

TI-RSLK

Texas Instruments Robotics System Learning Kit



Module 10

Activity: Debugging Real-time Systems



Activity: Debugging Real-time Systems

Question 1

Write C code that dumps Port 4 input and Port 5 output into arrays. Define two 8-bit arrays of length 1000.

```
void Debug_Init(void);
void Debug_Dump(void);
```

Question 2

Write C code that dumps four 8-bit parameters into a single array. Pack the four 8-bit numbers with w as the most significant byte and z as the least significant byte. Define one 32-bit array of length 1000.

```
void Debug_Init(void);
void Debug_Dump(uint8_t w, uint8_t x,
                uint8_t y, uint8_t z);
```

Question 3

Analyze the following two implementations of a debugging dump. The first uses an index access and the second uses pointer access. What can you say about the relative intrusiveness of the two implementations?

```

DumpI () :                ;void DumpI(uint8_t x)
000004ac:  F1AD0D08    sub.w    sp, sp, #8
000004b0:  F88D0000    strb.w  r0, [sp]
-----
; if (I<1000) {
000004b4:  481C        ldr     r0, [pc, #0x70]
000004b6:  6800        ldr     r0, [r0]
000004b8:  F5B07F7A    cmp.w   r0, #0x3e8
000004bc:  D209        bhs    $C$L1
-----
; Buffer[I]=x;
000004be:  491A        ldr     r1, [pc, #0x68]
000004c0:  4A1A        ldr     r2, [pc, #0x68]
000004c2:  F89D0000    ldrb.w r0, [sp]
000004c6:  6809        ldr     r1, [r1]
000004c8:  5450        strb   r0, [r2, r1]
-----
; I++;
000004ca:  4917        ldr     r1, [pc, #0x5c]
000004cc:  6808        ldr     r0, [r1]
000004ce:  1C40        adds   r0, r0, #1
000004d0:  6008        str    r0, [r1]
-----
; }}
$C$L1:
000004d2:  B002        add    sp, #8
000004d4:  4770        bx     lr
```

```

DumpPt () :                ; void DumpPt(uint8_t x) {
000004d6:  F1AD0D08    sub.w    sp, sp, #8
000004da:  F88D0000    strb.w  r0, [sp]
-----
; if (pt<&Buffer[1000]) {
000004de:  4814        ldr     r0, [pc, #0x50]
000004e0:  4914        ldr     r1, [pc, #0x50]
000004e2:  6800        ldr     r0, [r0]
000004e4:  4281        cmp     r1, r0
000004e6:  D908        bls    $C$L2
-----
; *pt=x;
000004e8:  4911        ldr     r1, [pc, #0x44]
000004ea:  F89D0000    ldrb.w r0, [sp]
000004ee:  6809        ldr     r1, [r1]
000004f0:  7008        strb   r0, [r1]
-----
; pt++;
000004f2:  490F        ldr     r1, [pc, #0x3c]
000004f4:  6808        ldr     r0, [r1]
000004f6:  1C40        adds   r0, r0, #1
000004f8:  6008        str    r0, [r1]
-----
; }}
$C$L2:
000004fa:  B002        add    sp, #8
000004fc:  4770        bx     lr
```

In each case, identify the assembly instruction that actually writes data into the buffer.

Question 4

Write a C program that maintains the time in hours, minutes and seconds using SysTick interrupts. Basically update these three global variables. Assume some other software initializes them to the correct time.

```
uint8_t Hour; // 0 to 23
uint8_t Minute; // 0 to 59
uint8_t Second; // 0 to 59
```

Question 5

List the steps required if one wished to change one bit of ROM from a 0 to a 1. Assume this is an arbitrary address and arbitrary bit. Assume the address is not within the ROM containing the software code.

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