



# 模块 10

活动：调试实时系统



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## 问题 1

编写将端口4输入和端口5输出转储到数组中的C代码。定义两个长度为1000的8位数组。

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

## 问题 2

编写将四个8位参数转储到单个数组中的C代码。将四个8位数字打包，其中X为最高有效字节，Z为最低有效字节。定义一个32位长度为1000的数组。

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

## 问题 3

分析以下两个调试转储的实现。第一个使用索引访问，第二个使用指针访问。关于这两种实现的相对侵入性你能说些什么呢？在每种情况下，确定实际将数据写入缓冲区的指令。

```
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
```

## 问题 4

编写一个C程序，使用 SysTick 中断以小时，分钟和秒为单位维护时间。基本上更新这三个全局变量。假设其他一些软件将它们初始化为正确的时间。

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

## 问题 5

列出1位将ROM从0变成1所需的步骤。

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