Sequence

We define sequence command structure to represent sequence commands such as point spectra, deposition, etc. It’s made up of a integer *seqnum*, a char array *command\_list* and a integer array *data\_list. Seqnum* represents the number of commands contained; *command\_list* contains command types and options; *data\_list* contains the data to be transferred. For different types of commands, *command\_list* and *data\_list* has different structures. The specific syntax rules are as follows.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Command (CMD)** | | **Option1 (OPT1)** | **Command equation** | **Option2 (OPT2)** | **Data** | **Unit** | **Note** |
| 0x00 | Wait | NA | CMD | NA | Delay (32 bits) | us |  |
| 0x20 | Match current | NA | CMD | Fast / Slow (32th bit) | Current data (16 bits) | volts/bits/nA |  |
| 0x40 | Digital output | Ch 0-5 | CMD + OPT1 | NA | ON/ OFF (1 bit) | bool |  |
| 0x60 | Shift analog output | Ch 0-16 | CMD + OPT1 | Up / Down (32th bit) | Shift data (20 bits) | volts/bits/nA |  |
| 0x80 | Analog output | Ch 0-16 | CMD + OPT1 | NA | Out data (20 bits) | volts/bits/nA |  |
| 0xa0 | Ramp analog output | Ch 0-16 | CMD + OPT1 | Step size (12 bits) | Target data (20 bits) | volts/bits/nA | Always 100us delay |
| 0xc0 | Read | Ch 0-7 | CMD + (OPT1\*4) | NA | Average number (16 bits) | times |  |
| 0xe0 | Shift ramp analog output | Ch 0-16 | CMD + OPT1 | Up / Down (32th bit), Step size (11bits) | Target data  (20 bits) | volts/bits/nA | Always 100us delay |

Fig1. MSB2LSB

Functions *setup\_pointSeq* and *setup\_depSeq* in “Sequence.c” are designed to unpack the serial command sent from PC into sequence structure. In *setup\_depSeq, depSeqB* stands for deposition sequence backward and *depSeqF* for deposition sequence forward. *setup\_depSeq* sets up backward sequence automatically from froward sequence. Function *pointSeq* executes a series of operation for a single data point.

Deposition

Function in “deposition.c” does deposition. It wraps *setup\_depSeq* and *pointSeq* in “Sequence.c”. It fist calls *setup\_depSeq* to set up deposition sequence and calls *pointSeq* to do forward deposition sequence, then calls functions in “Oscilloscope.c” to read, finally calls *pointSeq* again to do backward deposition sequence. There are 3 read modes: *OSC\_C*, *OSC\_N* and *OSC\_U*. User can refer to Oscilloscope chapter. If *OSC\_N* or *OSC\_U* mode is used, it tells PC how many data to be expected and sends out the data after deposition process is finished.