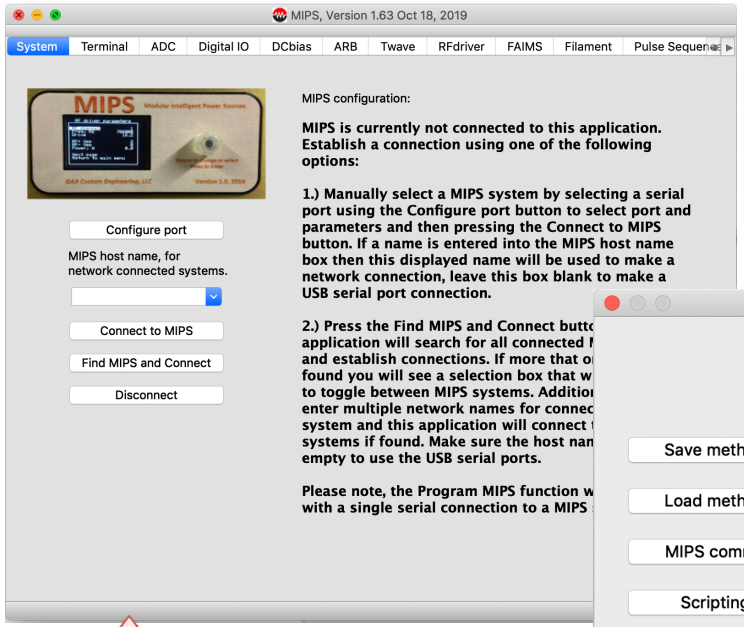
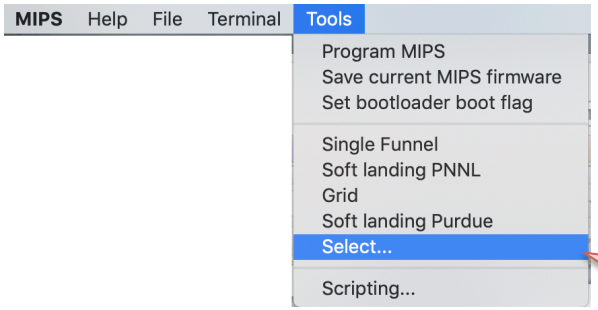
MIPS Control Panel
Timing Generator

Overview
December 3, 2018
Revised May 19, 2019
Revised October 20, 2019
Revised March 30, 2020

Loading MIPS Control Panels

MIPS main startup dialog



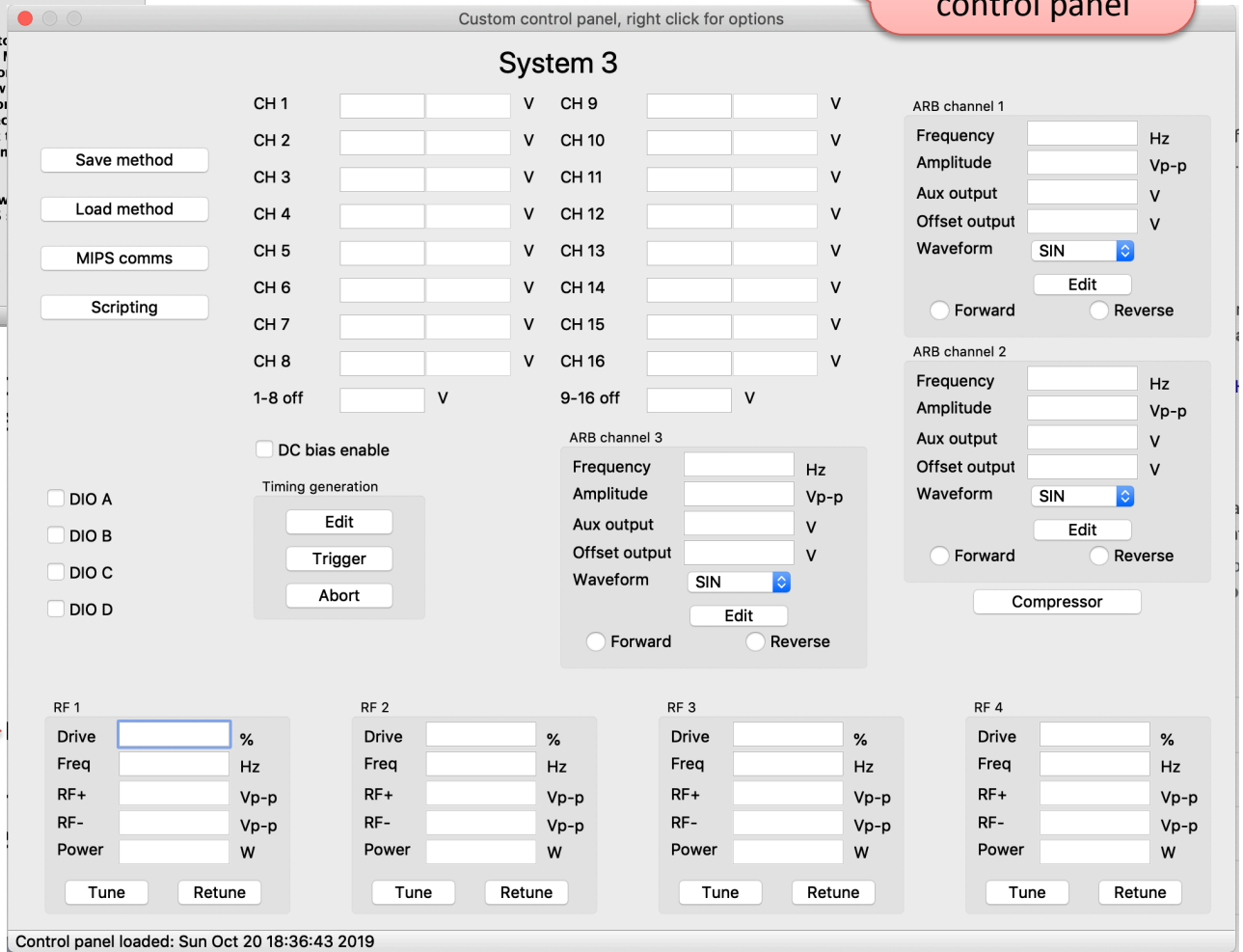


MIPS menu

Select this option to select a .cfg file that will load a control panel

MIPS host application, supports PC, MAC and Linux

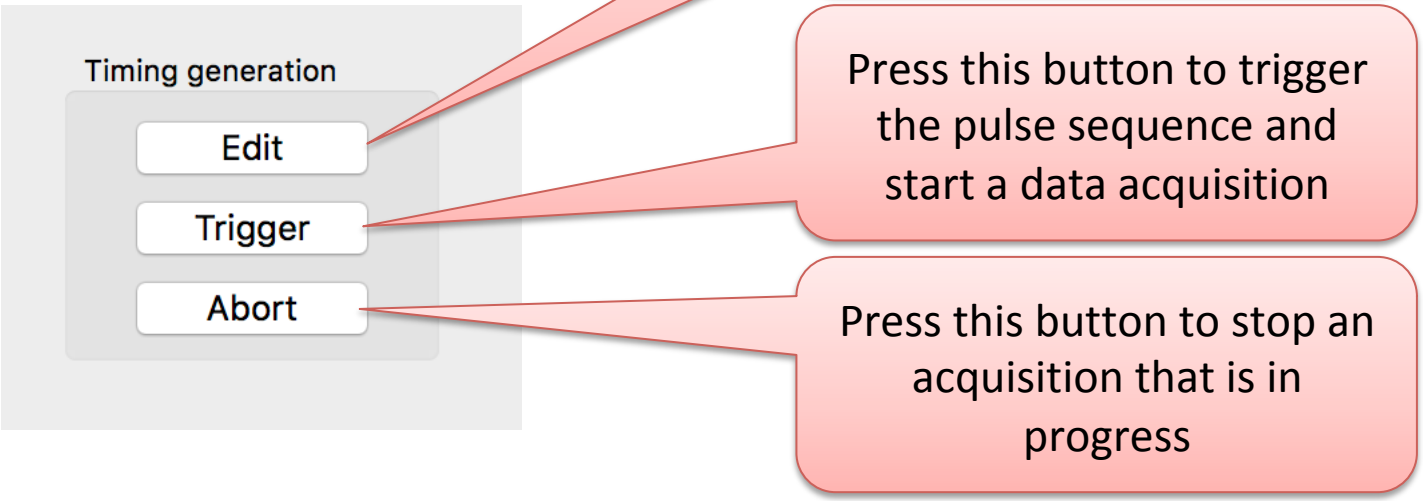
Example control panel, these are easy to customize based on your system. When the control panel loads the MIPS main dialog will minimize.



Control panel Interface

Adding the following command to the control panel configuration file will enable the timing generation function discussed in this document:
TIMING,Timing generation,MIPSname,X, Y
MIPSname is the name of the MIPS system where this timing control will be applied. X and Y define the location of the control.

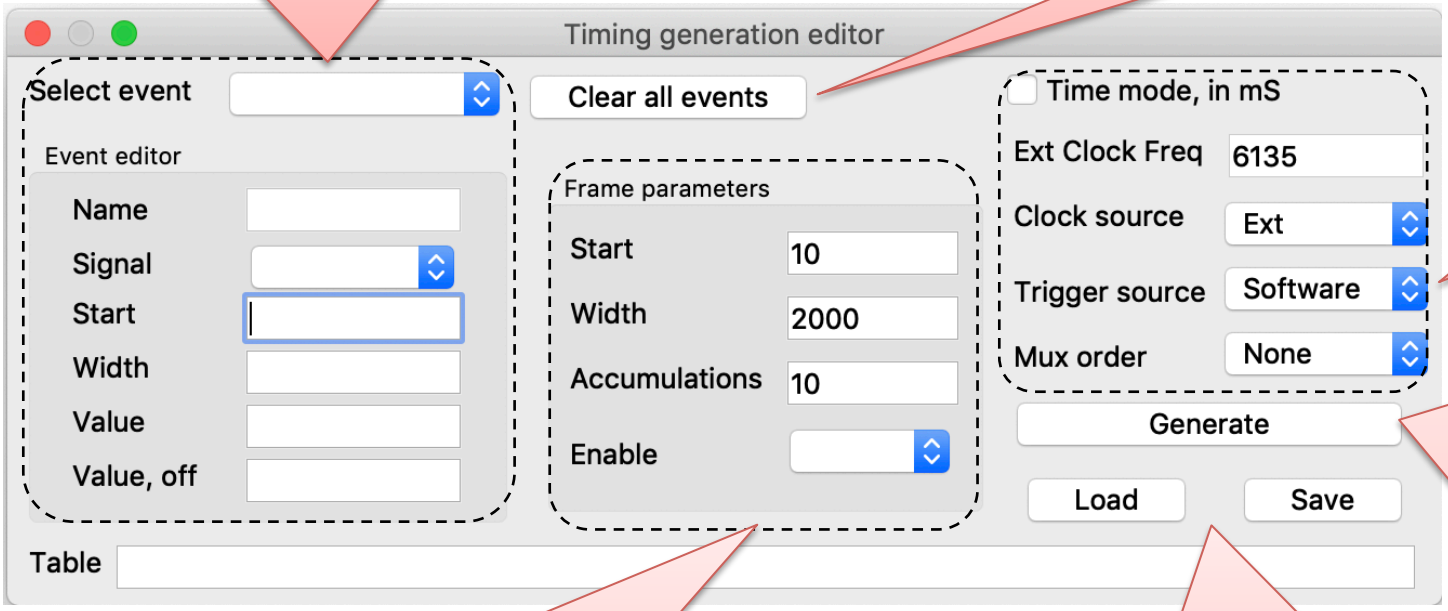
This is the dialog you will see on your control panel.



Pulse sequence editor

This section allows you to define an event in the pulse sequence. You can have as many events as needed in a pulse sequence.

This button will clear all events and allow you to start a new sequence.



This section defines clock and triggering options.

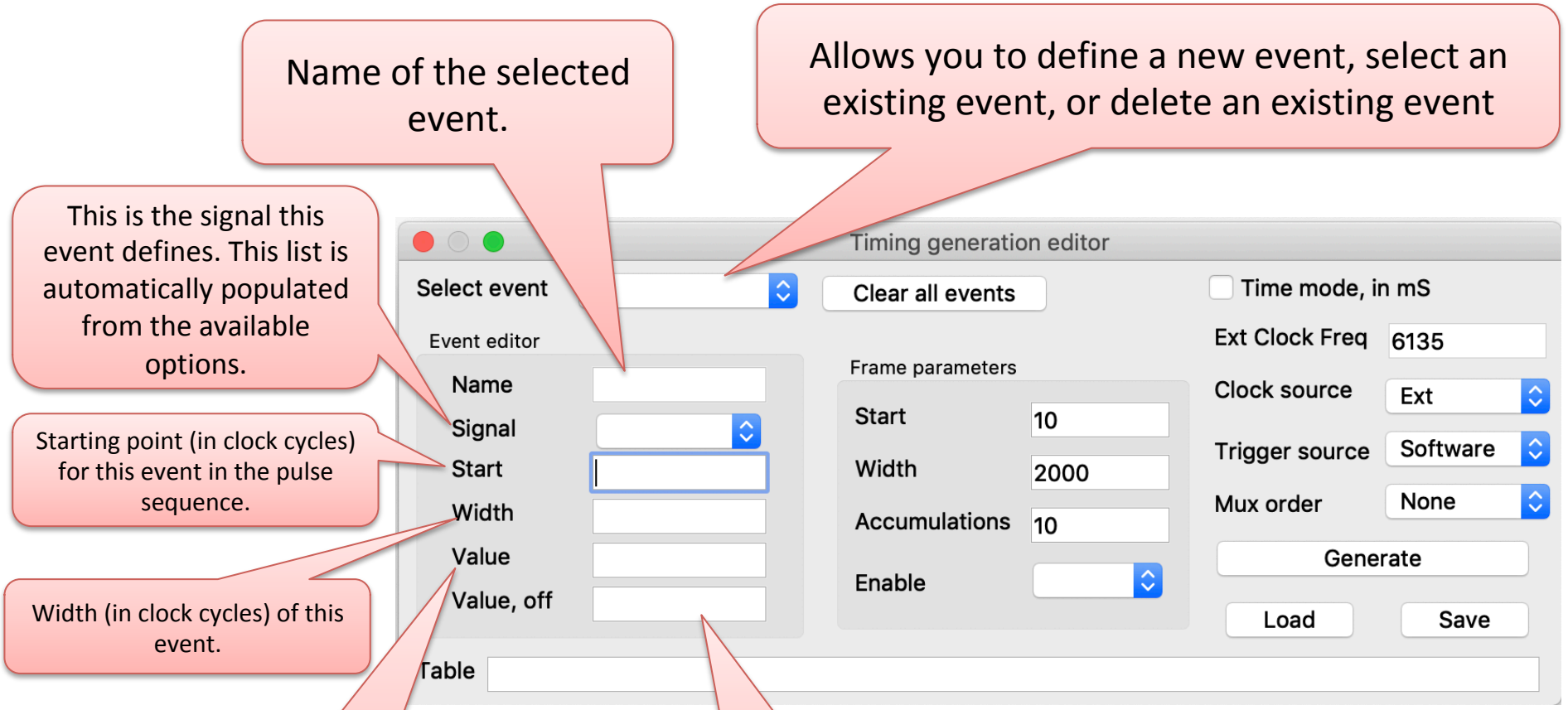
This button will use the current settings to generate a pulse sequence and display it in the table box.

This section defines the data collection frame, the number of accumulations and allows defining an Enable output signal if needed.

These buttons allow you to load and save pulse sequences to a data file.

Pulse sequence editor

Event definition



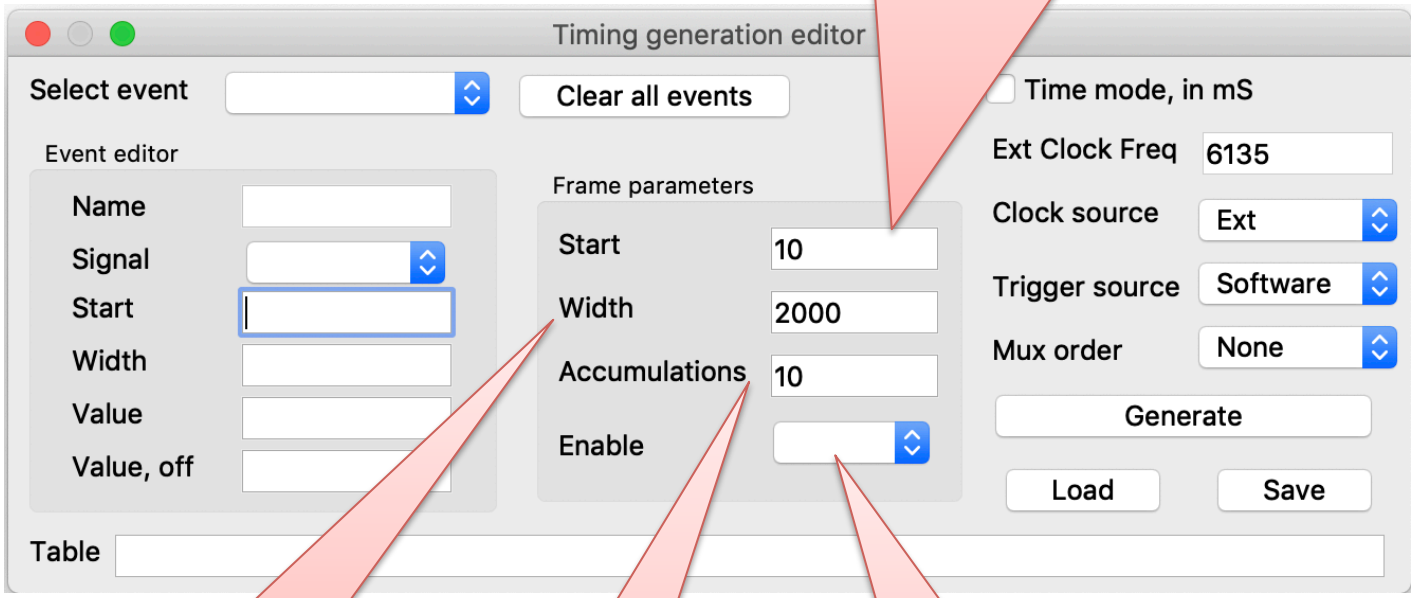
Define as many events as needed. You can have multiple events with the same start and width values. The event name must be unique.

Pulse sequence editor

Frame parameters

The Frame parameters define the total length to the frame and the number of cycles the pulse sequence will repeat.

Defines the start point (in clock cycles) of the data acquisition frame in the pulse sequence.



Data acquisition frame width (in clock cycles).

This is the number of accumulations or cycles for this pulse sequence.

This option allows you to define an output logic signal that will signal the acquisition interval.

Pulse sequence editor

Clock and trigger options

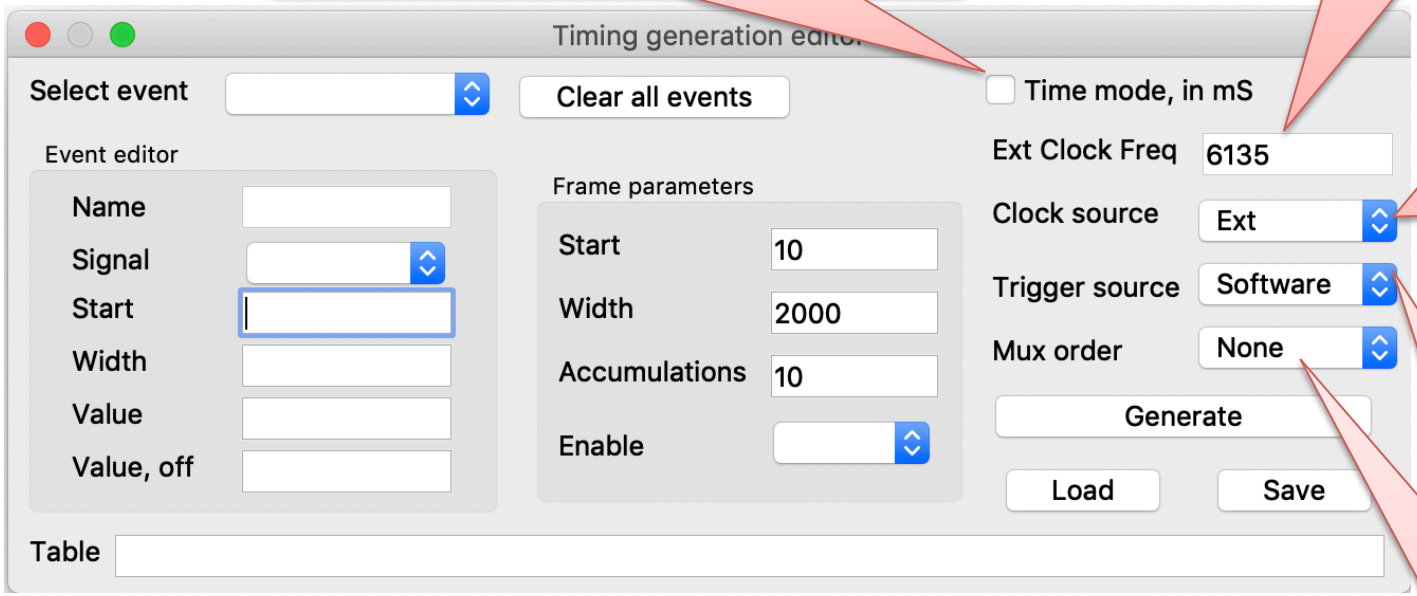
Pulse sequences can be defined in clock cycles or time in mS. Check this box if you wish to enter the parameters in mS.

If you have selected time mode and your using an external clock then this box allows you to define the external clock frequency in Hz. This is needed to calculate the time in mS.

Defines the clock used by the pulse sequence generator:
Ext uses the Clk input.
ExtN used the negative edge of the Clk input.
ExtS uses the S input.
There are also a number of internal clock frequency options.

Define the trigger option used to start a pulse sequence. Options include:
Software
External Trg input on the Pos edge, Neg edge, or Edge for any edge.

The pulse sequence generator supports generation of Hadamard multiplexing bit sequences. Use this option to select the desired option.



Note: The count values in the start and width boxes of the events and frame parameters can contain fixed numbers representing total counts or time and can also contain references to other event start and width values. For example if you define an event named ACC and it has a start count of 100 you can then define another event or frame parameter start or width as 25 + ACC.Start. You can use both + and – operators. This allows you to link events in a logical way so changing one event's value will redefine other event in a logical way for your application.

Example pulse sequence

- In this example we generate a generic pulse sequence. This sequence consists of four main events:
  - Fill time
  - Trap time
  - Release time
  - Inject time
- For each of these events we define a start and width time and well as a signal to control. The signal is optional and it can be left blank. If the signal is selected then its active and off values need to be defined.
- In this example we will focus on the event's start and width values. This sequence is defined in a way that the user only need to edit the Inject time to define where in the sequence the injection occurs, all the events are linked. Below is a table of event start and width values to illustrate the capability:

Event name	Start	Width
Fill time	Trap time.Start-Fill time.Width	100
Trap time	Inject time.Start-Trap time.Width	10
Release time	Inject time.Start	20
Inject time	200	9

- In this example the user only needs to adjust the width values for the first three events and the Inject time Start. I have not shown the signals that are controlled, this will depend of your system, also Trap time does not control a signal, it represents a delay while the ions are held in the trapping region.

Hadamard multiplexing

- Generation of a Hadamard multiplexing pulse sequence requires first the generation of the injection event. The following events must be defined as outlined in the example pulse sequence:
  - Fill time
  - Trap time
  - Release time
  - Inject time
- When the pulse sequence is generated all the injection times are calculated based on the bit order, then the above four events are used to calculate each injection event.
- Events defined in the pulse sequence with any other event names are used as defined and can control other aspects of the experiment.
- Please note, the Injection time event's start time must be set to zero