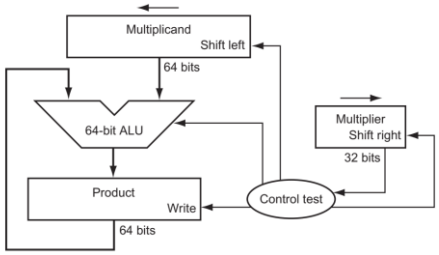
CS202 Computer Organization HW#3

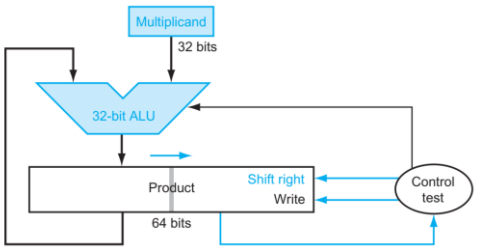
Problem 1.

Calculate the product of the unsigned 6-bit integers in decimal 50_{dec} and 9_{dec}, using the hardware described below. Show the procedures by filling the contents of each register (Multiplicand, Multiplier and Product) on each step in a form.



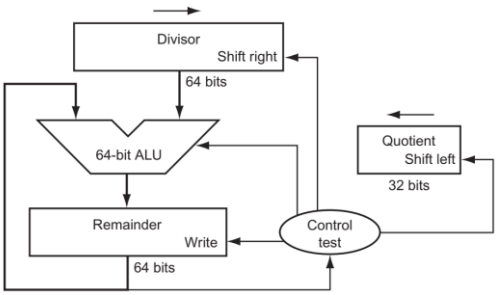
Problem 2.

Calculate the product of the unsigned 8-bit integers in decimal 98_{dec} and 17_{dec}, using the hardware described below. Show the procedures by filling the contents of each register (Multiplicand and Product) on each step in a form, please also show the boundary between product and multiplier in the Product register using the symbol "|".



Problem 3.

Calculate 60_{dec} divided by 18_{dec} using the hardware described below, assume that both inputs are unsigned 6-bit integers. Show the procedures by filling the contents of each register (Quotient, Divisor and Remainder) on each step in a form.



Problem 4.

IEEE 754-2008 contains a half precision that is only 16 bits wide. The leftmost bit is still the sign bit, the exponent is 5 bits wide and has a bias of 15, and the mantissa (fraction) is 10 bits long. A hidden 1 is assumed. Write down the bit pattern to represent -0.9375_{dec}. calculate the range and relative accuracy of this 16-bit floating point format.

Problem 5.
Calculate the sum of 26.125 and 0.2900390625 by hand, assuming A and B are stored in the 16-bit half precision described in Problem 4. Assume 1 guard, 1 round bit, and 1 sticky bit, and round to the nearest even. Show all the steps.