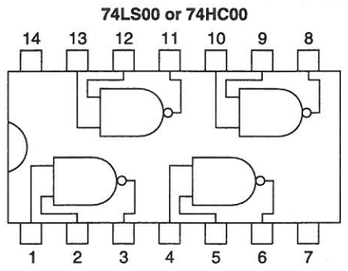
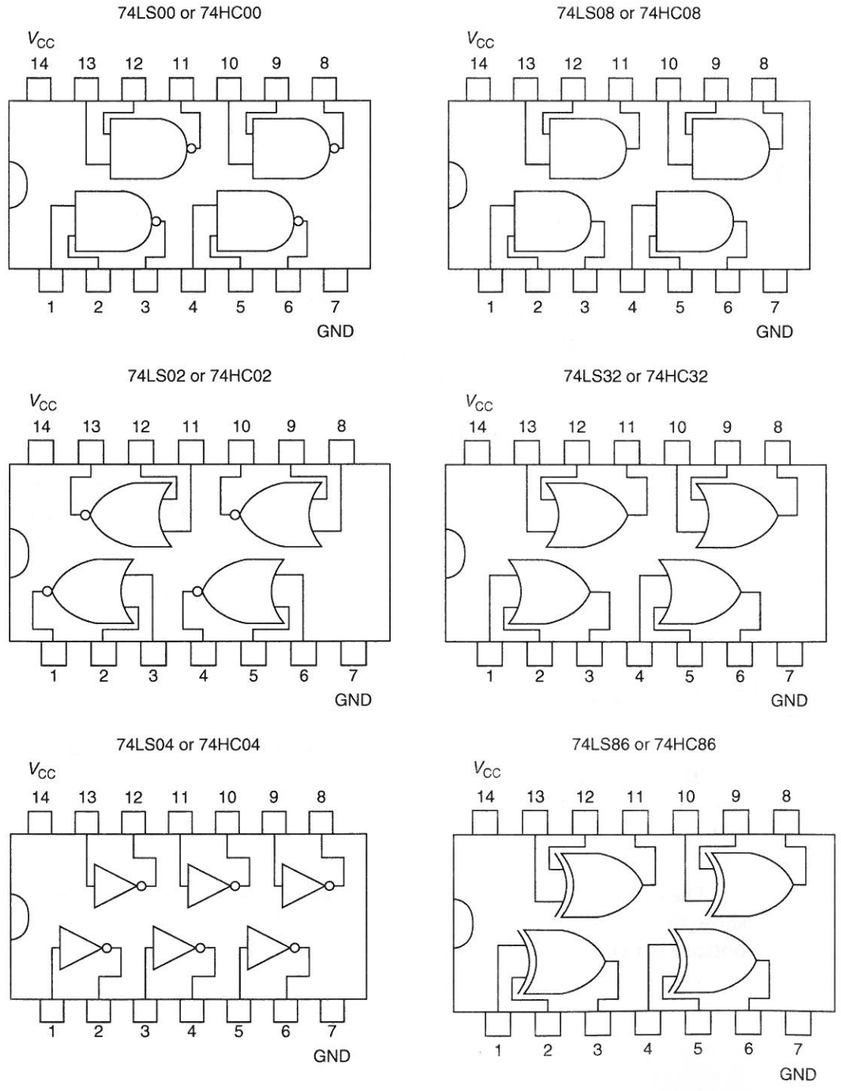


Figure 3.1 DIP IC (Quad 2-Input NAND)

Figure 3.2 shows the internal diagrams of gates listed in the Equipment Required section. These can be found in manufacturer's datasheets describing the devices. In addition to the gate inputs and outputs, there are two more connections to be made on each chip: the power and ground connections. V_{CC} (pin 14) must be connected to +5 volts and GND (pin 7) to ground to provide power supply connections. ***The gates won't work without these connections.*** Logic levels at the other pin inputs are derived from these power supply voltages by connecting them to +5 volts for logic 1 and ground for logic 0.

Figure 3.2 Pinouts of Some Basic Logic ICs



A **truth table** of a digital logic gate or circuit is a table showing the gate or circuit output for all possible combinations of inputs. These ***must*** be shown in standard binary order. Table 3.1 shows an example of a truth table for one of the NAND gates from Figure 3.1.

Note that the input combinations count up from 00 to 11 in binary. This is the standard order for all truth tables. Truth tables for other gates would have the same input pattern and a unique output pattern.

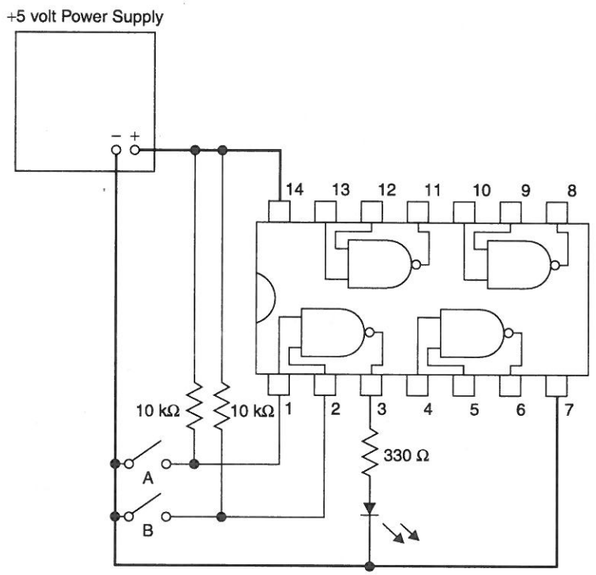
Table 3.1 Truth Table

A	*B*	*Y*
0	0	1
0	1	1
1	0	1
1	1	0

Procedure

1. Insert a 74LS00 or 74HC00 quad 2-input NAND gate into the circuit breadboard. Connect pin 14 to V_{CC} (the + terminal of the +5-volt power supply) and pin 7 to ground (the – terminal of the power supply), as shown in Figure 3.3.

Figure 3.3 Testing a Gate in a DIP IC (Without a Digital Trainer)



2. If you are not using a digital trainer with logic switches and LED indicators, connect one end of a single-pole single-throw (SPST) switch to ground and the other end to pin 1 of the NAND IC. Connect the junction of the switch and pin 1 to V_{CC} through a 10-kΩ resistor. This represents input A of the gate. Make a similar connection to pin 2 of the IC for input B.

   Note If you are using a digital logic trainer with logic switches and LED indicators as shown in Figure 3.4, you may use those instead of the switches and LED shown in Figure 3.3. In this case, the resistors are not required. Simply connect pins 1 and 2 to the pins associated with the logic switches. If in doubt, ask your instructor.

3. If not using a digital trainer, connect pin 3 of the NAND IC to an LED through a 330-Ω series resistor or to the pin for an LED indicator on a digital trainer. The cathode (indicated by a short lead or by a flat spot on the LED case) should go to ground. If you are using a logic trainer, the series resistor is not required. Simply connect pin 3 of the NAND IC to the LED on the trainer.