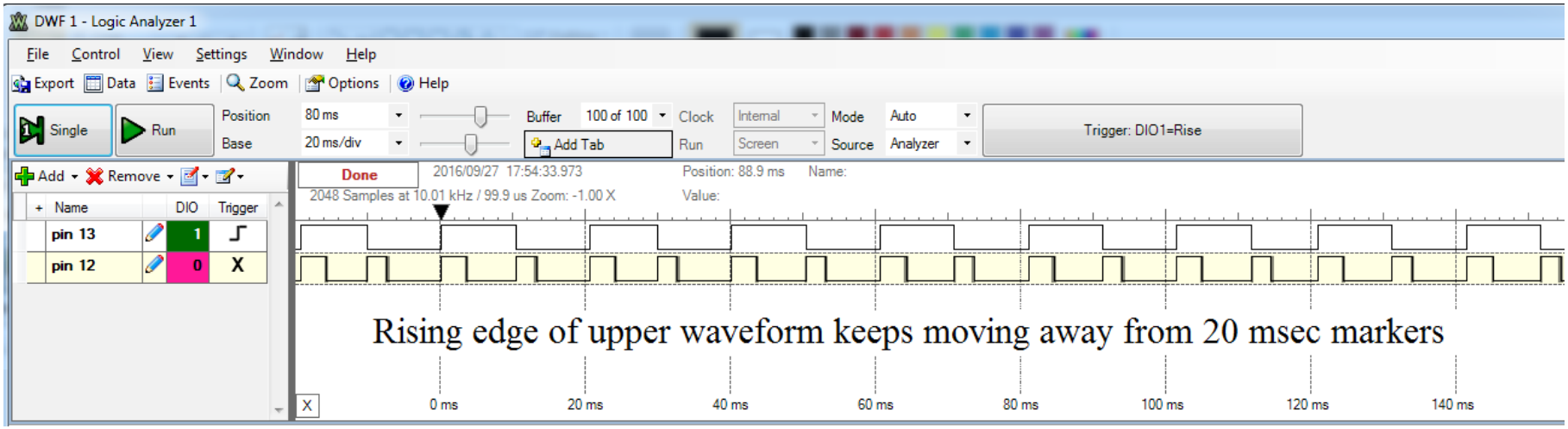
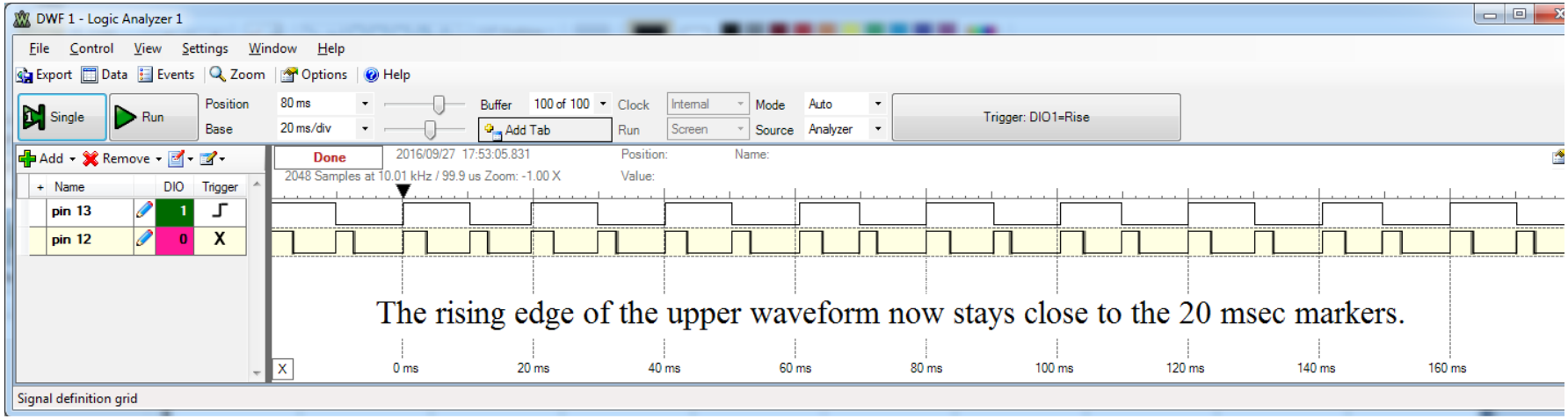
Software timer with incorrect update of variable Timer

```
// Timer for millis() approach.
unsigned long Timer;

// Interrupt Service Routine to toggle pin
void TogglePin13()
{
	// Set pin 12 on to indicate start of ISR
	bitSet(PORTB, 4);
	// if pin 13 is one,
	if (bitRead(PINB, 5))
	{
		// Clear pin 13
		bitClear(PORTB, 5);
	}
	else
	{
		// set pin 13.
		bitSet(PORTB, 5);
	} // end of if

	// Clear pin 12 on to indicate end of ISR
	bitClear(PORTB, 4);

} // End of TogglePin13.

// Configure System, run at startup
void setup()
{
	pinMode(13, OUTPUT);  // 13 an output.

	// Timer based on millis()
	Timer = millis();

} // End of setup.

// Main loop is constantly run.
void loop()
{
	// Timer using millis() call.
	if( millis()-Timer >= 10 ) // check of 10 milliseconds
	{
	   TogglePin13(); // Then toggle pin 13,

	   Timer = millis();  // Incorrect update of timer.
	}

	// Time consuming loop.
	for (int m = 0; m < 1000; m++)
	{
		for (int k = 0; k < 32000; k++)
		{
			int j = k * k + 5; // Calculation to use time.
		}
	}

} // End of loop.
```


DWF 1 - Logic Analyzer 1
File Control View Settings Window Help
Export Data Events Zoom Options Help
Single Run
Position 80 ms
Base 20 ms/div
Buffer 100 of 100
Add Tab
Clock Internal
Run Screen
Mode Auto
Source Analyzer
Trigger: DIO1=Rise
Add Remove
Name DIO Trigger
pin 13 1
pin 12 0 X
Done
2016/09/27 17:54:33.973
2048 Samples at 10.01 kHz / 99.9 us Zoom: -1.00 X
Position: 88.9 ms
Name:
Value:
Rising edge of upper waveform keeps moving away from 20 msec markers
X
0 ms
20 ms
40 ms
60 ms
80 ms
100 ms
120 ms
140 ms

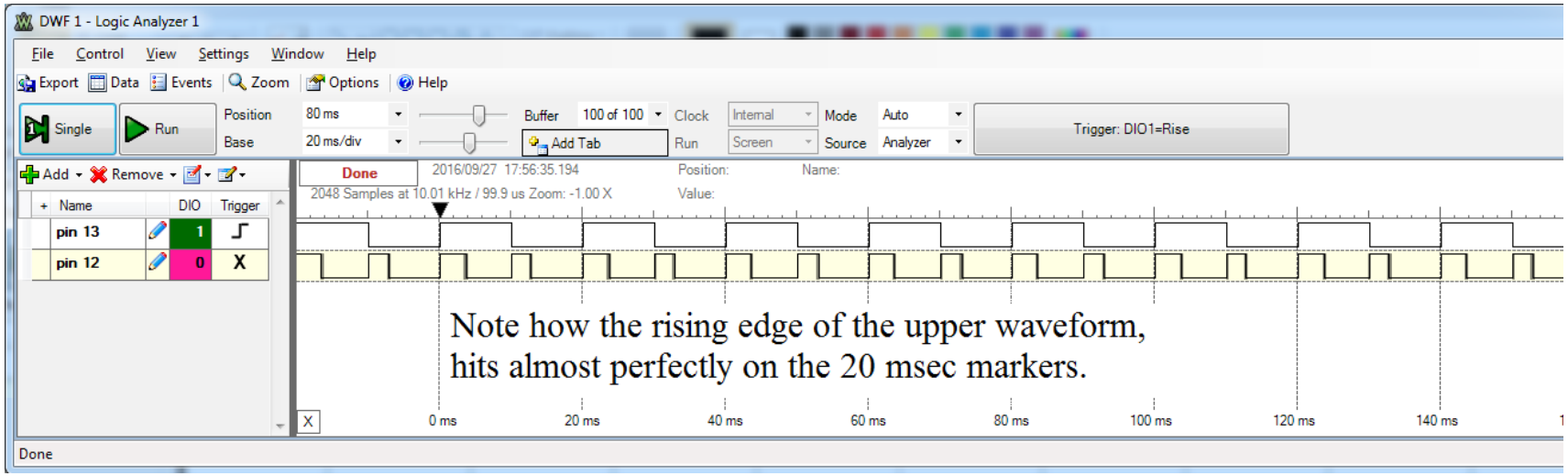
Software timer with more accurate update of variable Timer

```
// Timer for millis() approach.
unsigned long Timer;

// Interrupt Service Routine to toggle pin
void TogglePin13()
{
	// Set pin 12 on to indicate start of ISR
	bitSet(PORTB, 4);
	// if pin 13 is one,
	if (bitRead(PINB, 5))
	{
		// Clear pin 13
		bitClear(PORTB, 5);
	}
	else
	{
		// set pin 13.
		bitSet(PORTB, 5);
	} // end of if

	// Clear pin 12 on to indicate end of ISR
	bitClear(PORTB, 4);

} // End of TogglePin13.

// Configure System, run at startup
void setup()
{
	pinMode(13, OUTPUT);  // 13 an output.

	// Timer based on millis()
	Timer = millis();

} // End of setup.

// Main loop is constantly run.
void loop()
{
	// Timer using millis() call.
	if( millis()-Timer >= 10 ) // check of 10 milliseconds
	{
	   TogglePin13(); // Then toggle pin 13,

	   Timer += 10;  // Correct update of timer.
	}

	// Time consuming loop.
	for (int m = 0; m < 1000; m++)
	{
		for (int k = 0; k < 32000; k++)
		{
			int j = k * k + 5; // Calculation to use time.
		}
	}

} // End of loop.
```


DWF 1 - Logic Analyzer 1
File Control View Settings Window Help
Export Data Events Zoom Options Help
Single Run
Position 80 ms
Base 20 ms/div
Buffer 100 of 100
Add Tab
Clock Internal
Run Screen
Mode Auto
Source Analyzer
Trigger: DIO1=Rise
Add Remove
Name DIO Trigger
pin 13 1
pin 12 0 X
Done
2016/09/27 17:53:05.831
2048 Samples at 10.01 kHz / 99.9 us Zoom: -1.00 X
Position:
Value:
Name:
The rising edge of the upper waveform now stays close to the 20 msec markers.
0 ms 20 ms 40 ms 60 ms 80 ms 100 ms 120 ms 140 ms 160 ms
Signal definition grid

Hardware based 10 millisecond interval

```
// 10 millisecond time interval implemented by hardware.
#include <TimerOne.h>

// Interrupt Service Routine to toggle pin
void TogglePin13()
{
	// Set pin 12 on to indicate start of ISR
	bitSet(PORTB, 4);
	// if pin 13 is one,
	if (bitRead(PINB, 5))
	{
		// Clear pin 13
		bitClear(PORTB, 5);
	}
	else
	{
		// set pin 13.
		bitSet(PORTB, 5);
	} // end of if

	// Clear pin 12 on to indicate end of ISR
	bitClear(PORTB, 4);

} // End of TogglePin13.

// Configure System, run at startup
void setup()
{
	pinMode(13, OUTPUT);  // 13 an output.
	// Timer1 based system
	Timer1.initialize(10000);
	Timer1.attachInterrupt(TogglePin13);

} // End of setup.

// Main loop is constantly run.
void loop()
{
	// Nothing to do since all is handled by hardware.

	// Time consuming loop.
	for (int m = 0; m < 1000; m++)
	{
		for (int k = 0; k < 32000; k++)
		{
			int j = k * k + 5; // Calculation to use time.
		}
	}

} // End of loop.
```


DWF 1 - Logic Analyzer 1
File Control View Settings Window Help
Export Data Events Zoom Options Help
Single Run
Position 80 ms
Base 20 ms/div
Buffer 100 of 100
Add Tab
Clock Internal
Run Screen
Mode Auto
Source Analyzer
Trigger: DIO1=Rise
Add Remove
Name DIO Trigger
pin 13 1
pin 12 0 X
Done
2016/09/27 17:56:35.194
2048 Samples at 10.01 kHz / 99.9 us Zoom: -1.00 X
Position:
Value:
Name:
Note how the rising edge of the upper waveform,
hits almost perfectly on the 20 msec markers.
X
0 ms
20 ms
40 ms
60 ms
80 ms
100 ms
120 ms
140 ms
Done