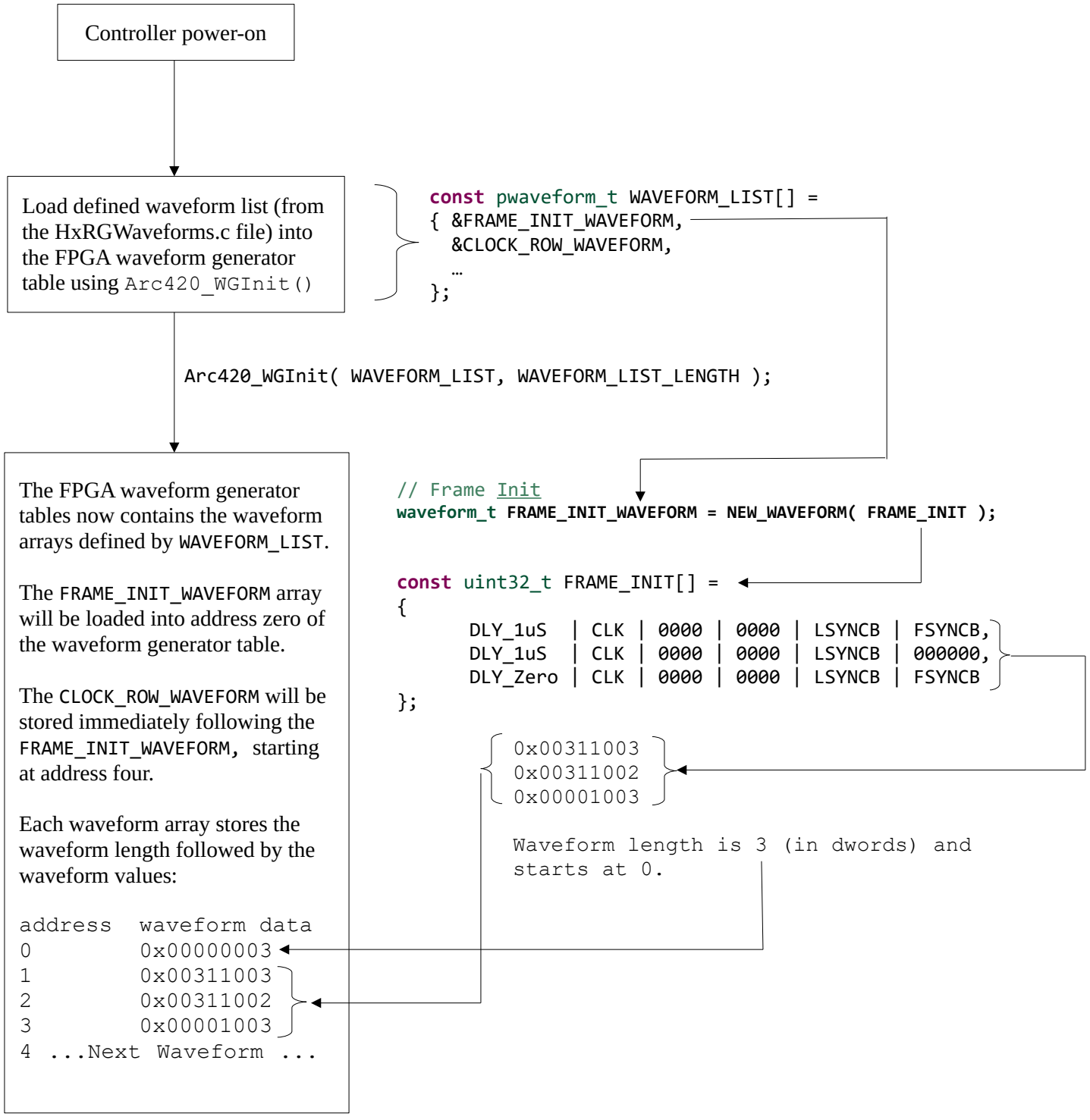
Waveform Generator

Application Note 03 Monday, July 19, 2021

The ARC-420 timing board FPGA contains a waveform generator that controls 16 signal lines on the controller's backplane that are received and interpreted by the ARC-430 clock driver and ARC-440 video boards to control their timing. These 16 signal lines, named SS15 to SS0 for signal state, are controlled by a waveform table and associated circuitry resident in the FPGA that is in turn controlled by commands sent from the micro-controller. Each micro-controller command instructs the FPGA to write a sequence of 16-bit data words from the waveform table to pins that are routed to the backplane pins SS15-SS0. This sequence is generated from one of a large number of waveform arrays in the waveform table, each array containing 32-bit words that are read in order by the waveform generator. The first entry in each waveform array is the length of the waveform array and is followed by the waveform array values. Each value consists of a 16-bit delay number and a 16-bit data value that controls SS15-SS0. After the 16-bit data field is written to SS15-SS0, the waveform generator waits by the delay number times 20 ns before processing the next value. Once the waveform generator reaches the end of the waveform array it decrements a loop counter and loops back to the beginning of the array if it is non-zero.

The construction of the FPGA waveform generator table is from an ordered list of waveform definitions, which are defined in the micro-controller source code, and written to the FPGA memory during controller initialization. The order in which waveform definitions are written into the waveform table is determined by the micro-controller code waveform list definition. The stored order of a waveform has no bearing on its execution. The micro-controller source code on the following pages shows the waveform array named FRAME_INIT being loaded into the FPGA waveform generator table and then executed using the Arc420_WGWriteCommand.



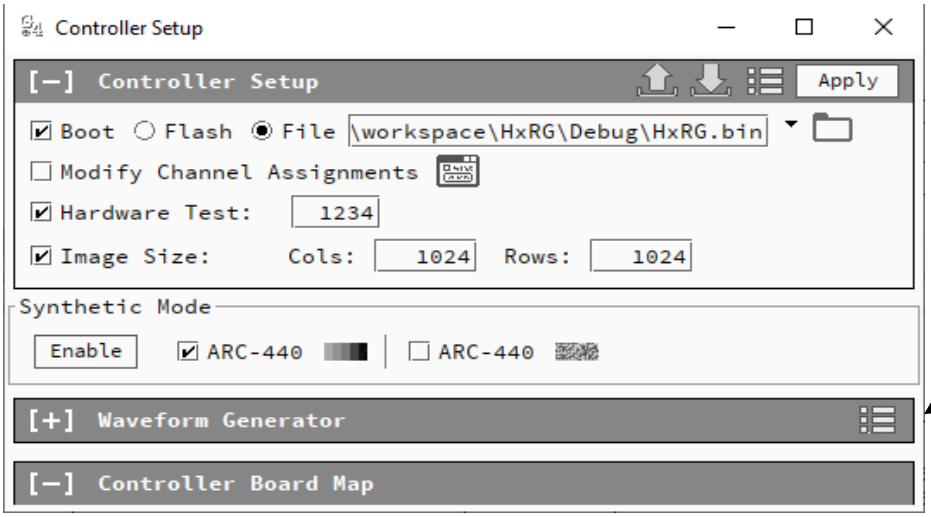
The following micro-controller call will cause the FPGA to execute the FRAME_INIT_WAVEFORM one time:

```
Arc420_WGWriteCommand( FRAME_INIT_WAVEFORM.addr, 1 );
```

waveform start address which is 0 for **FRAME_INIT_WAVEFORM**

loop count

To view the waveform table in G4, click the button on the waveform generator section in the setup window:



Then click the Run button on the window that appears: