 13:03 (02) +1 h
- Gruppe 8: TMC (2196 Pakete 44.3% 0.20s)
  - TMC Quelle: TMC-4 |  nutze freie Blöcke | 0,2 s
- Gruppe 3: ODA IDA (434 Pakete 8.8% 1.00s)
  - TMC ID: CD46 | 1,0 s
- Gruppe 2: RadioText senden
  - 6 x | | Rate: 0,3 s
  - 6 x | | Rate: 0,3 s
- Gruppe 10: PTYN Program Type Name (869 Pakete 17.5% 0.50s)
  - 8 x | Golf | 0 x | | Rate: 0,5 s
- Gruppe 14: EON Enhanced Other Networks
  - Rate: 0,5 s

**Fehler Generator (Error Generator):**

- Fehler: 4 % |  pro Gruppe
- Korrigiere:  Gruppe  PI  CRC

**Alternative Frequenzen (Alternative Frequencies):**

- 96,8 MHz

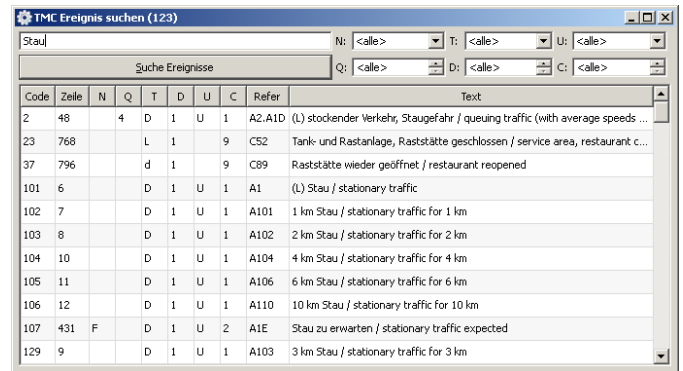
Buttons: + Quelle, - Quelle, + Frequenz, - Frequenz

## TMC Sources

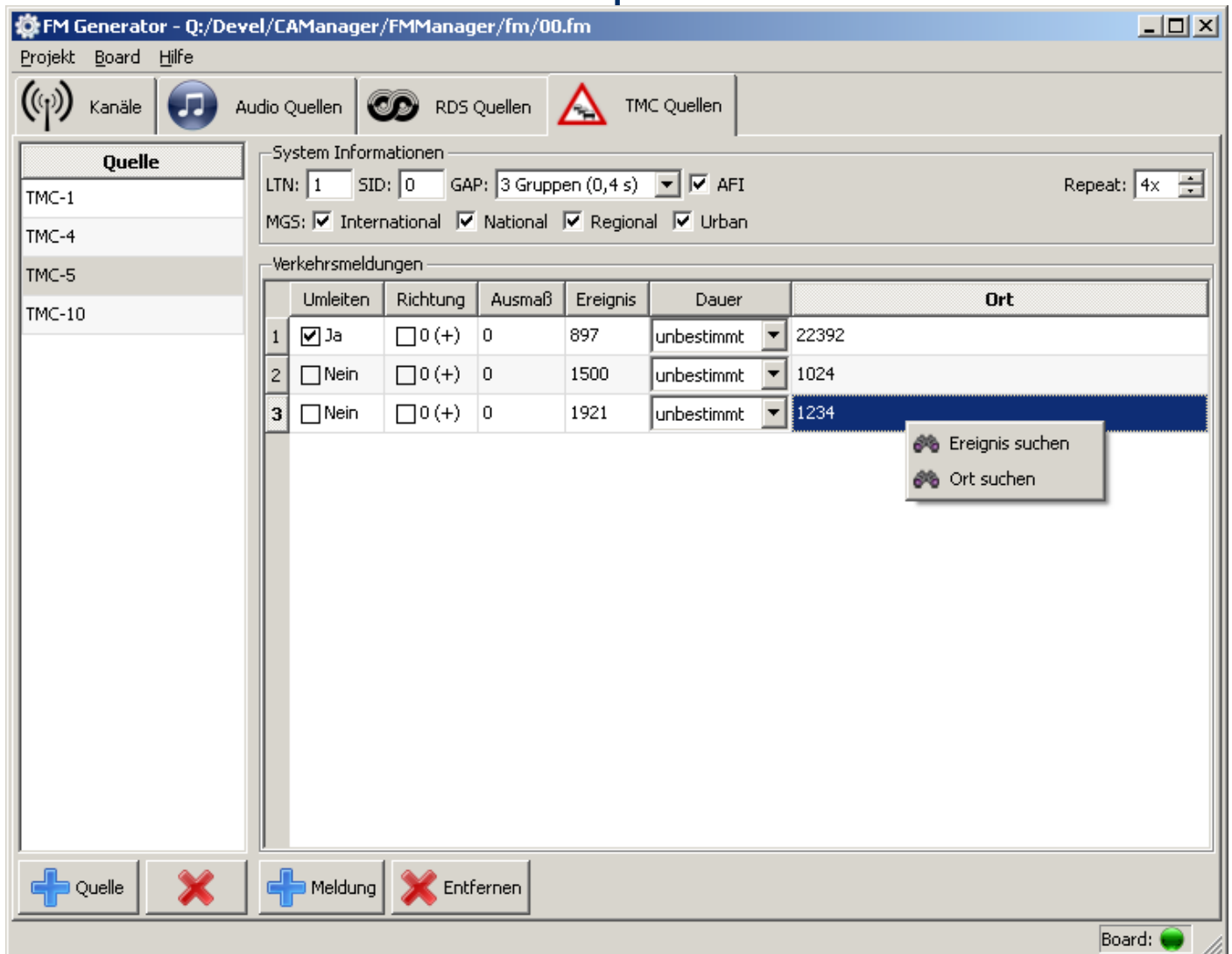
For car radios and additional navigation functions, TMC data is very important. The MultiFM Modulator software features various settings of location, event type and transmission parameters.

The software generates and outputs a complete TMC data stream. A pre-recorded data stream can be emitted, too.

The software features TMC encryption according to ISO 14819-6, too.



Code	Zelle	N	Q	T	D	U	C	Refer	Text
2	48		4	D	1	U	1	A2.A1D	(L) stochender Verkehr, Staugefahr / queuing traffic (with average speeds ...
23	768			L	1		9	C52	Tank- und Rastanlage, Raststätte geschlossen / service area, restaurant c...
37	796			d	1		9	C89	Raststätte wieder geöffnet / restaurant reopened
101	6			D	1	U	1	A1	(L) Stau / stationary traffic
102	7			D	1	U	1	A101	1 km Stau / stationary traffic for 1 km
103	8			D	1	U	1	A102	2 km Stau / stationary traffic for 2 km
104	10			D	1	U	1	A104	4 km Stau / stationary traffic for 4 km
105	11			D	1	U	1	A106	6 km Stau / stationary traffic for 6 km
106	12			D	1	U	1	A110	10 km Stau / stationary traffic for 10 km
107	431	F		D	1	U	2	A1E	Stau zu erwarten / stationary traffic expected
129	9			D	1	U	1	A103	3 km Stau / stationary traffic for 3 km



**FM Generator - Q:/Devel/CAManager/FMManager/fm/00.fm**

Projekt Board Hilfe

Kanäle Audio Quellen RDS Quellen TMC Quellen

**Quelle**

- TMC-1
- TMC-4
- TMC-5
- TMC-10

**System Informationen**

LTN: 1 SID: 0 GAP: 3 Gruppen (0,4 s) AFI Repeat: 4x


MGS:  International  National  Regional  Urban

**Verkehrsmeldungen**

	Umleiten	Richtung	Ausmaß	Ereignis	Dauer	Ort
1	<input checked="" type="checkbox"/> Ja	<input type="checkbox"/> 0 (+)	0	897	unbestimmt	22392
2	<input type="checkbox"/> Nein	<input type="checkbox"/> 0 (+)	0	1500	unbestimmt	1024
3	<input type="checkbox"/> Nein	<input type="checkbox"/> 0 (+)	0	1921	unbestimmt	1234

Ereignis suchen  
Ort suchen

+ Quelle -x- + Meldung -x- Entfernen

Board: 

## Test Procedure Automation: Remote Control via TCP

For series of tests and automated procedures, the Multi FM Modulator is equipped with an TCP interface for remote control of all functions.

With a simple Telnet program, you can send commands and monitor events. Please ask for our client software for a demonstration of the interface.

## Dynamic Event Recording and Playback

Another option is this function for recording and playing out dynamic changes of all configurable parameters.

Thereby, dynamic test cases are not only simulated in a simple way, but also reproducible.