This setting is not affected by an instrument preset `*rst` or the and Save/Recall function. Only the factory preset resets this setting.

Parameters:

<SuppressState>   0 | 1 | OFF | ON

                         *RST: 0

Example: `INP:MOD:WIGN ON`

                         suppresses the overvoltage warnings.

Manual operation: See "Ignore Overvoltage Warning" on page 207

[:SOURce]:INPut:TRIGger:SLOPe <Slope>

Sets the polarity of the active slope of an externally applied trigger signal at the trigger input (BNC connector at the rear of the instrument).

The setting is effective for both inputs at the same time.

Parameters:

<Slope>   NEGative | POSitive

                         *RST: POSitive

Example: `INP:TRIG:SLOP NEG`

                         Activates the falling slope of the external trigger signal at the trigger input.

Manual operation: See "Ext. Trigger Input Slope" on page 187

6.13.6 SOURce:LFOutput Subsystem

The `SOURce:LFOutput` subsystem contains the commands for setting the LF signal source in CW and Sweep mode and for analog modulation.

Example

The following example shows how to set an LF sweep.

1. Set the sweep range.
   ```
   LFOutput:FREQuency:STARt 4 kHz
   LFOutput:FREQuency:STOP 10 kHz
   ```

2. Select linear or logarithmic sweep spacing.
   ```
   LFOutput:SWEep[:FREQuency]:SPACing LIN
   ```

3. Set the step width and dwell time.
   ```
   LFOutput:SWEep[:FREQuency]:STEP[:LINear] 100 Hz
   LFOutput:SWEep[:FREQuency]:DWELl 20 ms
   ```

4. Determine the sweep mode.
   ```
   LFOutput:SWEep:MODE AUTO
   ```

5. Determine the trigger.

```
TRIGger0:SOURce SINGle
```

6. Activate the sweep.
```
LFOutput:FREQuency:MODE SWEep
```

7. Trigger the sweep (depending on the mode).
```
LFOutput:SWEep:EXECute
```

[:SOURce]:LFOutput<ch>:FREQuency <Frequency>

Sets the frequency of the LF signal in `LFO:FREQ:MODE CW|FIXed` mode.

Note:

- If signal source "Internal" is set, the instrument performs the analog modulations (AM/FM/ϕM/PM) with this freqeuncy.

- In sweep mode (`LFO:FREQ:MODE SWEep`), the frequency is coupled with the sweep frequency.

Parameters:

<Frequency>	float

	Range:	full frequency range
	Increment:	see the data sheet: Modulation sources > Resolution of frequency setting
	*RST:	1000

Example:	`LFO2:FREQ 5kHz` sets the frequency of the LF generator 2 signal to 5 kHz.

Manual operation:	See "LF Gen Freq" on page 206

[:SOURce<hw>]:LFOutput:FREQuency:MANual <Manual>

Determines the frequency and triggers the next sweep step manually in
`LFO:SWE[:FREQ]:MODE MAN`, and `LFO:SWE:[FREQ]:MODE STEP`.

Note: You can select any frequency within the setting range. The range is defined with
`LFO:FREQ:STARt` and `LFO:FREQ:STOP`.

Parameters:

<Manual>   float

	Range:	full frequency range
	Increment:	see the data sheet: Modulation sources > Internal modulation generator > Resolution of frequency setting
	*RST:	1000

Example: `LFO:SWE:MODE MAN`
sets the "Step" sweep mode.
`LFO:FREQ:MAN 5 kHz`
sets an LF frequency of 5 kHz for the next step in the "Step" sweep mode.
`LFO:FREQ:MODE SWE`
sets the LF Sweep mode. An LF frequency of 5 kHz is output.
`LFO:FREQ:MAN 5.1 kHz`
triggers the next sweep step with a frequency of 5.1 kHz.

Manual operation: See "Current Freq" on page 229

[:SOURce<hw>]:LFOutput:FREQuency:MODE <Mode>

Sets the instrument operating mode, and determines the commands to be used for frequency settings.

Parameters:

<Mode>   CW | FIXed | SWEep

CW|FIXed
Sets the CW frequency mode. `CW` and `FIXed` are synonyms.
The instrument operates at a fixed frequency. To set the LF output frequency, use the command `[:SOURce]:LFOutput<ch>:FREQuency`.

SWEep
Sets the sweep mode.
The instrument processes the frequency settings in defined sweep steps. To determine the corresponding frequency values, use the commands `[:SOURce<hw>]:LFOutput:FREQuency:STARt`, `[:SOURce<hw>]:LFOutput:FREQuency:STOP` or `[:SOURce<hw>]:LFOutput:FREQuency:MANual`.

*RST: CW

Example: `LFO:FREQ:MODE SWE`
sets the sweep mode.

Manual operation: See "State" on page 226

[:SOURce<hw>]:LFOutput:FREQuency:STARt <Start>

Sets the start frequency for the LF sweep.

Parameters:

<Start>   float

Range: full frequency range
Increment: see the data sheet: Resolution of frequency setting
*RST: 1 KHz

Example: RST*
activates all presettings.
LFO:SWE:MODE AUTO
TRIG0:SOUR SING
LFO:FREQ:STAR 1 kHz
LFO:FREQ:STOP 10 kHz
LFO:FREQ:MODE SWE
LFO:SWE:EXEC
the instrument generates a single sweep cycle from 1 kHz to 10 kHz automatically after a manual trigger event occurs (:LFOutput:SWEep:EXECute or *TRG). The step width is 1 kHz linear, with 15 ms dell time until the signal switches to the subsequent step.

Manual operation: See "Start Freq" on page 229

[:SOURce<hw>]:LFOutput:FREQuency:STOP <Stop>

Sets the stop frequency for the LF sweep.

Parameters:

<Stop>   float

Range: full frequency range
Increment: see the data sheet: resolution of frequency setting
*RST: 100 KHz

Example: LFO:FREQ:STOP 10 kHz
sets the stop frequency for the LF sweep to 10 kHz.

Manual operation: See "Stop Freq" on page 229

[:SOURce]:LFOutput[:STATe] <State>

Activates/deactivates the LF output.

Parameters:

<State>   0 | 1 | OFF | ON
*RST: 0

Example: LFO ON
                       activates the LF output. The settings under LFO:FREQ and
                       LFO:SWE become effective.

Manual operation: See "LF Output State" on page 224

[:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:DWELl <Dwell>

Sets the dwell time for each frequency step of the sweep.

Tip: It is recommended to switch off the "Display Update" for optimum sweep perfor-
mance especially with short dwell times (SYSTem:DISPlay:UPDate OFF).

Parameters:
<Dwell>   float

                       Range: see data sheet: Dwell time setting range
                       Increment: 100E-6
                       *RST: 15E-3

Example: LFO:SWE:DWEL 20 ms
                       sets a dwell time of 20 ms.

Manual operation: See "Dwell Time - LF Sweep" on page 230

[:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:EXECute

Immediately starts an LF frequency sweep in LFO:SWE:MODE SINGle.

Example: LFO:SWE:MODE SING
                       sets the single cycle mode of the LF sweep.
                       LFO:SWE:EXEC
                       starts one cycle of the LF sweep.

Usage: Event

Manual operation: See "Execute Single Sweep" on page 228

[:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:MODE <Mode>

Sets the cycle mode of the LF sweep.

The assignment of the GPIB commands to the sweep modes is given in the description
of the sweep dialogs.

Parameters:
<Mode>   AUTO | MANual | STEP

                       AUTO
                       Performs a complete sweep cycle from the start to the end value
                       when a trigger event occurs.
                       The dwell time deterrmines the time period for the signal to
                       switch to the next step.

MANual
Performs a single sweep step when a manual trigger event occurs.
The trigger system is not active. You can trigger each frequency step of the sweep individually with the command `[: SOURce<hw>]:LFOutput:FREQuency:MANual`. In manual mode, use the rotary knob for switching to the next step.
With each step, the frequency increases by the value specified with the command `[:SOURce<hw>]:LFOutput:SWEep[: FREQuency]:STEP[:LINear]` or `[:SOURce<hw>]: LFOutput:SWEep[:FREQuency]:STEP:LOGarithmic`, respectively. A frequency value, entered with `[:SOURce<hw>]: LFOutput:FREQuency:MANual` takes no effect.
With manual control, the frequency increases or decreases (depending on the direction of the rotary encoder) by the value specified under `SOUR:LFO:SWE:FREQ:STEP:LIN` (linear spacing) or `...:STEP:LOG` (logarithmic spacing).

STEP
Each trigger triggers one sweep step only. The frequency increases by the value entered with `[:SOURce<hw>]:LFOutput: SWEep[:FREQuency]:STEP[:LINear]` or `[:SOURce<hw>]: LFOutput:SWEep[:FREQuency]:STEP:LOGarithmic`.

*RST: AUTO

Example: `LFO:SWE:MODE AUTO`
selects Auto mode.

Manual operation: See "Mode" on page 226

[:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:POINts <Points>

Determines the number of steps for the LF frequency sweep within the sweep range.

This parameter always applies to the currently set sweep spacing and correlates with the step size as follows:

- for linear sweeps and $f_{STARt} < f_{STOP}$
  freq_points = (f_{SPAN} / step_lin) + 1
  with $f_{SPAN} = f_{STOP} - f_{STARt}$
  To determine the step size, use the command `SWE:STEP[:LIN]`.

- logarithmic sweeps and $f_{STARt} < f_{STOP}$
  freq_points = ((log f_{STOP} - log f_{STARt}) / log step_log) + 1
  To determine the logarithmic step size, use the command `SWE:STEP:LOG`.

If you change the number of sweep points, the step size changes accordingly. The sweep range remains the same.

Each sweep spacing mode has assigned the `POINts` setting separately. Thus, the command refers always to the particular set mode, see `[:SOURce<hw>]:LFOutput: SWEep[:FREQuency]:SPACing`.

Parameters:

<Points>   integer

                          Range: 2...max

Example: LFO:FREQ:STAR

                         sets the start frequency to 2 kHz.

                         LFO:FREQ:STOP

                         sets the stop frequency to 20 kHz

                         LFO:SWE:SPAC LIN

                         sets linear sweep spacing.

                         LFO:SWE:POIN 11

                         sets 11 sweep steps for linear sweep spacing. The sweep step
                         width (STEP) is automatically set to 2 kHz.

[:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:RETRace <State>

Activates that the signal changes to the start frequency value while it is waiting for the
next trigger event.

You can enable this feature, when you are working with sawtooth shapes in sweep
mode "Single" or "External Single".

Parameters:

<State>   0 | 1 | OFF | ON

                          *RST: 0

Example: TRIG0:SWE:SOUR SING

                         LFO:SWE:MODE SWE

                         LFO:SWE:SHAP SAWT

                         LFO:SWE:RETR ON

                         activates retrace function, that menas the frequency changes to
                         the value at start frequency while waiting for the next trigger
                         event.

Manual operation: See "Retrace - LF Frequency Sweep" on page 230

[:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:RUNNing?

Queries the current status of the LF frequency sweep mode.

Return values:

<State>   0 | 1 | OFF | ON

Example: LFO:SWE:RUNN?

                         Response "1": the frequency sweep is running.

Usage: Query only

[:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:SHAPe <Shape>

Sets the cycle mode for a sweep sequence (shape).

Parameters:

<Shape>   SAWTooth | TRIangle

                SAWTooth
A sweep runs from the start to the stop frequency. A subsequent sweep starts at the start frequency, that menas the shape of the sweep sequence resembles a sawtooth.

                TRIangle
A sweep runs from the start to the stop frequency and back, thatnt menas the shape of the sweep resembles a triangle. A subsequent sweep starts at the start frequency.

                *RST: SAWTooth

Example: SOUR:LFO:SWE:SHAP TRI
selects the sweep cycle with alternating ascending and descending sweep directions.

Manual operation: See "Shape" on page 229

[:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:SPACing <Spacing>

Selects the mode for the calculation of the frequency sweep intervals.The frequency increases or decreases by this value at each step.

Parameters:

<Spacing>   LINear | LOGarithmic

                LINear
With the linear sweep, the step width is a fixed frequency value which is added to the current frequency. The step width for linear sweep is entered in Hz (see [:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:STEP[:LINear] on page 361).

                LOGarithmic
With the logarithmic sweep, the step width is a constant fraction of the current frequency. This fraction is added to the current frequency. The logarithmic step width is entered in % (see [:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:STEP:LOGarithmic on page 362).

                *RST: LINear

Example: LFO:SWE:SPAC LIN
selects linear sweep spacing.

Manual operation: See "Spacing" on page 229

[:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:STEP[:LINear] <Linear>

Sets the step size for linear LF frequency sweep steps.

This parameter correlates with the number of steps `[:SOURce<hw>]:LFOutput: SWEep[:FREQuency]:POINts` within the sweep range as follows:

$f_{STARt} < f_{STOP}$

freq_points = ((f_{STARt} - f_{STOP}) / step_lin) + 1

If you change the step size, the number of steps changes accordingly. The sweep range remains the same.

Parameters:

<Linear>	float

	Range:	full frequency range
	Increment:	see the data sheet: Modulation sources > Resolution of frequency setting
	*RST:	1000

Example: `LFO:FREQ:STAR`
sets the start frequency to 2 kHz.
`LFO:FREQ:STOP`
sets the stop frequency to 20 kHz.
`LFO:SWE:SPAC LIN`
sets linear sweep spacing.
`LFO:SWE:STEP 2 kHz`
sets the sweep step width to 2 kHz. The number of sweep steps for linear sweep spacing (`POINts`) is automatically set to 11.

Manual operation: See "Step Lin/Log - LF Sweep" on page 230

[:SOURce<hw>]:LFOutput:SWEep[:FREQuency]:STEP:LOGarithmic
    <Logarithmic>

Sets the logarithmically determined sweep step size for the LF frequency sweep. It is expressed in percent and you must enter the *value* and the unit *PCT* with the command.

The frequency is increased by a logarithmically calculated fraction of the current frequency according to:

step_log$_{step+1}$ = f_{step} + step_log$_{step}$ x f_{step}

f_{step+1} = f_{step} + step_log$_{step+1}$

with $f_{STARt} < f_{STOP}$ and step = the current number of the sweep steps

This parameter correlates with the number of steps `LFO:SWE[:FREQ]:POIN` within the sweep range as follows:

freq_points = ((log f_{STOP} - log f_{STARt}) / log step_log) + 1

If you change the step size, the number of steps changes accordingly. The sweep range remains the same.

Parameters:

<Logarithmic>	float

Range: 0.01 to 100
Increment: 0.01
*RST: 1

Example: `LFO:FREQ:STAR`
sets the start frequency to 1 kHz.
`LFO:FREQ:STOP`
sets the stop frequency to 100 kHz.
`LFO:SWE:SPAC LOG`
sets logarithmic sweep spacing.
`LFO:SWE:STEP:LOG 10PCT`
sets the step width for logarithmic sweep spacing to 10% of the previous frequency in each instance.

Manual operation: See "Step Lin/Log - LF Sweep" on page 230

[:SOURce]:LFOutput:SHAPe <Shape>

Selects the shape of the LF signal.

Note: The installed hardware determines the available settings. Use the Hardware Config dialog to check the hardware the instrument is equipped with.

For information on the required hardware revision, refer to the release notes.

Parameters:

<Shape>	SINE | SQUare | TRIangle | SAWTooth | ISAWtooth
	*RST: SINE

Example: `LFO:SHAP SQU`
selects a rectangular shape for the signal of the LF generator.

Manual operation: See "LF Gen Shape" on page 206

[:SOURce]:LFOutput:SIMPedance <SImpedance>

Selects the output impedance of the LF generator. Selection "LOW" and "600 Ohm" are available.

Note: The installed hardware determines the available settings. Use the Hardware Config dialog to check the hardware the instrument is equipped with.

For information on the required hardware revision, refer to the release notes.

Parameters:

<SImpedance>	LOW | G600
	*RST: LOW

Example: `SOUR:LFO:SIMP G600`
'sets the output impedance of the LF generator to 600 Ohms

Manual operation: See "LF Source Impedance" on page 225