Controlling the
GNSS Time and Frequency Receiver
over an USB CDC Data Link

Version 1.2

General

The GNSS Time and Frequency Receiver 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 though 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> <?> CR/LF/;
prefix:suffix <numerical argument> <?> 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. 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 are ignored.

Commands

This section lists all commands and explains their usage. A square bracket `[a|b|c]` represents alternatives.

Prefix only commands

`idn?` prints identification string

`ver?` prints firmware version

`err?` prints 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 (microprocessor is not reset and USB device remains enumerated)

`cls` clears all errors (except errors still pending)

`sve` saves current setup data in non-volatile memory; setup data will be recalled automatically when unit is switched on or reset (when no valid setup data is found in nonvolatile memory, an *EEPROM read or write error* is issued)

`ers` erases nonvolatile memory

Prefix group `sys`

`sys:sts?` prints a formatted overview of instrument status as well as GNSS time and navigation information

`sys:sat?` prints a list of space vehicles currently being tracked

`sys:fpl?` prints current parameter values and status of the FPLL and OCXO

`sys:utc?` prints UTC at next PPS time pulse in `hh:mm:ss.ms` format

`sys:dat?` prints date in `yyyy.mm.dd` format

`sys:run?` queries OCXO disciplining on or off status

`sys:out?` queries outputs (10 MHz and PPS) on or off status

`sys:fix?` queries if a valid (within accuracy limits) GNSS fix is available

`sys:hld?` queries if GNSSDO is in holdover mode

`sys:def?` queries if GNSSDO is in default frequency mode

`sys:mdu?` prints GNSS minimum survey-in duration in seconds

`sys:alm?` prints GNSS survey-in accuracy limit in mm

`sys:tmd?` queries if GNSS receiver is in timing mode

`sys:dly?` prints GNSS receiver cable delay in ns

`sys:dop?` prints GNSS receiver T-DOP value

Prefix group `set`

`set:run [1|0|?]` runs or stops OCXO disciplining, or queries status

`set:out [1|0|?]` switches outputs (10 MHz and PPS) on or off, or queries status

`set:hld [1|0|?]` switches forced holdover mode on or off, or queries status

`set:def [1|0|?]` switches forced default frequency mode on or off, or queries status

`set:mdu` *duration*, `set:mdu?` sets GNSS minimum survey-in duration in seconds, or prints minimum survey-in duration

`set:alm` *limit*, `set:alm?` sets GNSS survey-in accuracy limit in mm, or prints accuracy limit

`set:tmd [1|0|?]` switches GNSS receiver timing mode on or off, or queries status

`set:dly` *delay*, `set:dly?` sets GNSS receiver cable delay in ns, or prints cable delay

Prefix group `osc`

`osc:dac?` prints current DAC value as integer

`osc:mid` *value*, `osc:mid?` sets OCXO center of tuning range voltage in volts, or prints center of tuning range voltage

`osc:def [1,?]` sets current DAC value as default frequency DAC value, or prints default frequency DAC value

`osc:phe?` prints current PPS phase error in rad (if available)

`osc:fre?` prints current OCXO frequency error in Hz (if available)

`osc:tco` *time constant*, `osc:tco?` sets maximum FPLL time constant (in seconds), or prints maximum FPLL time constant

`osc:dmp` *damping factor*, `osc:dmp?` sets FPLL damping factor, or prints current FPLL damping factor

`osc:ega` *EFC tuning gain*, `osc:ega?` sets OCXO EFC tuning gain in Hz/V, or prints OCXO EFC tuning gain

`osc:cur?` prints current OCXO current consumption in A

`osc:thr` *threshold*, `osc:thr?` sets OCXO current threshold in A above which an *OCXO cold* error is issued (hysteresis is fixed to 25 mA), or prints OCXO current threshold

`osc:tst?` prints timestamp (elapsed milliseconds) at which last phase and frequency error were measured

Examples

Print overview of instrument status and GNSS time and navigation information:

```
sys:sts? CR LF
```

Set OCXO EFC gain to 1.25 Hz/V:

```
osc:ega 1.25 CR LF
```

Save current configuration to non-volatile memory:

```
sve CR LF
```

List of errors

The instrument firmware checks for and reports the following errors:

1. Command argument out of range

2. OCXO error

3. OCXO cold

4. OCXO supply current

5. OCXO time pulse missing

6. GNSS receiver configuration failed

7. GNSS no fix

8. GNSS fix not within accuracy limits

9. GNSS navigation or timing data missing or obsolete

10. GNSS time pulse missing

11. Time-to-digital converter error

12. Digital-to-analog converter error

13. FPGA configuration error

14. EEPROM read or write error