

1 Application

The EFR-telegram generator EFRG1 (fig. 1) is an easy to handle, compact equipment which allows the generation of high frequency FSK-modulated signals conform to the EFR-telegram specifications as well as the generation of lower frequencies, normally used as intermediate frequency inside of ripple control receivers.

By the connection of a corresponding transmitting antenna, the generated signals can be broadcasted in order to generate a well defined field-strength inside of a specified area. The EFRG1 is able to be completely remote-controlled by the connected PC or it can work in its "stand-alone" operation mode.

The wide frequency range and its easy handling make the EFRG1 to a very powerful tool, for example, for the following typical applications:

- Generation of FSK-modulated signals conform to the EFR-telegram specifications on typical carrier frequencies like 129.1kHz, 135.6kHz, etc.
- Generation of lower, intermediate frequencies, typically used inside of ripple receiver products (like ZF=5kHz)
- Easy detection and evaluation of reserves in existing FSK-demodulator solutions.
- Support of software- and hardware development for EFR-related products (tuning and test-procedures)
- Support of general functional tests, detailed sensitivity tests and quality inspections during the development and/or production process.
- Support of the preparation and execution of PC-controlled test-routines
- Frequency inversions, which may appear during the signal mixing, can be handled.
- Possibility to connect different types of transmitting antennas in order to broadcast the simulated EFR-telegram signal with a well defined field strength over a specified, limited area.
- Possibility to feed the simulated time signal directly into the D.U.T. (device under test)



3D-view (w/o any accessory and w/o any connection cable)

front side



rear side



Figure 1: EFRG1, the EFR-telegram generator

2 Features

- Mains operated equipment with 50 Ohm output-impedance for signal RFout
- USB-interface for PC-connection
- Functional operation and parameter setting controlled by PC
- Very easy update of EFRG1-features by software-update
- D-Sub connector (9-pole) for FSK IN – telegram (RS232 interface)
- External and / or internal types of signal-modulation can be applied
- Operation / Display
 - a) by PC with installed user-software, or
 - b) in "stand-alone" operation mode, based on pre-defined settings stored into the EFRG1-unit, by use of 1 button and a two-line, illuminated display (24 characters each) on the EFRG1-unit itself
- Simple adjustment / setting of centre frequency, frequency deviation, stepping information, output level, antenna factor, type of modulation, etc. (please refer to figure 2).
- Once the value of an antenna factor is set, the adjustment/indication of output signal level can be done as output-voltage (dB μ V) or as field strength (dB μ V/m)
- Generation of SYNC-pulses in order to trigger external measurement equipment
- User software attached to the unit for MS-Windows based operation systems: Win98 SE and newer

- A library of practical approved parameter settings for EFR-telegram signals can be prepared, reflecting typical field-test conditions for ripple control receivers. Corresponding parameter-settings can be downloaded into the EFRG1 and afterwards it can run in its stand-alone operation mode.
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3 Technical data (values referred to ambient temperature: 23°C ± 1°C)

Parameter	value	Condition
Output voltage ($V_{out\ rms}$)	20 dB μ V ... 139 dB μ V respect. 10 μ V ... 9 V	Measured on output impedance 50 Ohm, without any connected load. Adjustable in steps of 0.1 dB (resolution); Output is short-circuit proof.
Accuracy of output voltage	± 0.2 dB	compared to displayed set value
Output impedance	50 Ohm	output: RF OUT
Centre Frequency range	0.10 kHz ... 499.99999 kHz	adjustable in steps of 0.01Hz; frequency tuning: digital
Drift of centre frequency	< 0.7 ppm/K	temperature range: 20°C ... 35°C
Antenna Factor range	-40dB ... +20dB	Adjustable in steps of 0.1 dB (resolution)
Pulse length of bits	1ms ... 32ms	internal modulation; adjustable in steps of 1ms (resolution)
Accuracy of bit clock edges	± 15 μ s	
Pulse length of synchronisation pulse	40 μ s	
Operating temperature range	10° - 35°C	
Humidity	0% - 90%	not condensing
Power consumption of USB - interface	≤ 100mA	
Power consumption of 12V DC	≤ 500mA	
Power-supply	12V DC	AC/DC adapter with EURO-plug (detachable); other plugs available for: UK, USA, ROW; Input: 100–240V~ / 47-63Hz / 400mA Output: 12V= / 1.25A

Notation: **EFRG 1**
 EFR-Telegram Generator

Part-no.: **MAX 13010**

8 Useful accessories:

no.	notation	part-no.
1	RAA1: 1-loop antenna	MAX 06010
2	RAA4: 4-loop antenna	MAX 05010
3	SB-Antenna: Shielded Antenna-Box	MAX 10010