## MLSL Synthesizer Programming Information

Commands are sent to the MLSL synthesizer via a three-wire bus consisting of a Select line, a Data line, and a Clock line. The Select line is active LOW, so the programming sequence is initiated by Select going LOW. The data is then clocked in on the rising edge of the Clock signal. The Data should be stable prior to the Clock line going HIGH. The timing parameter values are listed in the table below and should be strictly adhered too. A programming sequence is terminated by the Select line going HIGH. Commands are sent MSB first and MSByte first. Commands must be separated by enough time for the unit to process the command. (Some of the internal floating-point calculations can take a fairly long time to complete, so this time is longer when using the floating-point frequency command. See below.)
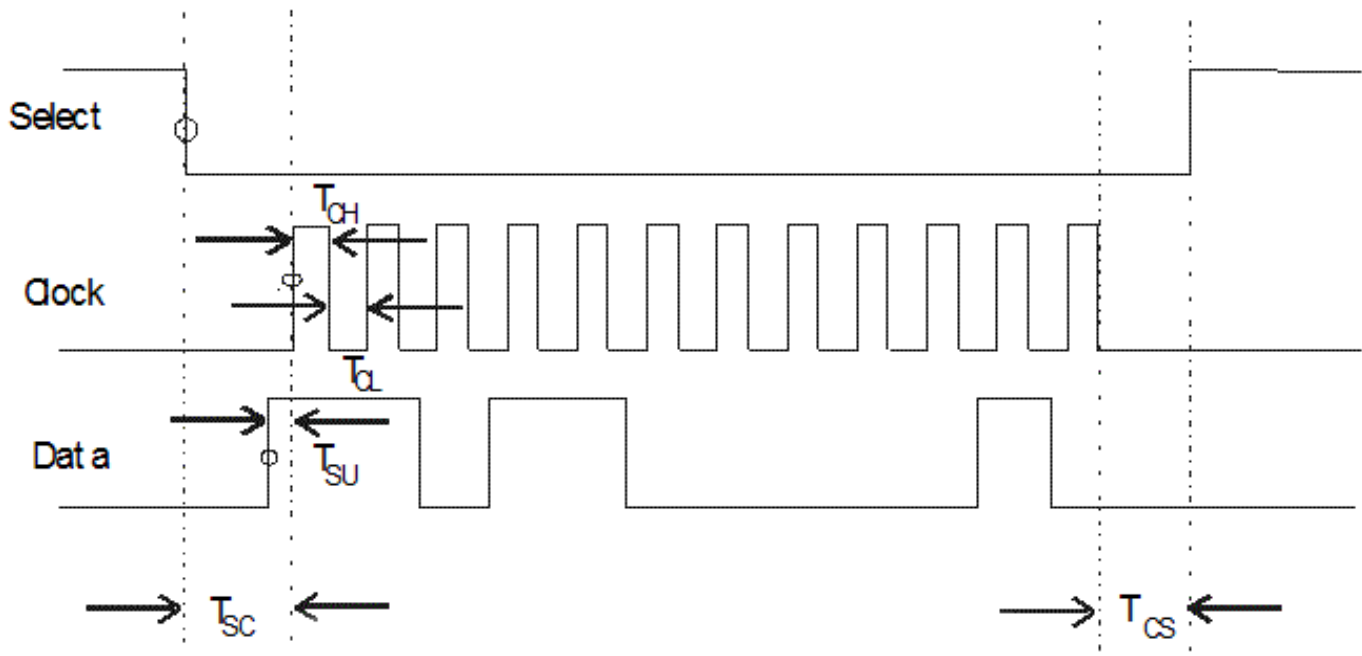
Data is clocked in on the rising edge of clock; times shown below pertain to Ver. 7.0 and above firmware.

Parameter	Limit	Comments
T_{SC} and T_{CS}	> 25 usec	SELECT active before CLOCK and after DATA done.
T_{SU}	> 25 usec	Data stable before CLOCK
T_{CH}	> 25 usec	CLOCK high time
T_{CL}	> 25 usec	CLOCK low time
T_{CS} to next T_{SC}	> 150 msec	Time between commands

The microcontroller in the MLSL maintains an internal memory of the last frequency for which it was programmed and will return to that state upon power-up.

The simplest and fastest tuning command for the MLSL synthesizer is the 'C' (for 'Channel') command. To use this command the user sends a data string that begins with the 8 bit ASCII code for 'C' (0x43 or binary 0100 0011) followed by a binary number equal to the desired output frequency divided by the channel spacing ('step size' per customer's specification). This binary number can be up to 24 bits in

length depending on the desired step size and the actual output frequency. The binary string only needs to be as long as necessary to accommodate the binary number although it can be padded with zeros for up to the full 24 bits.

Frequency may also be set by entering the frequency directly. To use this command, assert the select line and send an 'F' (for Frequency) followed by the desired frequency in MHz. Each character must be an 8-bit ASCII sequence and the decimal point is required.
Example:

F8008.123 ➜ unit programmed to the nearest frequency realizable (typically within 150 KHz)
Or 01000110 00111000 00110000 00110000 00111000 00101110 00110001 00110010 00110011

The other parameter that is programmable is the LOCK Polarity. To set the LOCK line to be HIGH for the LOCKed condition, assert the select line and send 'L1' (one). Again, the rising edge of the select line terminates the string. To set the LOCK line to be LOW for the LOCKed condition, assert the select line and send 'L0' (zero). The default value is 'L1'. (All in ASCII)

The unit will not receive commands while it is processing the previous command. The typical times to allow before sending the next command is variable and listed below:

Command	Typical Time to Process	Comment
L – Lock polarity	20 msec	
C – Channel command	100 msec + 10 msec/GHz	Frequency step dependent
F – Frequency commad	120 msec + 10 msec/GHz	Frequency step dependent