

EECE 320 – Digital Systems Design

Project

Three-digit BCD Adder

1. Introduction

For this project you will design and test a three-digit binary-coded-decimal (BCD) adder capable of adding positive and negative BCD numbers. The project has a combinational part and a sequential part. You will implement it in two phases; first the combinational part and next the sequential part.

Components

PHASE I

DIGITADD

This is a digit adder that takes two 4-bit BCD digits and a carry/borrow input and produces a 4-bit BCD sum or difference and a carry/borrow output.

PHASE II

Figure-1 shows the blocks of the sequential component. This is very similar to the sequential adder explained in class, except for the one-bit full adder replaced by the one-digit BCD adder.

CTRLUNIT

This module takes information from the other modules and generates the control signals for those modules:

- It checks the signs and magnitudes of the operands and decide whether to do an addition or subtraction and whether to swap the operands.
- It is responsible for computing the sign of the result.
- It is responsible for enabling the shifting of the registers.

A. REGUNIT

You should implement this unit, one for register-A and one register-B.

The input is shifted into register A, 4 bits at a time, the least significant part goes first, followed by the most significant part.

Figure 1: Three-digit BCD Sequential Adder

