Discrete Logic Replacement

Decimal Adjust Routines

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APPLICATION OPERATION

When implementing packed BCD logic with PICmicros™ it may be necessary to perform additions or increments. In this case, it is necessary to execute a decimal adjustment to ensure a valid result.

I've included two routines.

Routine #1

This routine emulates the 'decimal adjust after addition' which is part of the instruction set of some microprocessor families. Of course, it works only after additions, but remember that a packed BCD number can be decremented by adding '99'.

ROM words:	16
Additional RAM:	1 byte (1 bit used)
Execution time:	15 to 17 instruction cycles

Routine #2

This routine is to be used when only an increment is necessary (i.e., up counters, clocks, etc.). It increments the 'number' register and performs the decimal adjust. In fact, this routine will work with additions of up to '6' in any or both of the packed BCD digits.

ROM words:	12
Additional RAM:	none
Execution time:	10 to 13 instruction cycles

Both routines return W = 0, if the result is '99' or less and W = 1, if the result is '100' or more. This allows for multiple precision packed BCD numbers manipulation.

MICROCHIP TOOLS USED

Assembler/Compiler version

MPASM V01.50, MPLAB V3.22.02

GRAPHICAL REPRESENTATION

FIGURE 1: ROUTINE #1

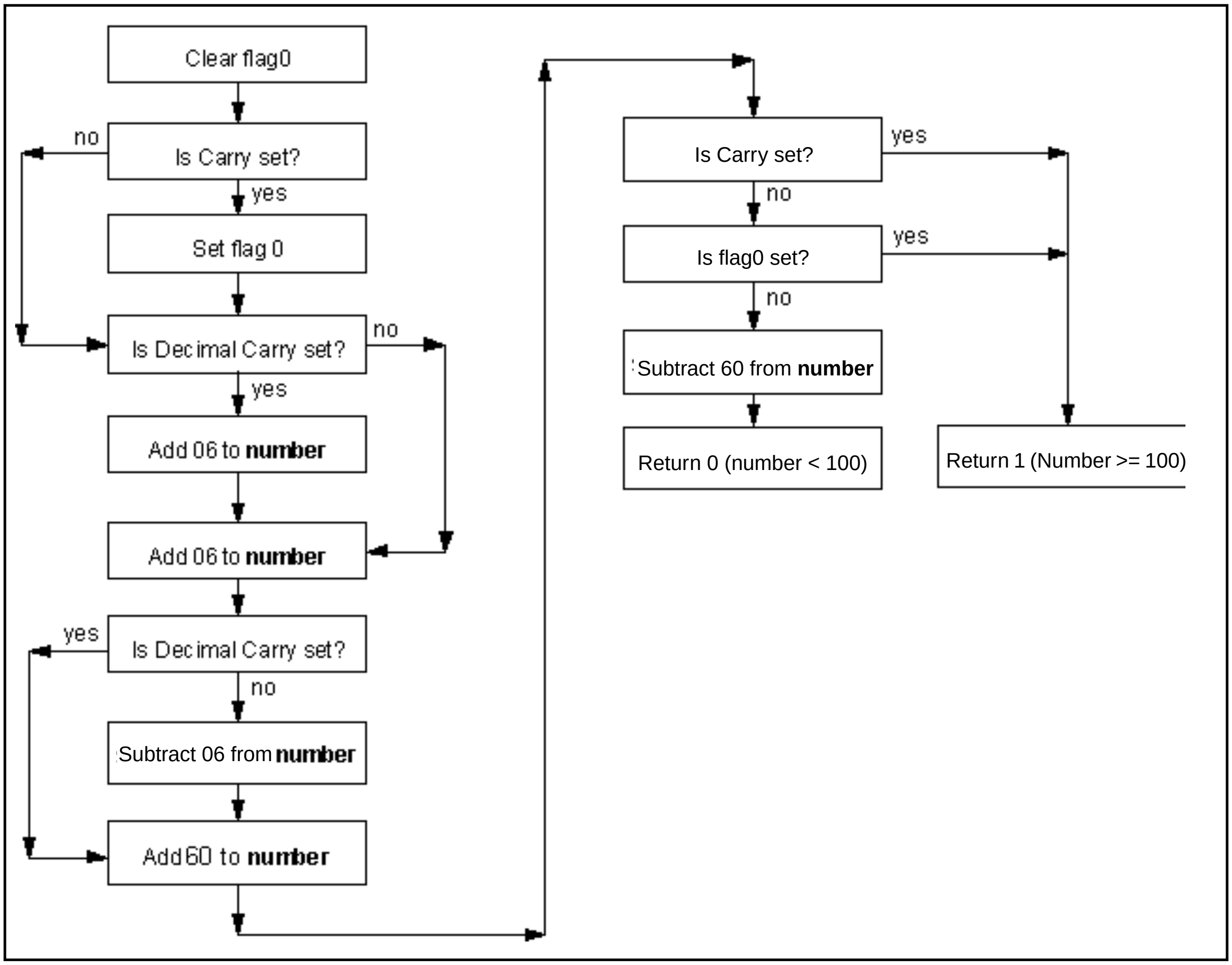
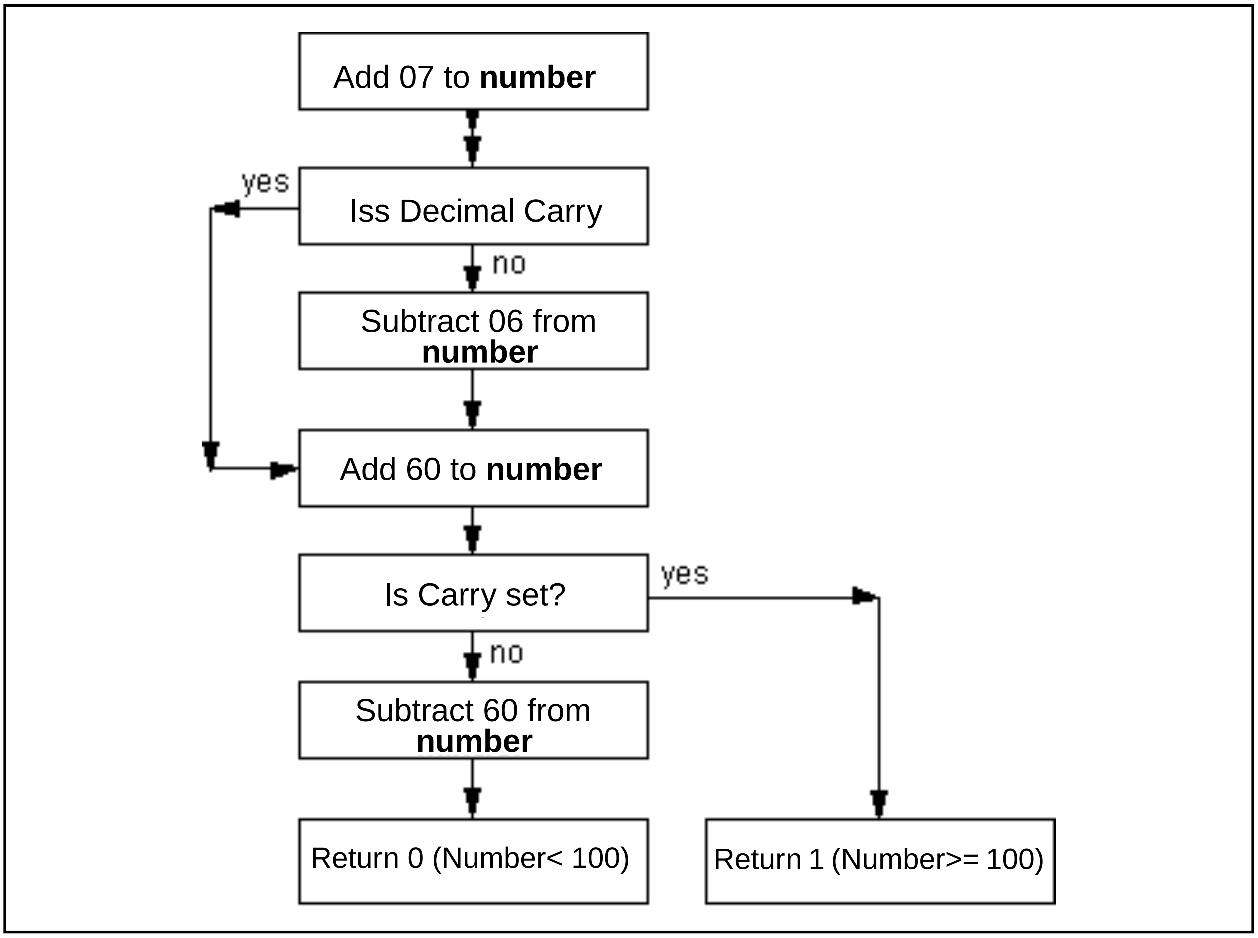


FIGURE 2: ROUTINE #2:



APPENDIX A: SOURCE CODE

A.1 Routine #1:Decimal Adjust After Addition

Note: ‘daa’ must be called immediately after the addition if performed, which result must be in ‘number’ register.

```
                 flag   equ            07h   ; Register for flag storing (only bit 0 is used)
                 number equ            08h   ; Register for number storing
;
daa              BCF    flag, 0
                 BTFSC  STATUS, C
                 BSF    flag, 0
                 MOVLW  06h
                 BTFSC  STATUS, DC
                 ADDWF  number, F
;
                 ADDWF  number, F
                 BTFSS  STATUS, DC
                 SUBWF  number, F
                 MOVLW  60h
                 ADDWF  number, F
                 BTFSS  STATUS, C
                 BTFSC  flag, 0
                 RETLW  01h
                 SUBWF  number, F
                 RETLW  00h
```

A.2 Routine #2: Increment and Perform Decimal Adjust to the ‘Number’ Register

```
number           equ    07h                ; Register for number storing
;
incdaa           MOVLW  07h
                 ADDWF  number, F
                 BTFSC  STATUS, DC
                 GOTO   test_c
                 MOVLW  06h
                 SUBWF  number, F
test_c           MOVLW  60h
                 ADDWF  number, F
                 BTFSC  STATUS, C
                 RETLW  01h
                 SUBWF  number, F
                 RETLW  00h
```