Science Board Serial Communications

The science board will communicate with the main computer over USB , using the serial communication protocol outlined here. Here are the frame types that are applicable to this board, and their arguments:

Frame Type	ID(Char)	Args*
Motor Speed	'1'	"Float(%.3f)"
Bool States	'2'	"byte"
Stepper Step	'3'	"int, float(%.4f)"
Stepper Agitate	'4'	"int"
CCD Poll	'5'	"3691 (pixel count) int16s"

General Conventions

- Boolean states are sent periodically (1 ms) to the main computer. (If the rover will be fully automated in the future, there will be feedback sensors in place and their results will need to be sent as well)
- CCD sensor readouts and Boolean states are memcpy'd onto a string argument. On the PC end, they should be memcpy'd back into their respective argument types. This is done to conserve memory on the Arduino.
- In code, the upper and lower carousel steppers are referred to as "Stepper 1" and "Stepper 2" respectively.

Motor Speed

- Polling Behavior: Currently none. If the rover will be fully automated, current speed will be sent.
- Command Behavior: Soil collection motor is set to the indicated speed.

Boolean States

The binary states of the science board are encoded as a single byte, whose bits are assigned from MSB to LSB as follows:

0: LED On/Off State

1: Laser On/Off State

2: Solenoid On/Off State

3: Peltier Cooler On/Off State

4: Shutdown Command

5: Upper Carousel Fault Condition

6: Lower Carousel Fault Condition

7: Unused

- Polling Behavior: The byte encoding current Boolean states are sent.
- Fault Behavior: If there is a fault in any stepper, an interrupt is triggered and the values 0b2 or 0b4 are sent with this frame ID for lower and upper carousels respectively.
- Command Behavior: Bit 7 is unused, bits 6 and 5 are reserved for fault conditions. These are ignored during command parsing, and the devices are toggled using the rest of the bits.

Stepper Step

The int value before the comma must be either 0 or 1, referring to either the upper or lower carousel (Stepper 1 and Stepper 2 in code). Commands with other values are ignored. The rest of the argument determines the stepping angle.

- Polling Behavior: Currently none. Potentially, the current angle of the stepper could be sent.
- Command Behavior: The selected stepper will increment its angle by the number given in the second part of the argument. Negative values are also allowed, resulting in the stepper decrementing the angle.

Stepper Agitate

The int value is subject to the same requirements as above.

- Polling Behavior: None
- Command Behavior: Selected carousel will agitate.

CCD Sensor Poll

- Polling Behavior: A CCD sensor readout is performed, and the resulting pixel buffer is sent.
- Command Behavior: None