ELT-217, Experiment AD-8: TTL Outputs

OBJECTIVE:

To investigate totem-pole and open-collector output stages and wired logic.

EQUIPMENT NEEDED:

> Digital Experimenter Kit
> 1- 7408 & 7409 IC's
> 1- 1K Resistor
> 1- LED and 330 ohm resistor
> 1-voltmeter

GENERAL:

The 7408 and 7409 chips are both identical quad AND gates except the 7408 has totem-pole outputs and the 7409 has open-collector outputs. See the relevant sections of your test book. *Note*: **Before** actually wiring, make a schematic diagram showing which virtual switch and/or virtual LED is connected to what; show all connections and pin numbers. Include diagrams in your report for each different set-up. As usual, take one screen shot of each procedure and include it in your report, clearly identifying which data set is being shown.
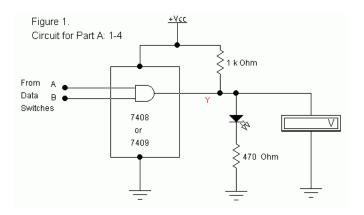
PROCEDURE A; simple gate:

1) Connect one gate of a 7409 as shown in figure 1 using BOTH an actual LED and the AD2 virtual LED for an indicator. Use the data switches on your AD2 to input all 4 combinations of high and low to the input and to observe and record the output voltage. Record the LED condition (on or off) for each input combination. Verify that you get the outputs expected from the AND gate.

2) Remove the 1K resistor and again check all input combinations. Was the resistor necessary? Explain why in your report

3) Re-connect the 1K resistor and replace the 7409 with a 7408. Repeat step one.

4) Remove the 1K resistor from the 7408 and repeat step two. If the results are different between the 7408 and 7409, explain.
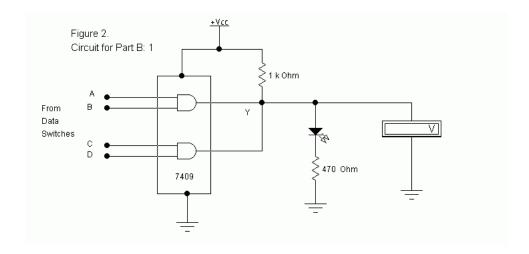
PROCEDURE B; combined gates (wired OR):

1) Using a 7409, wire the circuit shown in figure 2 which uses two gates fed by four data switches. Use an actual LED in the circuit, not the AD2 virtual LED. Switch through all 16 possible input combinations recording the output (high or low) for each input condition.
    CAUTION: Do not use the 7408 in this circuit.
   What is the equivalent logic diagram for this circuit (using standard logic symbols)?

Figure 1.
Circuit for Part A: 1-4

+Vcc

1 k Ohm

From   A
Data   B
Switches

7408
or
7409

Y

470 Ohm

V

Figure 2.
Circuit for Part B: 1

+Vcc

1 k Ohm

A
B
From
Data
Switches
C
D

Y

7409

470 Ohm

V

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