

# Controlling the Mk III RF Signal Generator over an USB CDC Data Link

## General

The Mk III RF signal generator is a USB 2.0 device of class CDC, and establishes a virtual COM port on the USB host computer. Commands can be sent and data can be received through this COM port.

Commands have the following general structure, where parts in angular brackets `<.>` are optional and depend on the individual command:

```
prefix <numerical argument> <unit> <?> CR/LF/;  
prefix:suffix <numerical argument> <unit> <?> CR/LF/;
```

A command consists of a prefix and a suffix part, separated by `‘:’`, or of a prefix only. Numerical arguments may contain a decimal point `‘.’`, and negative values are preceded by a `‘-’` sign. In most cases, a unit must follow a numerical argument (except when the argument is dimensionless). Command lines are terminated by `CR`, `LF` (or `CR LF`), or by `‘;’`. Several commands, separated by `‘;’`, can be sent on a single line.

Many commands can be followed by the query symbol `‘?’`, which causes the device to send a string in response.

Invalid commands are ignored. Numerical arguments outside permissible bounds generate an error.

Commands and units are not case sensitive, space characters, except in string arguments, are ignored.

## Commands

This section lists all commands and explains their usage. A square bracket `[a|b|c]` represents alternatives, and an angular bracket `<a>` represents an optional part.

### Prefix only commands

`idn?` returns identification string

`ver?` returns firmware version

`err?` returns binary error code, zero means “no error”; also clears the last “argument out of range” error

`sts?` prints current error messages in plain text

`rst` resets instrument state, re-loads calibration data and re-initializes all hardware (micro-processor is not reset and USB device remains enumerated)

`rfe [0|1|?]` switches RF output off or on, or queries status

**sv**:**n** saves current instrument setup in non-volatile memory number **n** (from 0 to 99; the signal generator will always start up from setup in memory 0, even when USB is not connected to a host)

**rc**:**n** recalls instrument setup in non-volatile memory number **n** (from 0 to 99)

### Prefix group **cw**

**cw:on** <?> switches to CW mode, or queries status

**cw:frq** *frequency* [Hz|kHz|MHz|GHz], **cw:frq?** sets generator to specified CW output frequency, or queries the set frequency

**cw:lvl** *level* [dBm|uV|mV|V], **cw:lvl?** sets the specified output level, or queries the set level

### Prefix group **swp**

**swp:on** <?> switches to sweep mode, or queries status

**swp:str** *frequency* [Hz|kHz|MHz|GHz], **swp:str?** sets the specified sweep start frequency, or queries sweep start frequency

**swp:stp** *frequency* [Hz|kHz|MHz|GHz], **swp:stp?** sets the specified sweep stop frequency, or queries sweep stop frequency

**swp:lvl** *level* [dBm|uV|mV|V], **swp:lvl?** sets the specified output level, or queries the set level

**swp:dwt** *dwel time* [s|ms|us], **swp:dwt?** sets the specified dwell time at each frequency point in sweep mode, or queries dwell time

**swp:npt** [**n**|?] sets the number of frequency points for a sweep to **n**, or queries the number of points

**swp:sgl** [1|0|?] sets sweep mode to single, or to continuous, or queries single/continuous sweep mode

### Prefix group **ref**

**ref:ext** [1|0|?] switches timebase to external reference input, or uses internal timebase, or queries external reference mode

**ref:frq** *frequency* [Hz|kHz|MHz|GHz], **ref:frq?** sets external reference frequency, or queries external reference frequency; must be a divisor of the PFD frequency of 100 MHz

### Prefix group **cal**

**cal:on** *password*, **cal:on?** switches to calibration mode, or queries if in calibration mode; the default password is 123456; calibration mode can be left with **rst** (calibration data in RAM will be lost unless it is saved to EEPROM)

**cal:lvl** *level correction value*, **cal:lvl?** sets the specified level correction value for the current frequency and the current attenuator stage, or queries that correction value; the frequency can be changed with **cw:frq** *frequency* [Hz|kHz|MHz|GHz] also when in calibration mode

**cal:mde** [0|1|2|?] sets calibration mode (mode 0: calibrate level, mode 1: set to high output level, mode 2: set to low output level; the latter two modes are used to calibrate the level detector slope), or queries calibration mode

`cal:att stage, cal:att?` engages the specified attenuator stage to calibrate it, or queries the engaged attenuator stage

`cal:scr slope correction value, cal:scr?` sets the specified level detector slope correction value, or queries that value

`cal:frq time base correction value, cal:frq?` sets the specified time base correction value, or queries that value

`cal:cst calibration string, cal:cst?` sets the specified calibration string, or queries current calibration string

`cal:sve` saves calibration data in RAM to EEPROM

`cal:dmp` dumps all calibration values to virtual COM port, including calibration string

`cal:ers` erases EEPROM (calibration data and instrument setups)

## Examples

Set CW output frequency to 1.2345 GHz:

```
cw:frq 1.2345 ghz CR LF
```

Set output level to  $-12.5$  dBm:

```
cw:lvl -12.5 dbm CR LF
```

Set sweep start frequency to 100 MHz and stop frequency to 2.2 GHz, set a sweep with 401 frequency points and 100 ms dwell time at each point, and engage sweep mode:

```
swp:str 100 mhz; swp:stp 2.2 ghz; swp:npt 401; swp:dwt 100 ms;  
swp:on CR LF
```

## List of errors

The instrument firmware checks for and reports the following errors:

1. ALC unlevelled
2. Reference PLL unlock
3. Main PLL unlock
4. Numerical argument out of range
5. Calibration protected
6. EEPROM error
7. EEPROM calibration data checksum error, default loaded