

EX-51 plus

Universal MCS-51 microcontroller Experiment board

Feature

Microcontroller Section

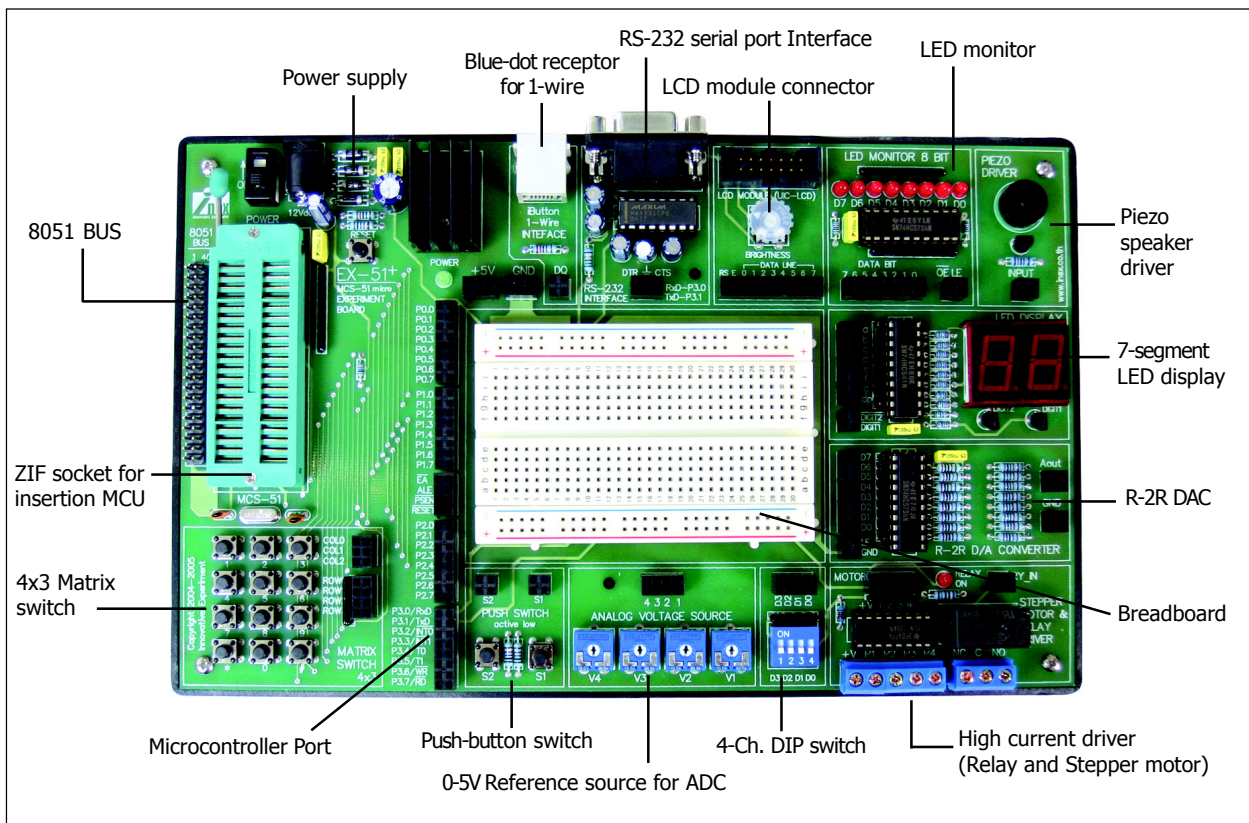
- 40-pin ZIF socket for insertion microcontroller. Support 40-pin DIP package MCS-51 microcontroller
- 8051 BUS direct connection from MCS-51 microcontroller pin
- 11.0592MHz clock
- Port connector (Port 0, 1, 2 and 3). For Port 0 connect pull-up resistor ready to use.
- Necessary pin connector for connect external memory included : EA, PSEN, ALE and RESET

Experiment tools

- +12V (unregulated) and +5V regulated
- 4x3 Matrix switch with pull-up resistor
- 2 of Push-button switch with pull-up resistor
- 4-ch. DIP switch with pull-up resistor
- 4-ch. 0 to +5V Reference source for ADC experiment
- Relay driver circuit with 12V relay and Uni-polar stepper motor driver circuit
- 8-bit Digital to Analog Converter circuit, R-2R ladder type with latch enable
- 7-segment LED display 2-digit in common cathode with buffer circuit
- Piezo speaker driver circuit
- 8-bit LED monitor with latch enable
- RS-232 Serial port interface. TxD and RxD connected to P3.1 and P3.0 of MCS-51 microcontroller. Addition DTR and CTS pin for more application
- LCD module connector for connect LCD module with contrast adjustment. Support 16x1 to 16x4 type
- Breadboard 2.5x3.5 Inches. 390 point contact for making circuit addition
- +12V 500mA external supply from DC adaptor
- Size : 9x5.5 Inches

Packing List

- Experiment board
- Documentation
- 16x2 LCD module with cable
- RS-232 serial port cable
- Wire jumper box set



EX-51 plus Schematic Description

Microcontroller section

The heart of this section is P89V51RD2BN microcontroller. It is programmed via serial port. On experiment board connect P3.0 (RxD) and P3.1 (TxD) to RS-232 circuit for interface PC's serial port for download code. All port is connected to Port connector for making the project or experiment.

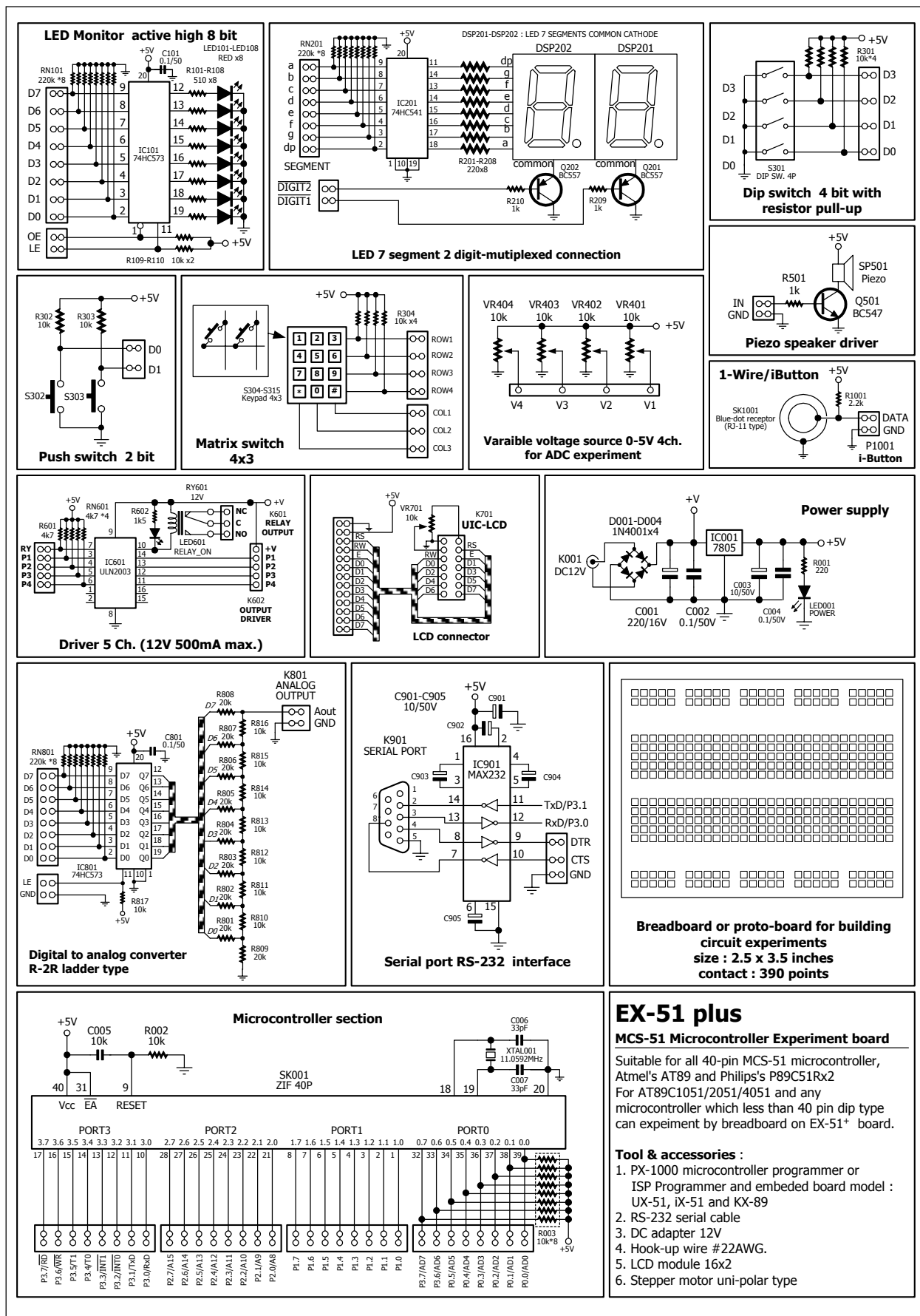
At Port 0 connected pull-up resistor then experimenters can use this port to interface external circuit ready.

At EA pin connected pull-up resistor for config microcontroller to use internal flash memory. If experimenter need to use external program memory, connect this pin to ground.

LED monitor

74HC573 Latched IC drive 8-bit LED following the data that apply to input. Normally MCS-51 port cannot drive source current enough. Latch or buffer IC need to support this disadvantage.

This circuit will operate when LE pin connected to logic "1" and OE pin connect to logic "0"



7-segment LED display

Include 74HC541 buffer, 2-digit common cathode 7-segment LED display, transistor BC557 and resistors. 74HC541 receive data from input to drive LED display each segment. LED display is connected in multiplexed and controlled by BC557 transistor.

Apply logic "0" to common pin that need to display and apply logic "1" to segment that need to display.

Switch input

Switch is the type of input device for microcontroller experiment. Two normally-open pushbuttons and four DIP switches are made available via connectors. The buttons and the switches are wired in an active-low configuration, with an pull-up resistor.

4x3 Matrix Switch or Keypad

This circuit consist of 12 push-button switch connect in matrix configuration. It is defined 4 rows and 3 columns. The pull-up resistors are connected at column lines. The switch position are defined in telephone keypad format, number 0 to 9, * and #.

0 to +5V Reference Voltage Source

For support analog experiment, NX-877 plus experiment board provides 4 channels of 0 to 5V analog voltage source to supply analog voltage for ADC circuit purpose only.

Piezo speaker Driver

Sounding device on this experiment board is Piezo speaker. It may connect with 1 to 470mF electrolytic capacitor for amplify sound level. The piezospeaker has resonance frequency at 2 to 3 kHz. If the resonance frequency apply to the piezo speaker, it sounds maximum. The amplifier device is BC547 transistor.

High current load driver

The ULN2003 open-collector driver allows the experimenter to control high-current devices like relays, solenoids, lamps and motors to the EX-51 plus experiment board. The experiment board define ULN2003's functional thus :

- 4 channels for uni-polar stepper motor driving (P1 to P4)

- 1 channel for relay driving (RY)

The current capability of ULN2003 is 500mA per channel maximum. However its depend on supply current capability.

Note that the output-high voltage must be supplied to the V+ terminal. +V on this board is approximate +12V

Digital to Analog Converter circuit

For support digital signal application, this experiment board provides 8-bit DAC circuit, R-2R ladder. It can convert digital data to analog voltage 0 to 5V.

Output voltage is very low current, not suitable to drive output load directly. The Op-Amp IC or any amplifier circuit need to amplify the output current to drive load. Experimenter can construct the amplifier circuit on breadboard that provide in this experiment board.

74HC573 latch IC is used for control the digital data input more stabilize.

LE pin must connect to logic "1" for enable this circuit.

LCD module connector

At this connector can connect with 16-characters 2-lines LCD module that bundle in experiment board set. It prepare variable resistor for LCD's contrast adjustment.

1-Wire/iButton interface RJ-11 Connector

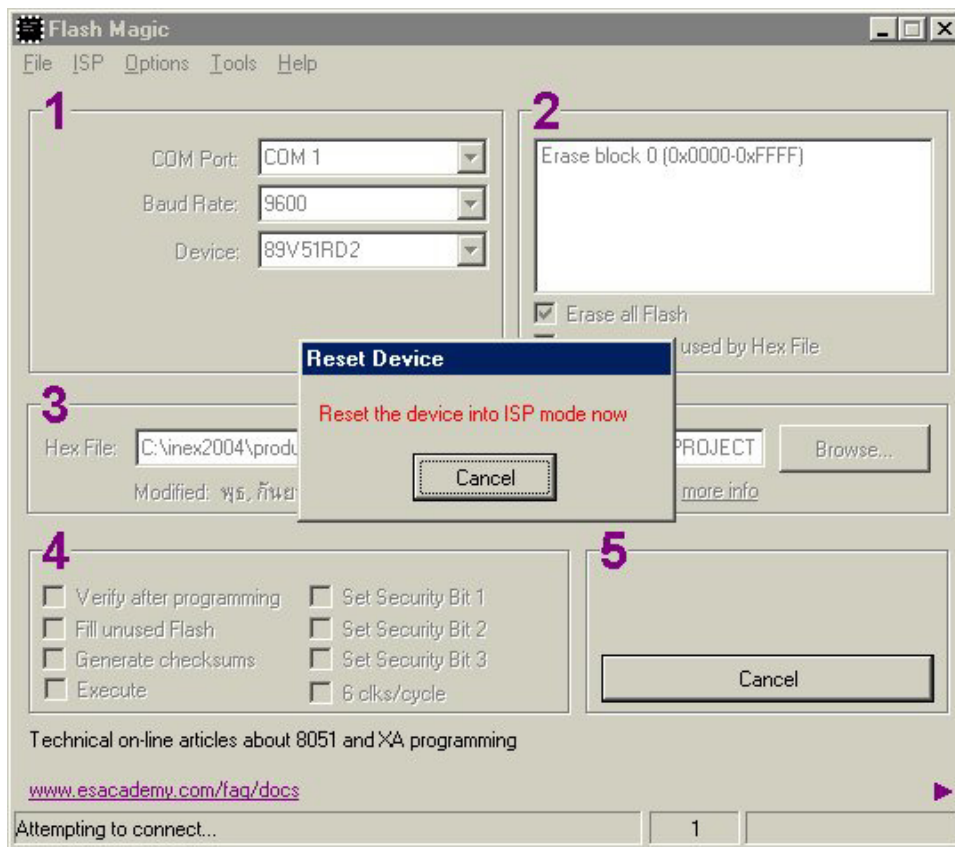
The RJ-11 connector is configured for Maxim/Dallas 1-Wire or iButton I/O. This experiment board bundle DS1402 iButton socket cable. Experimenter can plug to this jack for interface iButton device (DS1990A and DS9093F included this package).

Preparing the Solderless Breadboard

Most experiments will involve components placed in the solderless breadboard. The breadboard on this experiment board size is 2.5x3.5 Inches and provides 390 point-contacts.

Using EX-51 plus experiment board with P89V51RD2 microcontroller

- (1) Connect EX-51 plus experiment board to RS-232 serial port.
- (2) Open Flash magic (V2.0 or higher) software. Experiemnter can download latest version from www.esacademy.com
- (3) Define parameter and open HEX file.
- (4) Click START button on Flash Magic software. The warning window will appear. It inform user to reset the microcontroller to entry ISP mode.



Experimeter apply supply voltage in this time (if not apply before) or press RESET switch on experiment board (if apply supply voltage before). The warning window will close. Microcontroller will entry ti ISP mode automatic and do programming process until finish. Press RESET switch again. Microcontroller will done.

