

*TMS320 DSP
DESIGNER'S NOTEBOOK*

Bit-reversed Addressing without Data Alignment on the 'C3x

APPLICATION BRIEF: SPRA199

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December 1992*



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Bit-reversed Addressing without Data Alignment on the 'C3x



Abstract

Bit-reversed addressing mode normally requires that the n-element array be aligned on an n-word boundary. When n is large, this may result in a large “hole” in the memory map. To enable more efficient use of memory, a technique to use bit-reversed addressing *without* data alignment is presented.



Design Problem

Bit-reversed addressing mode requires that the n-element array be aligned on an n-word boundary. When n is large, this may result in a large “hole” in the memory map. To use memory more efficiently, a technique to use bit-reversed addressing without data alignment is required.

Solution

Figure 1 shows a block diagram of one solution to this problem. AR2 points to the data. AR1 is initialized to 0 and becomes an offset into the array. Bit-reversed addressing mode is used to modify AR1. Figure 2 shows an assembly language version. Figure 3 shows a C version that uses in-line assembly to permit bit-reversed addressing.

Figure 1. Solution diagram

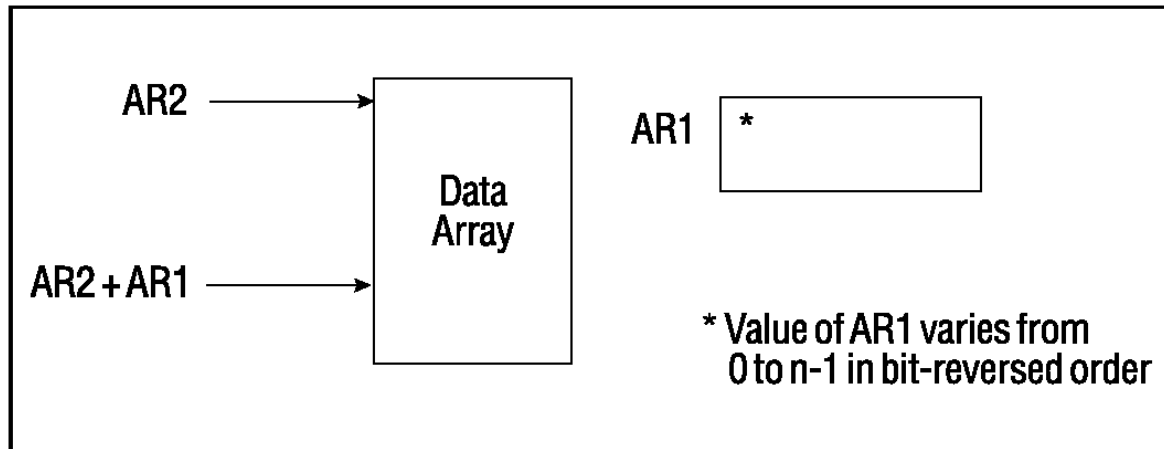


Figure 2. Assembly Code Implementation

```
.data
table      .word    8,9,10,11,12,13,14,15
taddr      .word    table
.text
.global   _main
_main      ldp      taddr
          ldi @taddr,ar2    ; pointer to array
          ldi 4,ir0    ; 1/2 array size for bit-rev addressing
          ldi 0,ar1    ; first address in bit-rev list
          ldi 7,rc
          rptb endloop
          ldi ar1,ir1    ; put new offset into index register
                    ; This instruction may also be put in parallel
                    ; if the right application comes along.
endloop    ldi *+ar2(ir1),r0 ; r0 holds array elements one at a
                    ; time so that results can be observed
```



```
|| ldi *ar1++(ir0)b,r7 ;calculate next address in  
;parallel r7 is a dummy variable to allow paral ops  
rets
```

Figure 3. C Code Implementation

```
int x[15]= {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15};  
int *y=(int *)&x;  
int m;  
main()  
{  
    int i;  
    y += 7; /* start with non-aligned array element */  
    asm(" ldi @_y,ar0"); /* ar0 points to array */  
    asm(" ldi 0,ar2"); /* index for bit-rev */  
    asm(" ldi 4,ir0"); /* set up for bit-rev */  
  
    for(i=0;i<8;i++)  
    {  
        asm(" ldi ar2,ir1"); /* load index of array */  
        asm(" ldi *+ar0(ir1),r7"); /* traverse */  
        asm(" || ldi *ar2++(ir0)b,r6"); /* array with */  
        asm(" sti r7,@_m"); /* bit-rev offset */  
    }  
}
```