

Communication protocol design

Design inspired from a CNC software called GRBL which also runs on Arduino.

1. Initialization Command:

- Command: **\$I**
- Description: Initializes the spectrometer.
- Response: **ok** or error code

2. Calibration Command:

- Command: **\$C=<type>**
- Description: Initiates calibration.
- Parameters: **<type>** specifies the calibration type (**W** for wavelength, **I** for intensity).
- eg. **\$C=W**
- Response: **ok** or error code

3. Calibration Data Command:

- Command: **\$D data typed here**
- Description: Sends calibration data.
- Parameters: data contains calibration coefficients or reference data.
- eg. **\$D E10 T10** (configuration data written here, the example here just uses random commands)
- Response: **ok** or error code

4. Measurement Command:

- Command: **\$M**
- Description: Initiates a measurement.
- Response: Measurement data or error code

5. Configuration Command:

- Command: **\$CFG parameters**
- Description: Sets configuration parameters.

- Parameters: **<parameters>** specify configuration settings (**T=100** for integration time of 100 ms, **R=400-700** for wavelength range, **G** for grating selection, **S** for spectral range, **A** for number of accumulations

eg. “**\$CFG T100 G1 S(400,700) T(400,700)**”

- Response: **ok** or error code

6. Status Inquiry Command:

- Command: **? or \$\$**
- Description: Requests the current status.
- Response: Status information or error code

7. Help command:

- Command: **HELP**
- Description: Requests all the lists of commands
- Response: Gives a list of all the commands

This is an example of GRBL commands for reference

```

$22 = 0 (Homing cycle enable, boolean)
$23 = 0 (Homing direction invert, mask)
$24 = 25.000 (Homing locate feed rate, mm/min)
$25 = 500.000 (Homing search seek rate, mm/min)
$26 = 250 (Homing switch debounce delay, milliseconds)
$27 = 1.000 (Homing switch pull-off distance, millimeters)
$30 = 1000 (Maximum spindle speed, RPM)
$31 = 0 (Minimum spindle speed, RPM)
$32 = 0 (Laser-mode enable, boolean)
$100 = 80.000 (X-axis travel resolution, step/mm)
$101 = 80.000 (Y-axis travel resolution, step/mm)
$102 = 80.000 (Z-axis travel resolution, step/mm)
$110 = 6000.000 (X-axis maximum rate, mm/min)
$111 = 6000.000 (Y-axis maximum rate, mm/min)
$112 = 6000.000 (Z-axis maximum rate, mm/min)
$120 = 20.000 (X-axis acceleration, mm/sec^2)
$121 = 20.000 (Y-axis acceleration, mm/sec^2)
$122 = 20.000 (Z-axis acceleration, mm/sec^2)
$130 = 210.000 (X-axis maximum travel, millimeters)
$131 = 297.000 (Y-axis maximum travel, millimeters)
$132 = 5.000 (Z-axis maximum travel, millimeters)
ok
>>> $G
[GC:G0 G54 G17 G21 G90 G94 M5 M9 T0 F0 S0]
ok

```

