**3DSim – Virtual 3D Printer**

Command Communications Protocol

**Problem statement**

Communication between the host and the firmware can be noisy and often results in lost or misread data. To handle this problem we will use an error-checking communications protocol to send and receive data between the host and firmware. This protocol is described below.

**Packet structure**

Byte 0: Command byte

Byte 1: Length of parameter data (# of bytes)

Byte 2: Low-byte of 16-bit checksum

Byte 3: High-byte of 16-bit checksum

Byte 4-n: Parameter data

**Calculating Checksum**

Add up all the bytes in the entire command packet including command byte, length, etc. When adding bytes, the checksum fields are initialized to zero. After the checksum for the command is calculated, the checksum bytes (2 & 3) are set with the calculated checksum.

**Host-to-Firmware Communication Procedure**

Send 4-byte header consisting of command byte, length, and 16-bit checksum

Read header bytes back from firmware to verify correct receipt of command header

If header is correct

Send ACK (0xA5) to firmware

Send rest of packet **not** including the 4-byte header

Wait for first byte of response to be received

Continue reading rest of response until null byte (0) is received

Verify that response string equals “SUCCESS” or “VERSION n.n” (If not, re-send entire command)

else if header is not received correctly

Send NAK (0xFF)

Retry command

**Firmware-to-Host Communication Procedure**

Read 4-byte header from host

Write 4-byte header back to host

Read ACK/NAK byte

If ACK received

Attempt to read number of parameter bytes indicated in command header

If insufficient bytes are received

return “TIMEOUT”

Else

Validate checksum (Be sure NOT to include checksum values themselves)

If checksum correct

Process command

Return “SUCCESS” or “VERSION n.n”

Else

Return “CHECKSUM”

Else if NAK received

Ignore command – it will be resent