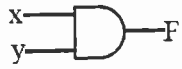
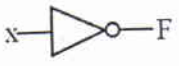
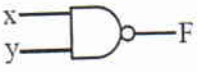
BASIC LOGIC GATES

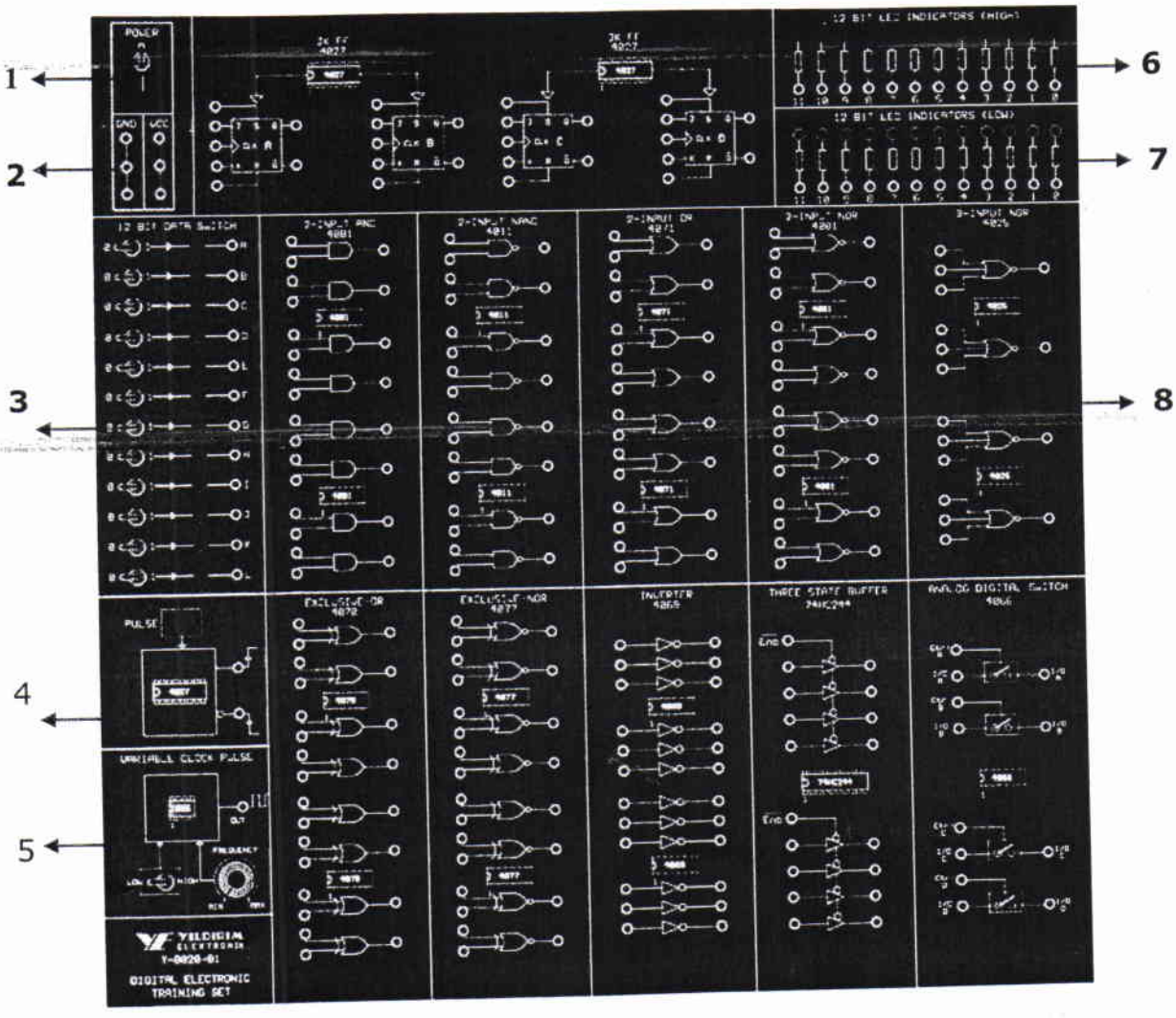
1) PURPOSE :

To study the operation principles of basic digital logic gates AND, OR, INVERTER, NAND, NOR and the representation of their functions by truth tables, logic diagrams and Boolean algebra.

2) Truth table, algebraic function and graphic symbol of basic 2-input logic gates:

Name	Graphic Symbol	Algebraic Function	Truth Table
AND		F=x.y	x y | F 0 0 | 0 0 1 | 0 1 0 | 0 1 1 | 1
OR		F=x+y	x y | F 0 0 | 0 0 1 | 1 1 0 | 1 1 1 | 1
NOT		F=x'	x | F 0 | 1 1 | 0
NAND		F=(x.y)'	x y | F 0 0 | 1 0 1 | 1 1 0 | 1 1 1 | 0
NOR		F=(x+y)'	x y | F 0 0 | 1 0 1 | 0 1 0 | 0 1 1 | 0

INTRODUCTION TO DIGITAL ELECTRONIC SET



1. POWER ON/OFF
2. DC + 5V POWER SUPPLY
3. 12 BIT LOGIC LED INDICATING SWITCH GROUP
4. PULSE SWITCHING CIRCUIT
5. TWO-STAGE 1Hz-1KHz TTL OSCILLATOR
6. 12 BIT HIGH LEVEL LED INDICATOR CIRCUIT
7. 12 BIT LOW LEVEL LED INDICATOR CIRCUIT
8. BASIC GATES

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USING THE CURCUITS IN THE DIGITAL ELECTRONIC TRAINING SET

1. ON/OFF POWER SWITCH:

It is used to give power to the circuit. ON indicates the turned on and OFF indicates the turned off position. It controls +5 V. The lamp above it shows the connection status.

2. DC + V5 POWER SUPPLY:

It is used for external + 5 Volts. It is designed to give maximum of 1A. The short circuit is protected.

3. SWITCHGROUP WITH 12 BIT LOGIC LED INDICATOR:

It is used to obtain logic '0' and logic '1'. 12 switches are used for 12 bit information. LED indicator lamps are used for switch positions and output data.

4. PULSE SWITCHING CURCUITS:

It is used to get logic PULSE. Both negative and positive PULSE can be obtained whenever the switch is pressed. PULSE can be received from all desired output terminals.

5. TWO STAGE 1Hz-1KHz SQUARE WAVE OSCILATOR:

It is a clock pulse unit that is constructed with 555 integrate, has high and low frequency, and has frequency adjustment. The LOW section of the switch produces 1Hz-35Hz pulse, and the HIGH section produces 30Hz-1Khz pulse.

6. 12 BIT HIGH LEVEL LED INDICATOR CURCUIT:

Binary information coming from digital circuits is indicated with 12 LED lamps. When the information is "1," LED lights up; and when the information is "0" LED does not light up. It works according to the principle of positive logic. As there are 12 LED lamps, it can indicate 12 BIT information.

7. 12 BIT LOW LEVEL LED INDICATOR CIRCUIT:

It is used to show the binary information coming from the digital circuits with 12 LED lamps. When there is "0" information, LED lights up; it does not light up, when the information is "1." It works according to the negative logic principle. As there are 12 LED lamps, it can indicate 12 BIT information.

8. BASIC GATES:

It is the section that addresses the basic gate experiments. It involves basic gate circuits that are given supply voltage and various special circuits.

EXPERIMENT NR: 1
EXPERIMENT TITLE: MAKING THE TRUTH TABLE OF THE AND GATE

The set and the measuring gadgets used in the experiment:

1- Y-0020-01 Experiment set
2- Digital voltmeter

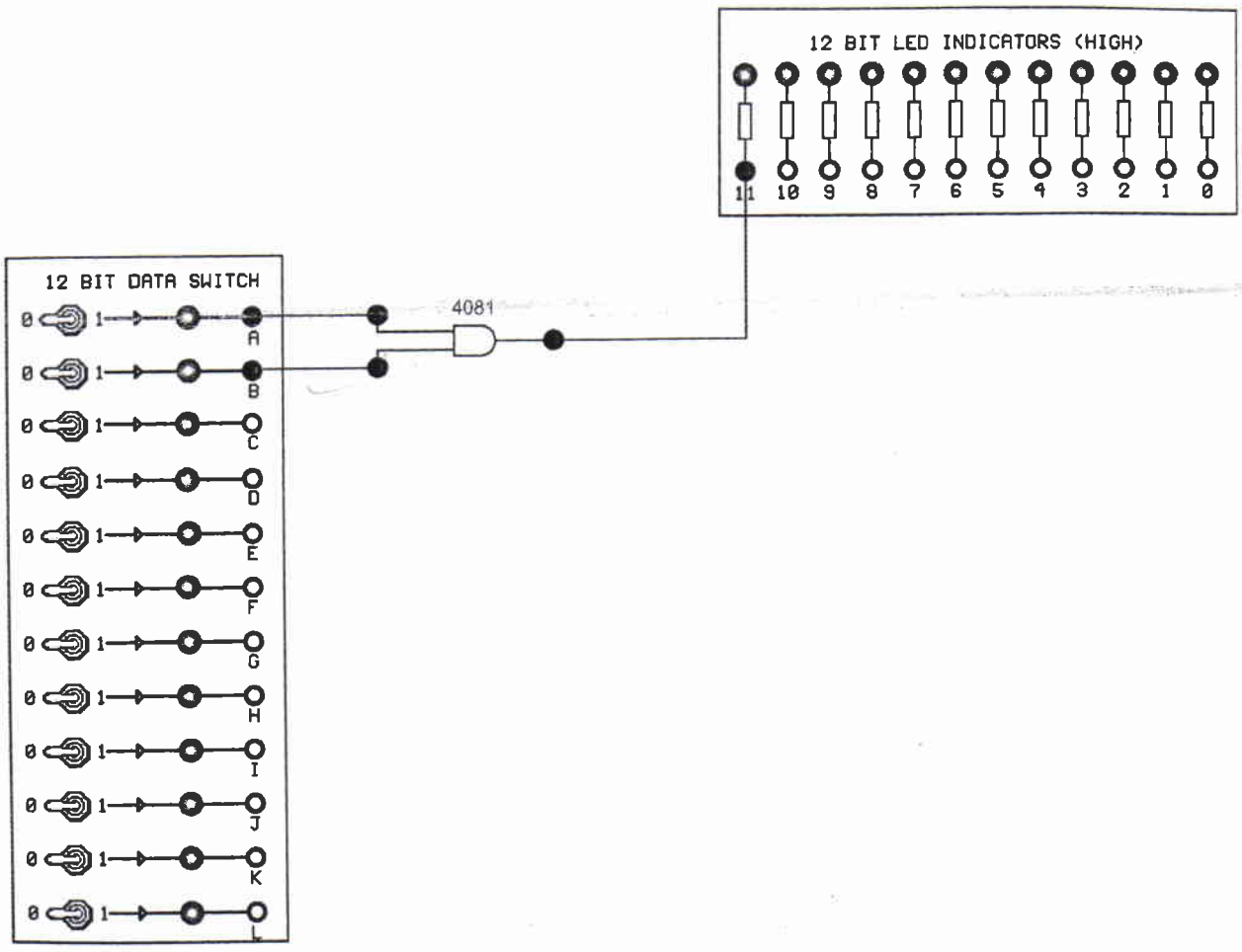

Figure.1.4

INPUT		OUTPUT
A	B	Y=A.B
0	0	0
0	1	0
1	0	0
1	1	1

Table.1.3

EXPERIMENT NR: 2
EXPERIMENT TITLE: MAKING THE TRUTH TABLE OF THE THREE-ENTRY AND GATE

The set and measuring gadgets used in the experiment:

1. Y-0020-01 Experiment Set
2. Digital Voltmeter

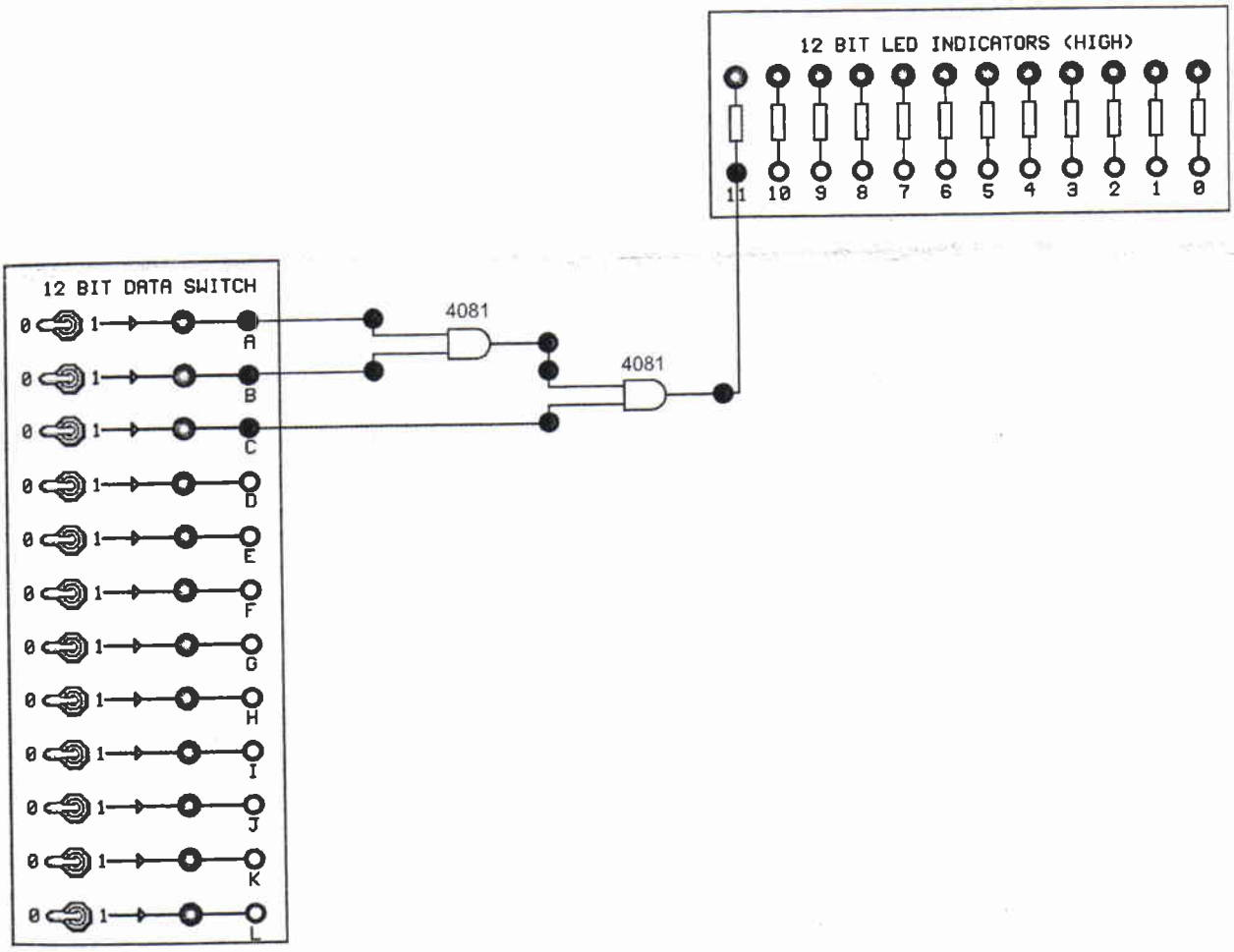

Figure 2.1

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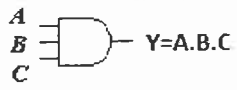

INPUTS			OUTPUTS
A	B	C	Y=A.B.C
0	0	0	
0	1	0	
1	0	0	
1	1	0	
0	0	1	
0	1	1	
1	0	1	
1	1	1	

Table 2.1

The steps of the experiments:

1. Apply the power by setting the circuit as in Figure 2.1.
2. Make sure that all the three inputs are "0."
3. Determine the logic level at the three-entry output gate with a light indicator and mark whether it is "1" or "0" on the Table 2.1.
4. Measure the same output with a voltmeter and indicate its voltage.
5. Repeat the 3rd and 4th steps for all input levels on the Table 2.1 and write them down on the table.
6. When is the output logic "1"?

Only when only three inputs are "1"

7. Is the truth table of the three-entry AND door obtained according to results in Table 2.1?

Yes, it was.

8. Construct a four-entry AND door.

EXPERIMENT NR: 3
EXPERIMENT TITLE: MAKING THE TRUTH TABLE OF AN OR GATE

The set and measuring gadgets used in the experiment:

1. Experiment Set Y-0020/01
2. Digital Voltmeter

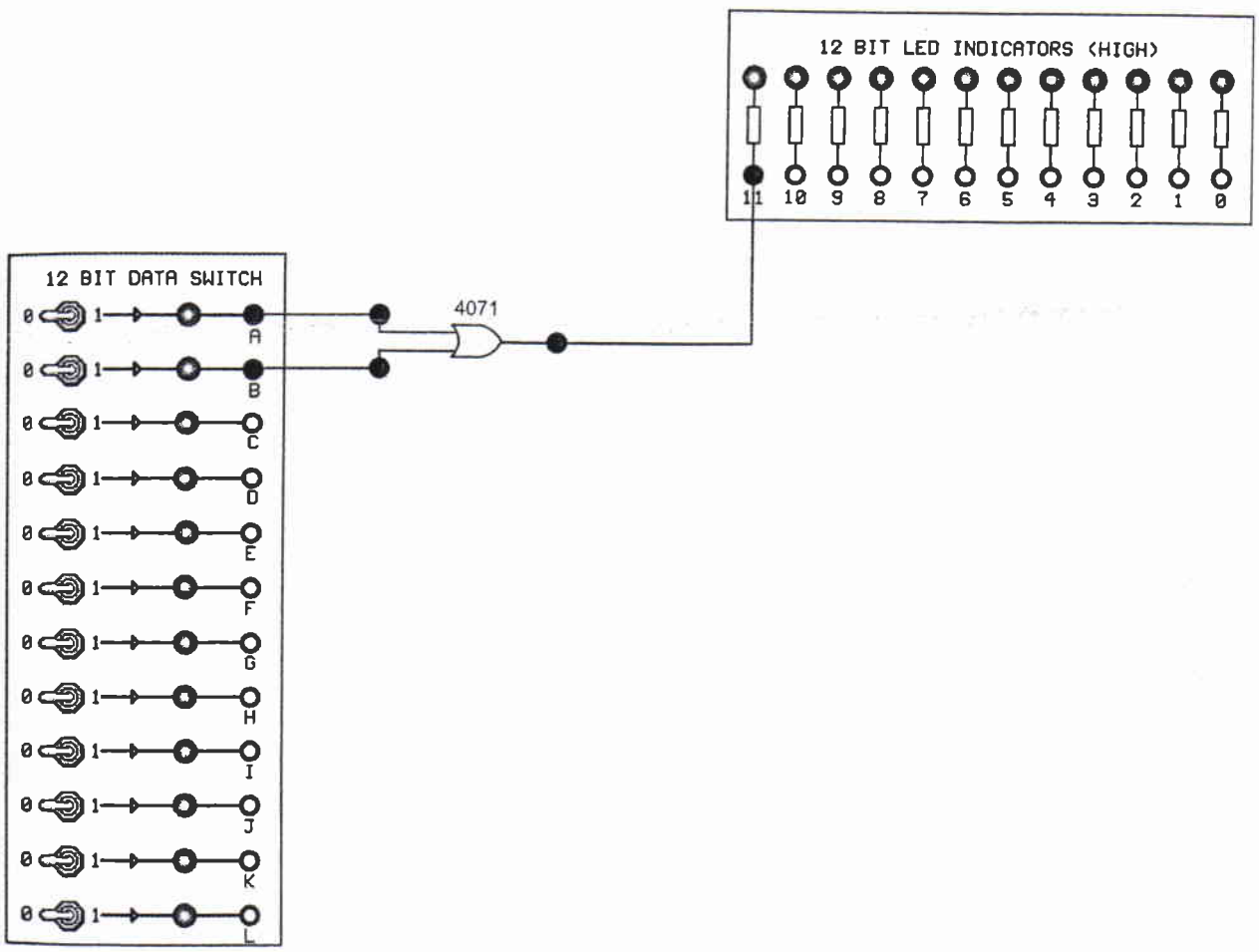

Figure 3.1

UTPUT		INPUT
A	B	Y=A+B
0	0	
0	1	
1	0	
1	1	

Table 3.1

EXPERIMENT NR: 5
EXPERIMENT TITLE: MAKING THE TRUTH TABLE OF THE INVERTER GATE

The set and measuring gadgets used in the experiment:

1- Experiment set Y-0020/01

2- Digital Voltmeter

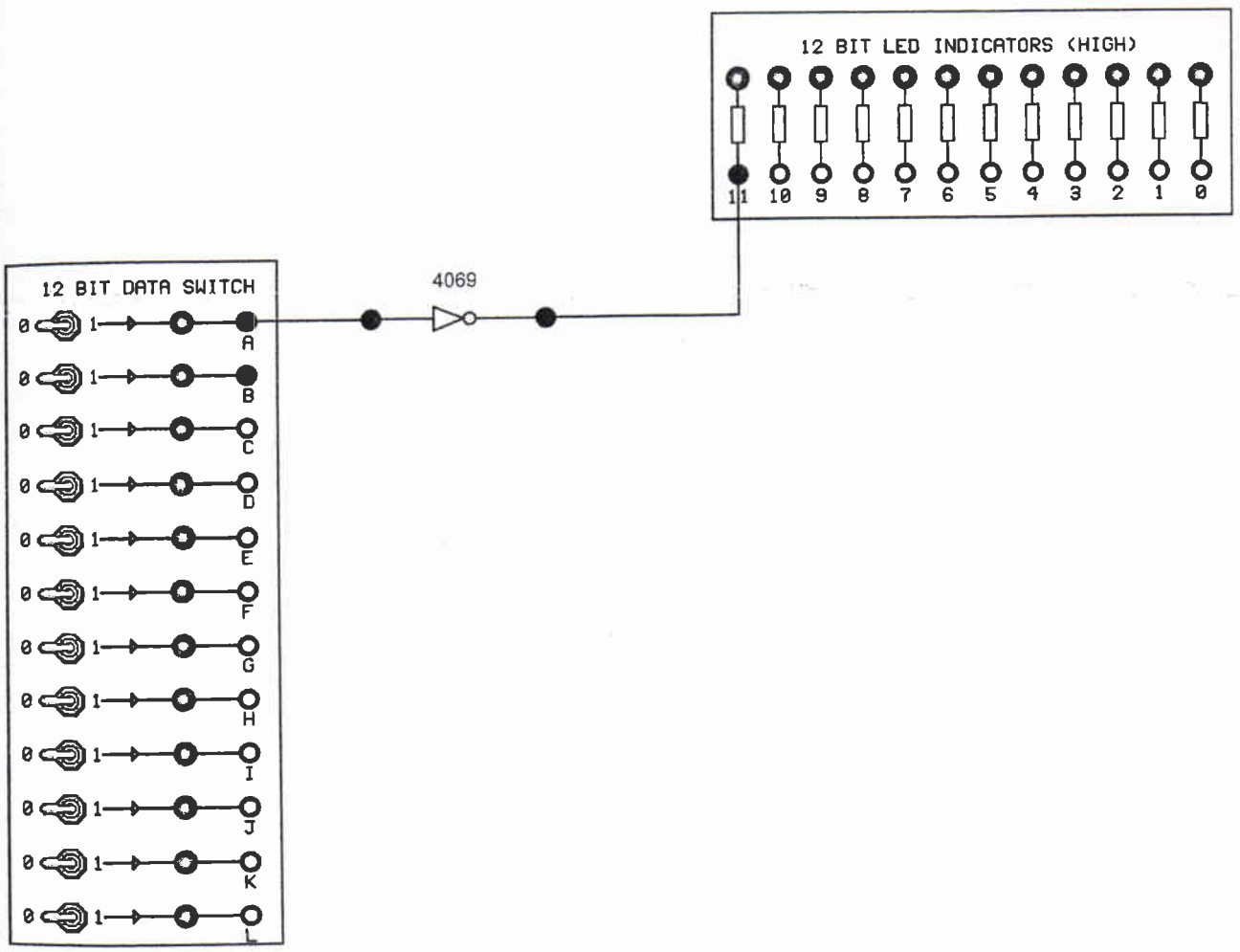

Figure 5.1.1

INPUT	OUTPUT
0	
1	

Table 5.1.1

EXPERIMENT NR: 8
EXPERIMENT TITLE: MAKING THE TRUTH TABLE OF A NAND GATE

The set and measuring gadgets used in the experiment:

a) Experiment set Y-0020-01

b) Digital Voltmeter

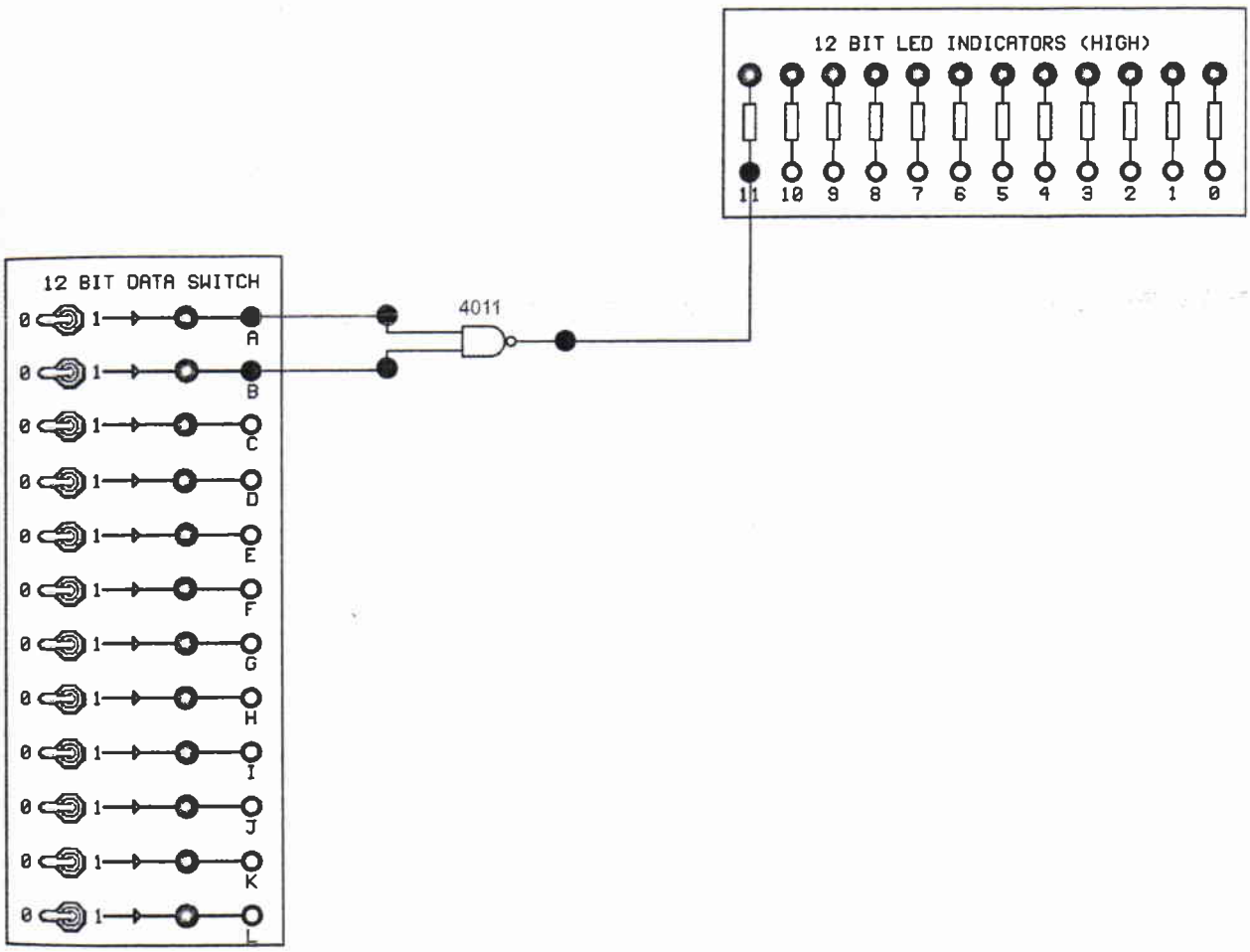

Figure 8.2

INPUT		OUTPUT
A	B	(Y=A.B)'
0	0	
0	1	
1	0	
1	1	

Table 8.2

EXPERIMENT NR: 11
EXPERIMENT TITLE: MAKING THE TRUTH TABLE OF THE NOR GATE

The set used in the experiment:
1- Experiment set Y-0020-01

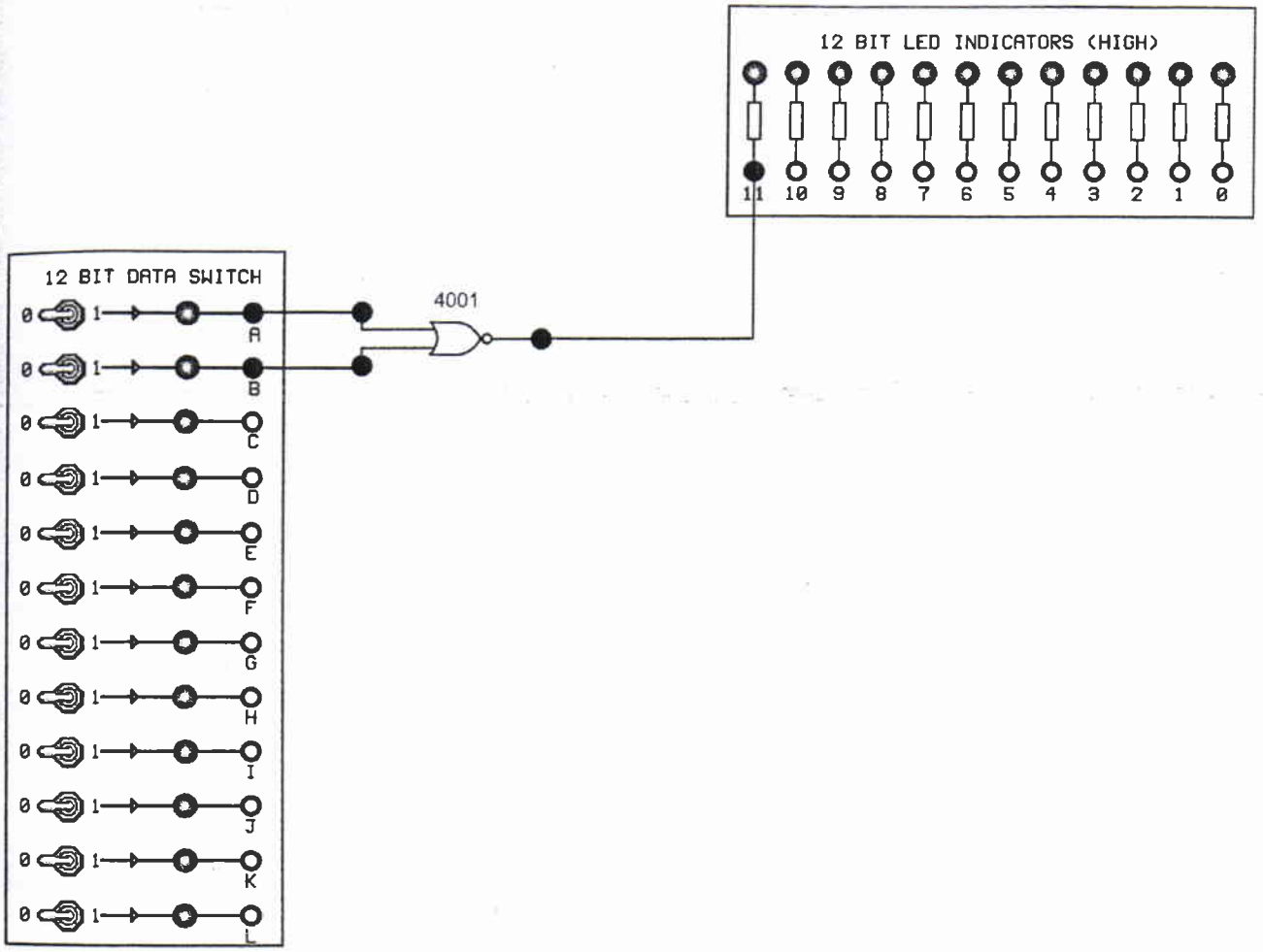

Figure 11.1

INPUTS		OUTPUTS	
A	B	Y=A+B	Y=(A+B)'
0	0	**0**	
0	1	**1**	
1	0	**1**	
1	1	**1**	

Table 11.1