

About the Buffers

Like most communication devices, the SCL drives use buffers to smooth the flow of data through the drive. If you are using a fast computer to communicate with the drive, it is helpful to understand the data flow within the drive.

The Receive Buffer

When commands are sent to an SCL drive, they arrive in a piece of hardware called a UART. Every 78 microseconds, our drives run a piece of code called an interrupt service routine (ISR). The ISR handles time critical functions and looks for characters that have arrived at the UART. It moves these characters to a 32 character receive buffer.

A less time critical piece of code scans the receive buffer for new commands. If it finds an immediate command, it executes it right away. Immediate commands run very fast – in less than 1 millisecond. If the command is a buffered command, it is moved into the 128 byte command buffer.

The Command Buffer

Buffer commands are things like moves and parameter changes. These execute in order, one at a time. You can check the number of characters available in the command buffer by using the BS command.

The Transmit Buffer

Some commands, like IS, ask the drive to send information back to the PC. If the command waited for all this data to leave the drive (at 1 millisecond per character) it wouldn't be very immediate. So responses from commands like IS and SS are stored temporarily in a 32 character transmit buffer. The ISR makes sure these characters make it out of the drive.

Overflow

If you are not careful about sending characters to the drive, you can overflow these buffers. And if you do, strange things may happen.

It is useful to note the rate at which characters can enter and leave the drive: 9600 bits per second. To transmit a serial character using UARTS, 10 bits are sent. So characters enter and leave the drive at a rate never greater than 960 characters/second. That's roughly one every millisecond.

Receive Buffer Overflow

There are some instances where the receive buffer is not attended to promptly. If you stream characters into the drive at that time, the buffer can overflow. It is a circular FIFO buffer (they all are), so if it overflows, commands may be lost. They may also be misunderstood and the drive will send the host a question mark. In some cases, a command previously sent will be executed. None of this is good. And you cannot check the status of the receive buffer. Scared yet? Don't be – just be sure to observe these precautions:

After each of the following commands, you should not send any other commands to the drive for 50 milliseconds: FS, FD, FC, FY, SH, SK, ST, CJ.

During the WT command, you must use a 20 millisecond delay between commands.

Command Buffer Overflow

Since buffered commands such as moves can take a long time to execute, other buffered commands must wait. It is easy to overflow the command buffer if you don't pay attention. The easiest thing to do is to ask the drive how much space is available for buffered commands before you send one. You do this with the BS command. If the BS command indicates that less than 20 characters are available, you should not send more buffered commands to the drive.

Transmit Buffer Overflow

Some commands return more characters than you send. IS, for example, takes 3 milliseconds to send: one ms for the "I", one for the "S" and one for the carriage return that completes the command. When processed by the drive, IS will put 12 characters into the transmit buffer: for example "IS=10101010<cr>". Those characters need 12 ms to leave the drive, so if you send a continuous stream of IS commands, the transmit buffer will quickly overflow. You may see the same data come out of the drive twice, or you may get garbage. It is wise to put some delay after each status command (IS, BS, RV, IE, IP, etc.) or to wait for the response before asking for anything else.