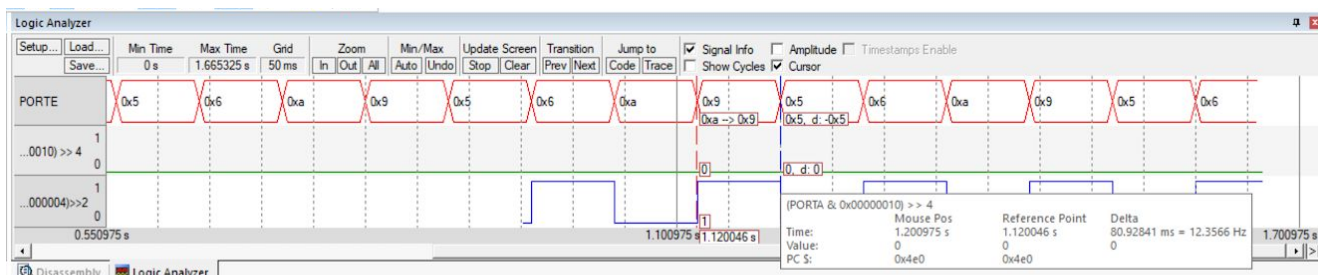


Deliverables Emma Harper, Christopher Bowling



```
60A0905E805000083A8610083A86100
3A8610083A8610083A8610083A86100
3A8610083A8610083A8610083A86100
3A8610083A8610083A8610083A86100
3A8610083A8610083A8610083A86100
3A8610083A8610083A8610083A86100
3A8610083A8610083A8610083A86100
3A8610083A8610083A8610083A86100
3A8610083A8610083A8610083A86100
3A8610083A8610083A8610083A86100
3A8610083A8610083A8610083A86100
3A8610083A8610083A892
```

Time Estimation:

Total Time for program to run: about 6,400,085 clock cycles (6.4 million due to the delay function) while our Debug Capture takes about 68 cycles to fully run through. Therefore our intrusiveness is calculated to be about **0.00106%** which is considered to be minimally intrusive.

Debug_Init

```
PUSH {R0-R4,LR}
LDR R0, =DataPt
MOV R1, #0x00000000
STR R1, [R0]
LDR R0, =TimePt
STR R1, [R0]
MOV R1, #0x00FFFFFF
LDR R0, =PTime
STR R1, [R0]
BL SysTick_Init
LDR R0, =DataBuffer
MOV R2, #0
MOV R3, #0xFF
StoreFF
STRB R3, [R0, R2]
ADD R2, R2, #1
CMP R2, #100
BNE StoreFF
LDR R0, =TimeBuffer
```

```

MOV R2, #0
MOV R3, #0xFFFFFFFF
TimeFF
STR R3, [R0, R2, LSL #2]
ADD R2, R2, #1
CMP R2, #100
BNE TimeFF

```

```

POP {R0-R4,PC}

```

Debug_Capture

```

PUSH {R0-R6,LR}      ;8 clock cycles
LDR R0, =DataBuffer   ;2 cycles
LDR R1, =DataPt       ; 2 cycles
LDR R2, [R1]
CMP R2, #100          ;R2 has the index for databuffer      ;1 cycle
BEQ Branch ; if taken, 3, else 1
LDR R4, =GPIO_PORTE_DATA_R
LDRB R3, [R4]
LDR R6, =GPIO_PORTA_DATA_R
LDRB R5, [R6]
ORR R3, R5 ;one cycle
STRB R3, [R0,R2] ;two cycles
ADD R2, #1 ;one
STR R2, [R1]
LDR R0, =TimeBuffer
LDR R1, =TimePt
LDR R2, [R1]           ; value of time pointer
LDR R4, =NVIC_ST_CURRENT_R
LDR R3, [R4]           ; data of timer
LDR R4, =PTime         ; address of previous time
LDR R5, [R4]
CMP R5, R3 ;one
SUB R5, R5, R3 ;one
AND R5, R5, #0x0FFFFFFF ; only need first 24 bits- one cycle
STR R3, [R4]
STR R5, [R0, R2]
ADD R2, #4 ;one cycle
STR R2, [R1]

```

Branch

```

POP {R0-R6,PC}      ;4 for branch, 8 for registers
; 68 clock cycles through this subroutine: .85 microsecond each time its exexuted

```

Heartbeat_Init

```
LDR R0, =SYSCTL_RCGCGPIO_R
LDR R1, [R0]
ORR R1, #0x20
STR R1, [R0]
NOP
NOP
NOP
NOP
LDR R0, =GPIO_PORTF_DIR_R
LDR R1, [R0]
MOV R1, #0x04 ;// bit 3 (PF2) in port F is output LED
STR R1, [R0]
LDR R0, = GPIO_PORTF_DEN_R
LDR R1, [R0]
MOV R1, #0x04
STR R1, [R0]

BX LR
```

Heartbeat

```
LDR R0, =GPIO_PORTF_DATA_R
LDR R1, [R0]
EOR R1, R1, #0x04 ;toggle LED for heartbeat
STR R1, [R0]
BX LR
```