

# **NX-4i** Digital circuit experiment board

---

## Features :

- I Dual DC power supply
  - ±12V 1A and ±5V 1A with Short circuit protection and indicators
- I 8-ch. Logic switch with indicators
- I 16-ch. Logic monitor
- I 2-Debounce switch
- I 3-State TTL Logic probe
  - Indicate Hi-Low Logic and Pulse
- I Function generator
  - 1Hz to 100kHz frequency output.
  - Button Selection with Frequency range indicators.
  - 3 Waveform selection :
    - Sine, Square and Triangle
    - Complete with a TTL output
- I Binary to Hexadecimal decoder
  - to four 7-segment LEDs
- I 8-Bit Analog to Digital Converter
  - Maximum input voltage +5V
- I Adjustable 0-5V Voltage reference source
  - for Analog to Digital Conversion experiment
- I 8-Bit Digital to Analog Converter
  - Output of 0 to +5V R-2R ladder type
- I Breadboard
  - Measuring 5" x 7"
  - Point contact 1,600 points
- I 7-segment LED in Common Anode and Cathode
  - 2 digits with limit-current resistor each
- I 250mW Audio Amplifier
  - with 250mW 8Ω Speaker
- I 8-ch. High-Current Driver
  - +12V 500mA Load driver
  - Supplied with Screw terminal block

---

## Includes :

Experiment board, AWG#22 Wires, Instruction leaflet, Lab book, Simple Digital ICs for multiple experiments.

# How to use the tools on NX-4i Digital Circuit Experiment Board

---

## 1. How to use the power supply

On the NX-4i board has 4 DC supply : +12V, -12V, +5V and -5V regulated. The connecting of DC supply can do directly and DC voltage has the common ground. All output has short circuit protection that cut-off the terminal suddenly if short output is occurred. The warning sound will be loud and indicator turned-on to report experimenters.

## 2. How to use the Function Generator

### 2.1 Waveform Selection

Press WAVEFORM button and see the Waveform indicator. Press until indicator target on. For example, if would like to select SINE, press WAVEFORM button until SINE's indicator on. In Squarewave and Triangle waveform selection are same method.

### 2.2 Frequency Selection

2.2.1 Target frequency is 500Hz. Press RANGE button until x100 Range's indicator on.

2.2.2 Connect output of Function Generator to Oscilloscope. Adjust AMPLITUDE knob to center. See the output waveform at Scope's display

2.2.3 Adjust FREQUENCY knob until the waveform's frequency is the target value.

### 2.3 Amplitude Adjustment

Turn AMPLITUDE knob until the waveform's amplitude level is target value.

## 3. How to use the Amplifier

3.1 Connect the Output of Amplifier and Ground to SPEAKER input terminal near the Amplifier.

3.2 Apply the input signal to Amplifier input.

3.3 Turn VOLUME knob to the target level.

### Warning

3.4 Must connect Amplifier's output to Speaker input before apply the input signal.

3.5 When finished, must disconnect or remove all circuit wires from The Amplifier and Spaeker input.

## 4. How to use the logic switch

To select logic "1" -press logic switch until LED-red show status logic "1". It supply +5V at output point, that means logic "1"

To select logic "0" -press logic switch until LED-green show the logic status "0". Output voltage is about 0.8V, it equal logic "0"

## 5. How to use the logic monitor

This tool is shown the logic status. On this board has 8 channels which enough for all digital circuit experiments.

At default, the all input are pulled down to ground. The LED output off that mean logic "0" occur.

To test the logic level in the circuit, connect the input point to a test point on the circuit. Observe the result at the LED monitor.

Light ON mean the point under test has logic status"1"

Light OFF mean the point under test has logic status"0"

*Attention: The logic monitor can use with every digital circuit, which use supply voltage +5V or TTL level.*

## 6. How to use the TTL logic probe

6.1 Connect input "IN" to the examined point

6.2 If the green light at "LO" turn-on, the examined point will be logic level "0"

6.3 If the red light at "HI" turn-on, the logic level equal "1"

6.4 If the yellow light at "PULSE" blink, in the same time light at LO and HI blink together. It shows the changing of unstable logic level or it occurs pulse at this point.

## 7. How to use the debounce switch

It's used for supplying the single perfect square-wave pulse for the digital circuit. There is 2 outputs; following,

7.1 *Rising edge pulse output* - if the switch is not pressed, the logic level will be "0". If press the switch, it will be "1" up to press it.

7.2 *Falling edge pulse output* - if the switch is not pressed, the logic level will be "1". If press the switch, it will be '0" up to press it.

It is noticed that, logic switch, logic monitor and debounce switch can work suddenly, do not use/connect the ground line.

## 8. How to use the LED 7 segment decoder (Binary to hexadecimal decoder and display)

This tool's function is decoding binary data to hexadecimal data and drive to LED 7 segment for displaying. *On this board has 4 units.*

At default, the display show "0" because all inputs is pulled-down to ground. It causes the all inputs receive "0" data.

To use, fed data signal into DCBA inputs and "dp" input, in case wants to use the dot point of LED 7 segment. For driving the dot-point in LED, connect the positive voltage (+5V max.) at "dp" point.

*Thus, please notice like logic switch and logic monitor. It can connect suddenly, don't connect the ground line.*

## 9. How to use the variable voltage reference 0-5V

On the NX-4i board has the variable voltage reference 0-5V for the analog to digital converter experiment. The voltage can connect directly and use the common ground.

The adjusting is very easy. Experimenter can turn the knob of variable resistor to change the voltage value. The experimenter can check the voltage level by connected the multi-meter which selected in DC voltage range at point + V, it will show the changing of the voltage 0-5 V followed by adjusting.

## 10. How to use the Analog to Digital converter circuit (ADC0804)

This tool is specially. It is designed for ADC experiment convenience.

1. Connect D0-07 digital data output to the logic monitor.
2. Fed DC voltage that wanted into input "Ain" and can fed voltage not over than +5V and the voltage does not DC supply voltage. For recommend using from variable voltage reference 0-5V on this experiment board. If use voltage input more than +5V, please connect pass attenuator circuit on this experiment board for protection ADC circuit
3. Connect WR input to ground or fed logic "0" into this input
4. Adjusted voltage input at Ain. Observe the changing at the logic monitor.
5. *If want to keep this value*, change the logic at WR point to logic "1"
6. *If want to convert the new value*, connect WR point to ground.
7. *In case, the automatic conversion*, connect the WR point to INTR point. When the analog input changes, the digital data output will change together.

## 11. How to use digital to analog converter circuit

Same the ADC circuit, this tool is designed for DAC experiment convenience.

1. Connect D0-07 digital data input to the logic switch or other digital data generator.

2. Connect the "Aout" output into voltmeter or oscilloscope or the other analog instruments as you want.

3. Fed data or digital signal as you want.

4. Observe the changing result from analog signal instrument. If connect voltmeter, it show voltage value since 0-5V (approximately) from digital data 00000000-11111111.

5. Can be conversed new value all time.

## 12. How to use the Free LED 7 segments

On the NX-4i board prepares 2 pairs of LED 7 segments; separated by common anode type and common cathode type (1 pairs per type). Convent for test circuit involved figure output.

Method :

1. Connect the a-g and pt input to digital signal directly. Because LED 7 segment has connected the limit currency resister already.

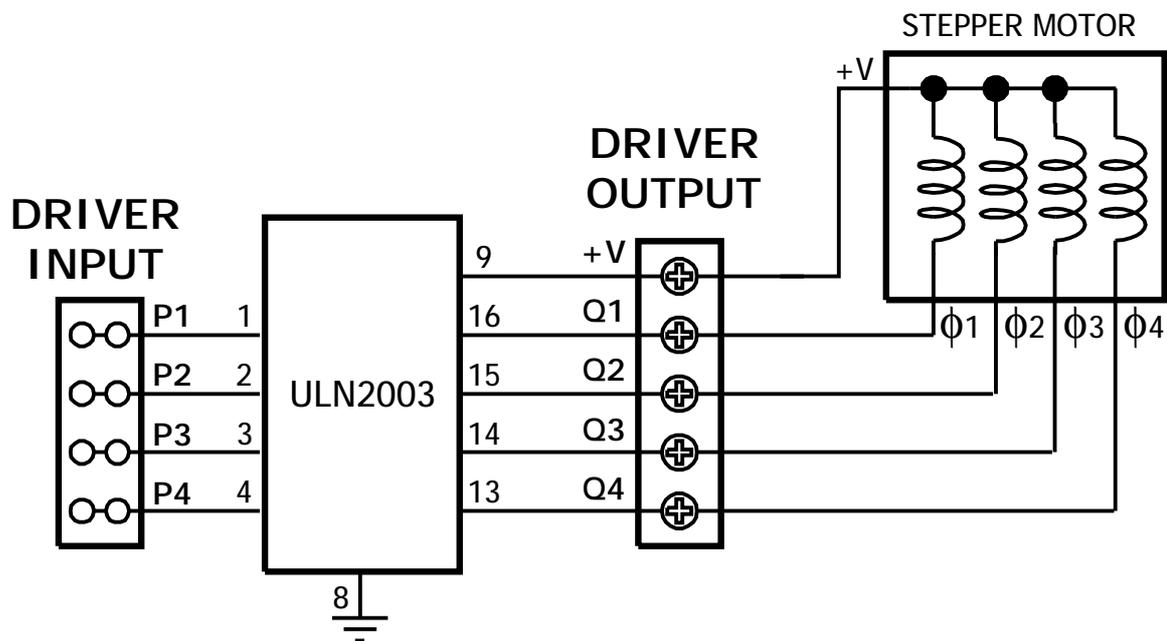
2. In case, to use LED 7 segment common anode type have to connect the COM input of LED 7 segment to +5V volatge or logic signal"1"

3. In case, to use LED 7 segment common cathode type have to connect the COM input into ground or logic signal"0"

## 13. How to use 7-channels high current driver

On NX-4i board provides the special tool for experiment about high current driver such as stepper motor driver. It has 7-channels of high current open collector driver. The heart of this circuit is ULN2003 driver-IC.

Experimenters can connect digital signal to input of ULN2003 directly. At output, it has terminal block for connecting high current load such as +12V unipolar stepper motor. At output terminal block has 7 ULN2003's output and +V. Sample stepper motor connection circuit for experiment see below.



Copyright 2002-2006 by Innovative Experiment Co.,Ltd.



