

Cost-effective, highly stable, signal generator



LG 3238

LG 3238 AM/FM STEREO SIGNAL GENERATOR

LG 3219 RDS STANDARD SIGNAL GENERATOR

GENERAL

LG 3238/LG 3219

The LG 3238 and LG 3219 generate CW, FM, AM, and simultaneous FM and AM signals in the frequency range of 100 kHz to 140 MHz as well as CW and FM signals in the frequency range of 162 MHz to 163 MHz. They are equipped with remote control capabilities.

These generators feature monaural FM and AM functions and an FM stereo modulator that complies with FM stereo broadcast standards.

Fundamental oscillation is used to generate frequencies between 70 MHz to 140 MHz and 162 MHz to 163 MHz directly. These signals are used to derive 100 kHz to 35 MHz signals through the heterodyne method and 35 MHz to 70 MHz signals through the 1/2 frequency division method.

The LG 3238 and LG 3219 are synthesized signal generators that produce accurate RF signals, which are phase-locked at all times to the internal reference crystal oscillator. The frequency resolution is 100 Hz.

The ΔF function can be used to get a direct reading of how much the frequency is offset from the reference frequency. In addition, the frequency can be changed in preset steps.

The output level can be set to a value from -20 dB μ V [emf] to 126 dB μ V [emf] in 0.1 dB steps. With the exception of the use of a relay to switch to 106 dB μ V [emf], a solid-state attenuator is used to switch the output levels in order to extend the generator's service life.

The ΔdB function can be used to get a direct reading of how much the output level is offset from the reference level. In addition, the output level can be changed in preset steps.

These generators can apply frequency modulation and amplitude modulation simultaneously. This feature can be used to combine internal modulation signals with one external modulation signal.

The internal stereo modulator generates composite stereo modulation signals that comply with FM stereo broadcasting systems.

These generators have a preset function that can store 100 sets of frequency, output-level, modulation-mode, and external-control output-signal settings. A preset can be recalled as necessary to reconfigure the generator.

The front panel settings are retained even when the power is turned off. If the generator is turned off and then turned back on, the previous settings are restored.

These specifications and features are the reasons why these generators are used in a wide variety of ways. They are used as automation devices for the manufacturing and inspection of AM and FM receivers and electronic components and as signal generators for servicing, research, and development.

Available Only on the LG 3219

The LG 3219 is equipped with RDS and TRI (or ARI) modulators for use with services provided mainly in Europe.

It contains RDS (Radio Data System) signals, TRI (Traffic Radio Information) signals, and RBDS (Radio Broadcast Data System) signals. RDS is a type of digital data transmission system for FM stereo broadcasts used in various European countries. TRI is used to provide traffic information in Europe. RBDS is used in the US. These signals can be multiplexed into composite stereo modulation signals during FM stereo modulation.

■ LG 3219



FEATURES

LG 3238/LG 3219

- **Wide-Band, High-Level Output**
These generators cover a wide frequency range from 100 kHz to 140 MHz and generate a high level of output at 126 dB μ V [emf].
- **High Stability**
The RF output signal is always phase-locked to the internal crystal oscillator to ensure high stability at $\pm 5 \times 10^{-6}$ (5 ppm).
- **Long Service Life**
A solid-state attenuator is used for varying the RF output signal level to extend the generator's service life.
- **ΔF and ΔdB Readout Functions**
The ΔF function displays the relative RF frequency from a given reference. The ΔdB function displays the relative output level from a given reference.
- **Preset Memories**
Up to 100 sets of frequency, output-level, modulation, and other settings can be stored as presets and recalled as necessary.
- **Output-Signal Setting Adjustment**
The rotary knob can be used to change a specific digit of an RF-frequency, output-level, or depth setting.
- **Remote Control**
The generators are standard equipped with GP-IB, RS232C, and external control interfaces.
- **Weather Band Output**
The generators can internally produce RF output from 162.0000 MHz to 163.0000 MHz (only FM monaural modulation).
- **Internal Stereo Modulator**
Equipped with an FM stereo modulator, a single LG 3238 or LG 3219 can generate stereo modulation signals for performing tests and measurements on FM multiplex receivers.
- **DDS for Internal Modulation**
As internal modulation signal sources, these generators have a DDS in addition to an RC oscillator. The DDS enables frequency settings ranging from 20 Hz to 20 kHz in 1 Hz steps. It can be used to test the frequency response of receivers.

Available Only on the LG 3219

- **RDS and TRI Signal Sources**
Equipped with an RDS or an RBDS signal source and a TRI (or ARI) signal source, a single LG 3219 can generate modulated signals for performing tests and measurements on FM multiplex receivers.

FUNCTIONS

LG 3238/LG 3219

- **Modulation Modes**
Modulation off, monaural, L=R, L, R, and L=R
- **Pilot Signal**
The pilot signal can be turned on and off independently, and the signal level ratio can be specified. (The pilot signal is always off when the modulation mode is monaural.)
- **Pre-emphasis**
The time constant can be set to 25 μ s, 50 μ s, or 75 μ s.
- **SCA Input**
The SCA input signal is approximately 0.56 V_{p-p}, which corresponds to a level ratio of 10 %.
- **Preset Function**
Up to 100 sets of RF-frequency, output-level, modulation-mode, stereo-mode, and other settings can be stored as presets.

Available Only on the LG 3219

- **RDS Signal**
The LG 3219 can generate RDS and RBDS signals.
- **RDS Data Editor**
The RDS Data Editor for creating original RDS data is included.
- **TRI (or ARI) Signal**
Equipped with a TRI (or ARI) signal generator, the LG 3219 can generate TRI and RDS signals together. (TRI signals are defined in CENELEC EN 50067 and are being broadcasted in various European countries.)

■ Rear Panel



LG 3238



LG 3219

SPECIFICATIONS

Specifications for Both the LG 3238 and LG 3219

Frequency

Range:	0.1 MHz to 140 MHz
Resolution:	100 Hz
Frequency Bands:	Band 1: 0.1000 MHz to 35.0000 MHz Band 2: 35.0001 MHz to 70.0000 MHz Band 3: 70.0001 MHz to 140.0000 MHz
Accuracy:	$\pm 5 \times 10^{-6}$
Internal Reference Oscillator	
Temperature Stability:	$\pm 5 \times 10^{-6}$

Output Level

Range:	-20 dB μ V [emf] to 126 dB μ V [emf]
Resolution:	0.1 dB
Accuracy:	± 1.5 dB (output level ≥ 0 dB μ V [emf]) ± 2.0 dB (output level < 0 dB μ V [emf])
Impedance:	50 Ω
VSWR:	≤ 1.3 (output level ≤ 101 dB μ V)
Attenuator Contact:	Solid-state

Spectral Purity

Spurious Output	
Harmonics (2nd, 3rd):	≤ -30 dBc
Non-Harmonics:	≤ -50 dBc (bands 2 and 3) ≤ -40 dBc (band 1: 0.1 MHz $\leq f_s \leq 35$ MHz) ≤ -30 dBc (band 1: $f_s \geq 35.0001$ MHz) (at 10 kHz or more away from the carrier f_s : spurious output frequency)
Residual Modulation	
FM Component:	≥ 76 dB (10.7 MHz ± 1 MHz, 76 MHz to 108 MHz) ≥ 73 dB (bands 1 to 3: 0.3 MHz to 140 MHz) (S/N at 1 kHz modulation frequency, 75 kHz deviation, 50 Hz to 15 kHz demodulation bandwidth, 50 μ s de- emphasis.)
AM Component:	≥ 55 dB (band 1: 0.4 MHz to 1.7 MHz) ≥ 50 dB (bands 1 to 3: 0.15 MHz to 140 MHz) (S/N at 1 kHz modulation frequency, 30 % depth. (Beat components are excluded.) 50 Hz to 15 kHz demodulation bandwidth.)

Modulation

RC Oscillator	
Frequency:	400 Hz, 1 kHz
Accuracy:	$\leq \pm 3$ %
External Modulation Input	
Impedance:	Approx. 10 k Ω
Voltage:	Approx. 1 V [peak]

Amplitude Modulation (AM)

Optimal Range:	Frequency ≥ 0.15 MHz
Depth:	0 % to 80 %
Displayed Depth:	0 % to 100 %
Resolution:	0.5 % (0 % to 100 %)
Accuracy:	$\pm(\text{Setting} \times 0.1 + 1)$ % (Band 1: 0.4 MHz to 1.7 MHz) $\pm(\text{Setting} \times 0.1 + 2)$ % (Bands 1 to 3: 0.15 MHz to 140 MHz) (Depth at 1 kHz modulation frequency. The maximum setting is 80 %.)
Distortion:	Band 1: 0.4 MHz to 1.7 MHz ≤ 0.5 % (0 % to 30 % AM) ≤ 1.5 % (30 % to 60 % AM) ≤ 3 % (60 % to 80 % AM) Bands 1 to 3: 0.15 MHz to 140 MHz ≤ 1.5 % (0 % to 30 % AM) ≤ 3 % (30 % to 60 % AM) ≤ 5 % (60 % to 80 % AM) (1 kHz modulation frequency by the RC oscillator, 50 Hz to 15 kHz demodulation bandwidth, beat components are excluded)
Incidental FM:	≤ 150 Hz (band 1: 0.4 MHz to 1.7 MHz) ≤ 300 Hz (bands 1 to 3: 0.15 MHz to 140 MHz) (at 1 kHz modulation frequency, 30 % depth)
Ext. Modulation Freq. Response:	± 1 dB (1 kHz reference) 20 Hz to 10 kHz (Maximum modulation frequency ≤ 2 % of carrier frequency for 30 % AM)

Frequency Modulation (FM)

Optimal Range:	Frequency ≥ 0.3 MHz
Frequency Deviation Range:	0.0 kHz to 100 kHz (Band 1's maximum FM deviation ≤ 25 % of the carrier frequency)
Resolution:	0.5 kHz

Accuracy:	$\pm(\text{Setting} \times 0.1 + 0.5)$ kHz (10.7 MHz ± 1 MHz, 76 MHz to 108 MHz) $\pm(\text{Setting} \times 0.1 + 1)$ kHz (Bands 1 to 3: 0.3 MHz to 140 MHz)
Distortion:	≤ 0.05 % (10.7 MHz ± 1 MHz, 76 MHz to 108 MHz) ≤ 0.1 % (bands 1 to 3: 0.3 MHz to 140 MHz) (1 kHz modulation frequency, 75 kHz deviation, 50 Hz to 15 kHz demodulation bandwidth, 50 μ s de-emphasis)
MPX Stereo Signal Separation:	≥ 55 dB (76 MHz to 108 MHz frequency, 1 kHz modulation frequency, 100 % depth, 67.5 kHz deviation)
Incidental AM:	≤ 0.5 % (10.7 MHz ± 1 MHz, 76 MHz to 108 MHz) (1 kHz modulation frequency, 75 kHz deviation)
External Modulation Frequency Response	
MONO Mode:	$\leq \pm 1$ dB (20 Hz to 100 kHz, 1 kHz reference)
Not MONO Mode:	$\leq \pm 1$ dB (20 Hz to 15 kHz, 1 kHz reference)
Pre-emphasis:	25 μ s, 50 μ s, 75 μ s, off (amplitude charac- teristics based on the off setting)

FM Stereo

Optimal Range:	Frequency ≥ 0.3 MHz
Main and Sub Channel Signals:	

Modulation Mode	Modulation Signal	Description
L = R	INT, EXT	Stereo modulation based on one signal
L		
R		
L = -R		
MONO		Monaural modulation

Depth

Range:	0 % to 127 %
Resolution:	1 %
Accuracy:	$\pm(\text{Setting} \times 0.1 + 1)$ % (10.7 MHz ± 1 MHz, 76 MHz to 108 MHz) $\pm(\text{Setting} \times 0.1 + 1.5)$ % (Bands 1 to 3: 0.3 MHz to 140 MHz)

Pilot Signal

Frequency:	19 kHz
Accuracy:	± 1 Hz
Level Ratio Range:	0.0 % to 15.0 %
Level Ratio Resolution:	0.1 %
Level Ratio Accuracy:	$\pm(\text{Setting} \times 0.1 + 1)$ % (10.7 MHz ± 1 MHz, 76 MHz to 108 MHz)

Stereo Separation:

Stereo Separation:	≥ 55 dB (400 Hz to 1 kHz modulation frequency) (at 10.7 MHz ± 1 MHz, 76 MHz to 108 MHz)
---------------------------	---

38 kHz

Subcarrier Leakage:	≤ -50 dB
Distortion:	≤ 0.05 % (10.7 MHz ± 1 MHz, 76 MHz to 108 MHz) (1 kHz modulation frequency, 100 % depth, 50 Hz to 15 kHz demodula- tion bandwidth, 50 μ s de-emphasis)
Pre-emphasis:	25 μ s, 50 μ s, 75 μ s, off (amplitude charac- teristics based on the off setting)

Simultaneous FM and AM

FM Mono, AM:	(1) FM mono (EXT) - AM (INT)
Simultaneous Modulation:	(2) FM mono (INT) - AM (EXT) (3) FM mono (EXT) - AM (EXT) (4) FM mono (INT) - AM (INT)
FM Stereo, AM:	(1) FM stereo (EXT) - AM (INT)
Simultaneous Modulation:	(2) FM stereo (INT) - AM (EXT) (3) FM stereo (EXT) - AM (EXT) (4) FM stereo (INT) - AM (INT)

Preset Function

Description:	Stores and recalls these settings: fre- quency, output level, modulation mode (AM/FM, external/internal, depth, on/off), external control output. (Maximum num- ber of presets: 100)
---------------------	--

DDS Signal

Oscillation System:	12-bit direct digital synthesizer
Frequency Range:	20 Hz to 20 kHz
Resolution:	1 Hz
Frequency Accuracy:	± 0.1 %
Flatness:	Same as the external modulation charac- teristics

Weather Band Output

Frequency Range:	162.0000 MHz to 163.0000 MHz
Resolution:	100 Hz
Frequency Accuracy:	$\pm 5 \times 10^{-6}$
Optimal Modulation Mode:	FM monaural

External Interface**SCA INPUT**

Input Level: 0.56 V [P-P] (0.2 V [rms]) (corresponds to a level ratio of 10 %)
Frequency Range: 20 kHz to 99 kHz, ± 1 dB (57 kHz reference)
Input Impedance: Approx. 10 k Ω
COMP OUTPUT: Modulation signal's monitor output connector
Output Voltage: Approx. 5 V [P-P] (into 600 Ω , 100 kHz FM mono)
Output Impedance: Approx. 600 Ω
PILOT OUTPUT: Output for modulation modes other than MONO
Output Voltage: Approx. 1 V [rms]
Output Impedance: Approx. 1 k Ω

GP-IB

Capability	Type	Description
Source handshaking	SH1	Full capability
Acceptor handshaking	AH1	Full capability
Talker	T7	Basic talker, untalk on MLA, talk-only
Listener	L3	Basic listener, unlisten on MTA, listen-only
Service request	SR0	No capability
Remote/Local	RL1	Full capability
Parallel polling	PP0	No capability
Device clear	DC1	Full capability
Device trigger	DT0	No capability
Controller	C0	No capability

RS232C

Baudrate: 38400 bps
Character Length: 8 bits
Parity: EVEN
Flow Control: Xon, Xoff
Stop Bits: 1 bit

External Control Interface

Description: (1) Remote sequential recall
 (2) Remote modify
 (3) Remote direct recall
 (4) Control output
 (5) Relay drive output Output voltage: Approx. 5 V
 Output current: Approx. 50 mA

Power Requirements

Voltage Range: 90 to 250 VAC
Frequency: 50/60 Hz
Power Consumption: ≤ 60 VA

Temperature and Humidity Range

Operating Temperature: 0 °C to 40 °C, 20 % to 90 % (RH)

Overvoltage Category

Overvoltage Category: CAT II

Dimensions and Weight

Dimensions: 426 (W) \times 99 (H) \times 300 (D) mm (excluding knobs and legs)
Weight: Approx. 9.0 kg

Accessories

Instruction manual (CD)..... 1
 Power cord..... 1

Specifications Only for the LG 3219**RDS Signal**

Level Range: 0.0 % to 10 % (75 kHz FM deviation is taken to be 100 %.)
Level Resolution: 0.1 %
Accuracy: \pm (Setting \times 0.1 + 0.5) %
Spurious Output: ≤ -50 dB (at 53 kHz, 10 % output)
 ≤ -40 dB (at 61 kHz, 10 % output)
Subcarrier:
Frequency Accuracy: 57 kHz \pm 6 Hz
Phase: 0 ° or 90 ° (with respect to the pilot signal)
Phase Accuracy: ± 10 °
Leakage: ≤ -50 dB

Internal Data

Mode: Subcarrier, null data, internal data
Patterns: 16 patterns max.
Pattern Length: 2048 groups max.

* The LG 3219 does not contain RDS pattern data.

TRI (or ARI) Signal**SK Signal**

Level Range: 0.0 % to 10 % (75 kHz FM deviation is taken to be 100 %.)
Level Resolution: 0.1 %
Accuracy: \pm (Setting \times 0.1 + 0.5) %
Frequency Accuracy: 57 kHz \pm 6 Hz
Phase: 0 ° (with respect to the pilot signal)
Phase Accuracy: ± 10 °

DK Signal

Frequency Accuracy: 125 Hz (57 kHz / 456) ± 1 %
AM Depth: 0 % to 40 %
AM Resolution: 1 %
AM Accuracy: ± 5 %
AM Distortion: ≤ 1 % (SK = 5.3 %, AM = 30 %)

BK Signal

Frequency Accuracy: Code A: 23.75 Hz (57 kHz / 2 400) ± 1 %
 Code B: 28.27 Hz (57 kHz / 2 016) ± 1 %
 Code C: 34.93 Hz (57 kHz / 1 632) ± 1 %
 Code D: 39.58 Hz (57 kHz / 1 440) ± 1 %
 Code E: 45.67 Hz (57 kHz / 1 248) ± 1 %
 Code F: 53.98 Hz (57 kHz / 1 056) ± 1 %

AM Depth: 0 % to 80 %
AM Resolution: 1 %
AM Accuracy: ± 5 %
AM Distortion: ≤ 2 % (SK = 5.3 %, AM = 60 %)

Accessory

RDS Data Editor (CD)..... 1
 (for Windows XP and 2000)

* The company and product names in this document are trademarks or registered trademarks of their respective holders.