AN534

Saving and Restoring Status on Interrupt (Implementing a Parameter Stack)

INTRODUCTION

The PIC17C42 has a 16 level deep hardware stack. The program counter is pushed into this stack on interrupts and subroutine calls. However, other key registers are not saved in the stack. Registers such as W, ALUSTA (which has carry, zero and other flag bits) and the bank select register (BSR) must be saved in an interrupt service routine. The following macros, PUSH and POP implement a parameter stack in data memory to accomplish this.

The indirect addressing register FSR0 is used to implement this parameter stack. It is assumed that FSR0 and its control bits are not used or modified elsewhere. The stack pointer (FSR0) is initialized at the highest RAM location (FFh).

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```
Main_prog       SETF    FSR0            ;Initialize and dedicate FSR0 as stack pointer
                BCF     ALUSTA,FS0      ;
                BCF     ALUSTA,FS1      ;Set-up FSR0 for auto-dec
                •
                •
                •
PUSH            MACRO
                BCF     ALUSTA,FS0      ;Set-up FSR0 for auto-dec
                MOVFP   ALUSTA,IND0     ;Save ALUSTA first
                MOVFP   BSR,IND0        ;
                MOVFP   W,IND0          ;
                MOVFP   RAM_x, IND0     ;Now save general
                MOVFP   RAM_y, IND0     ;Purpose registers
                ENDM
POP             MACRO
                BSF     ALUSTA,FS0      ;Set-up for auto-inc
                INCF    FSR0            ;
                MOVPF   IND0, RAM_y     ;
                MOVPF   IND0, RAM_x     ;
                MOVPF   IND0,W          ;
                MOVPF   IND0,BSR        ;
                MOVFP   IND0,ALUSTA     ;restore ALUSTA last
                DECF    FSR0            ;Adjust stack pointer
                ENDM
                •
                •
                •
interrupt_routine
                PUSH                    ;save registers
                •
                •
                •
;main body of interrupt service
                •
                •
                •
                POP                     ;restore status
                RETFIE                  ;return
```

Saving and Restoring Status on Interrupt

While the macros are quite self-explanatory, the user should note a few subtle points.

1. `MOVFP` instruction does not affect status flags while `MOVPF` does.

2. `MOVFP` and `MOVPF` are used such that any register can be saved and restored. Note that register being saved or restored has address f (which can be 00h to FFh) and other address, IND0 (indirect), therefore, can be any address.

3. FSR auto-increments or auto-decrements after the operation ('post'). Therefore, in the POP macro pre-increment is simulated.

4. All interrupts should be disabled when executing the PUSH and POP instructions. While PUSH will have the GIE bit disabled, POP may not necessarily have the GIE bit disabled. The user should disable the GIE bit when executing the POP.

Using this scheme, interrupts and subroutine calls can be nested, since the stack will grow and shrink. The stack can be used to pass parameters to subroutines.

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9/22/95