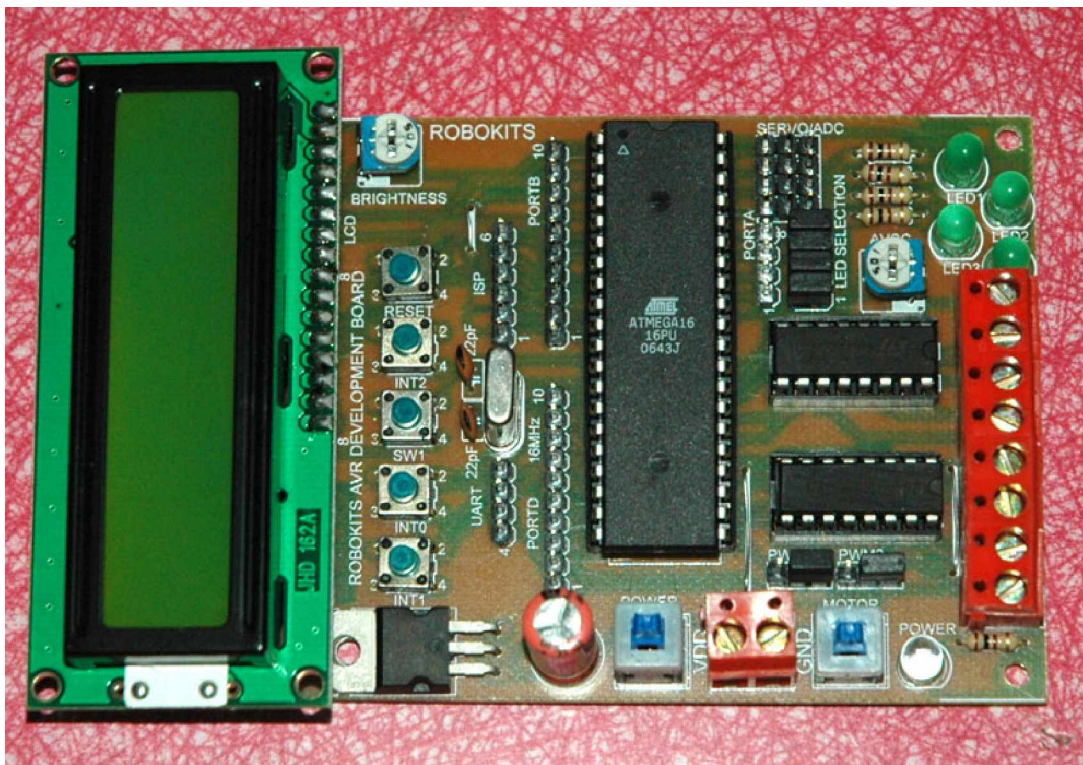


# AVR 40 Pin Rapid Robot controller board



# User Manual

# Robokits India

<http://www.robokits.org>

[info@robokits.org](mailto:info@robokits.org)



Thank you for purchasing the AVR 40 Pin Rapid Robot controller board. This unit has been carefully engineered and tested to provide superior performance. This document covers the features and operation of the AVR 40 Pin Rapid Robot controller board.

This is an easy-to-use board using the popular Atmel ATmega16/32 microcontroller. The board includes everything you need to learn, develop or using for a robotic application. It is ideal for any kind of autonomous or manual controlled robot.

## Features

- Small Size : 93 x 71 mm
- Can be easily power from an AC – DC source or Battery
- On Board Regulator with filters and Operating voltage from 6V - 20 V
- 4 LED's selectable though individual jumpers
- 5 Switches including reset
- 3 Switches on interrupt pins
- Power on/off toggle switch
- Motor on/off toggle switch
- 16MHz crystal for maximum speed
- AREF setting potentiometer
- Onboard LCD connector compatible to HD44780 LCD Modules
- LCD brightness control
- Frosted Blue Power Indicator
- 4 DC/2 Stepper motor driving capability
- PWM pins connected to motor drivers for speed control of motors
- Full Speed/PWM Speed control selection jumpers
- 4 ADC/Standard servo compatible connectors
- All Pins accessible through male header with standard .1" header pins
- Serial Programmer and PC-MCU serial link included
- All required connectors included.
- Programmer, Serial port and Power Supply are provided externally which helps keeping the board size small.

## Optional items

- LCD Module HD44780 compatible
- AVR Microcontroller (Selectable among None, ATmega16 and ATmega32)
- PC-MCU link (Selectable among none, serial and USB port)
- AVR programmer (Selectable between none, serial, parallel and USB port)
- Motor Drier L293D(Selectable between none, one or two)

## This Product Includes

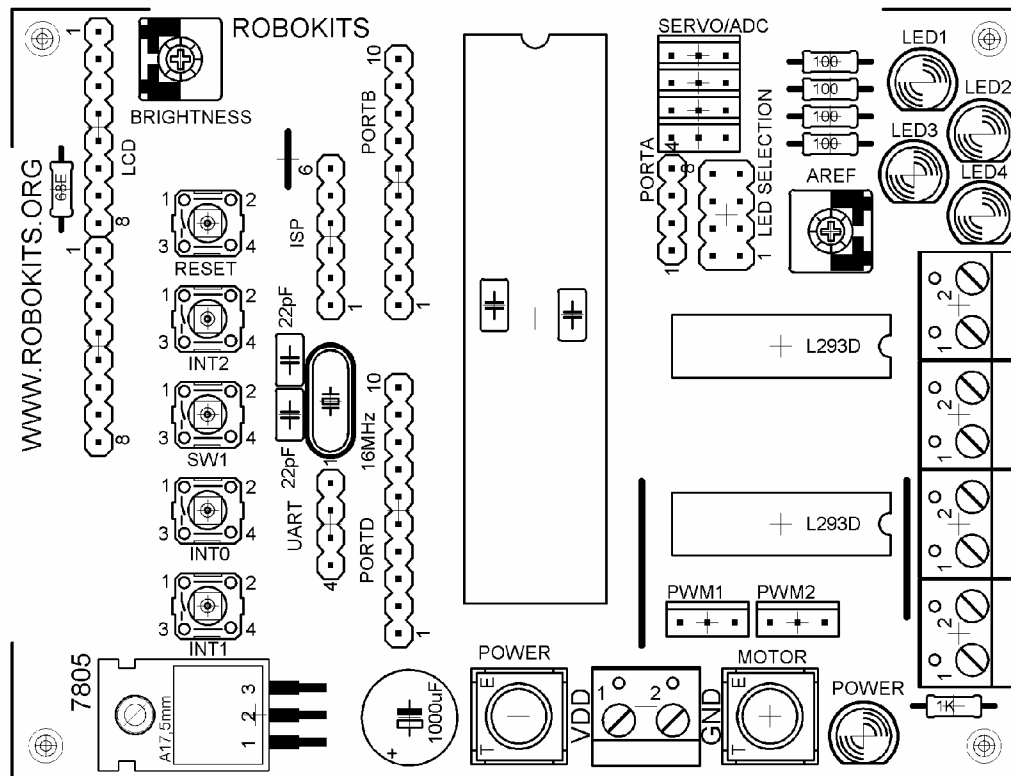
- AVR 40 pin Rapid Robot Controller Board
- CD containing all required software's and sample codes in WINAVR

# Setting up the Board

## Providing Power Supply

- You can provide the power supply to the board from any DC source from 6V to 20V.
- The microcontroller is preprogrammed for Blinking LEDs, printing ROBOKITS INDIA on the LCD and running all motors in one direction with motor1 and motor2 changing its speed. Blinking LED's will change the duration of blinking by press of all four switches. This is the default program provided on CD in folder named Default.
- To provide the supply from AC adapter with red wire going to VDD terminal and white wire going to GND terminal.
- To power up the board using any DC source use VDD terminal as +VE terminal and GND as -VE terminal.
- Be careful while applying power otherwise the regulator IC will blow up.
- To give supply other than power supply provided open the screws, insert the supply wires and fasten them again.

## Board Top Layout



## Board Information

### Switches

- There are five small and two big switches on the board to facilitate user.
- The toggle switch written with POWER on the top is to control power supply to the board.
- The toggle switch written with MOTOR on the top is to control power supply to the motors.
- The one written Reset at bottom is a Reset switch for microcontroller.
- Switches INT2, SW1, INT0 and INT1 are connected with microcontroller pins PB.2 (INT2), PD.1, PD.2 (INT0), PD.3 (INT1) respectively.
- Three switches named INT0, INT1 and INT2 are connected to external interrupt pins for general use.
- These switches do not affect the operation of the pins they are connected with. So, you can use this microcontroller I/O pins for other use also.

### LED's

- There are five LED's on the board.
- Blue LED at the right bottom corner is power indicator.
- Rest four led's named LED1, LED2, LED3 and LED4 are connected to PA.4, PA.5, PA.6 and PA.7 respectively.
- All LED's are selectable through individual jumpers so that those pins can be used for other external purpose.
- Remove jumpers to use the Pin as normal I/O pin.

### LCD Connector

- The 16 pin male header at left top is standard HD44780 LCD module compatible connector.
- Just fix any standard HD44780 LCD module to control it through AVR.
- The connections to the microcontroller and LCD are as below.
- RS – PB.0
- RW – PB.1
- EN – PB.3
- D0 – PB.4
- D1 – PB.5
- D2 – PB.6
- D3 – PB.7
- Brightness control potentiometer is also provided to adjust brightness of LCD module.
- Remove LCD to use these pins as Normal I/O pins.



## **Motor Drivers**

- Motor driver is using L293D Integrated IC.
- Two L293D motor drivers can control upto 4 DC motors or 2 stepper motors.
- Motor output connectors are at the right side of the board.
- Two DC motors can also be controlled by PWM of AVR or at full speed by PWM1 and PWM2 selection jumpers.
- Put jumpers PWM1 and PWM2 in right side two pins to avoid speed control and achieve maximum speed.
- Put jumpers PWM1 and PWM2 in left side two pins for speed control through OC1A (PD5) and OC1B (PD4).
- If PWM is not used PD4 and PD5 can be used as normal I/O pins.
- Motor1 can be controlled by PC0 and PC1. If speed control is activated by PWM1 jumper then speed can be controlled by OC1A pin.
- Motor2 can be controlled by PC2 and PC3. If speed control is activated by PWM2 jumper then speed can be controlled by OC1B pin.
- Motor3 can be controlled by PC4 and PC5.
- Motor4 can be controlled by PC6 and PC7.

## **ISP (In System Programming) Connector**

- 6 pin male header denoted by ISP on the board is used to program AVR.
- The pins are connected to MOSI (PB5), MISO (PB6), SCK (PB7), RESET, VCC and GND.

## **UART Connector**

- 4 Pin male header denoted by UART on the board.
- Used for serial communication between MCU & PC or MUC & MCU of same or different made.
- The pins are connected to RXD (PD0), TXD (PD1), VCC and GND.

## **PORTA, PORTB, PORTD Connectors**

- All 8 port pins are accessible through male header pins
- PORTA connector has 8 pins connected to PA0..7
- PORTB connector has 10 pins connected to PB0..7, VCC and GND
- PORTD connector has 10 pins connected to PD0..7, VCC and GND

## **AREF Potentiometer**

- For setting reference voltage for ADC at AREF pin of microcontroller.

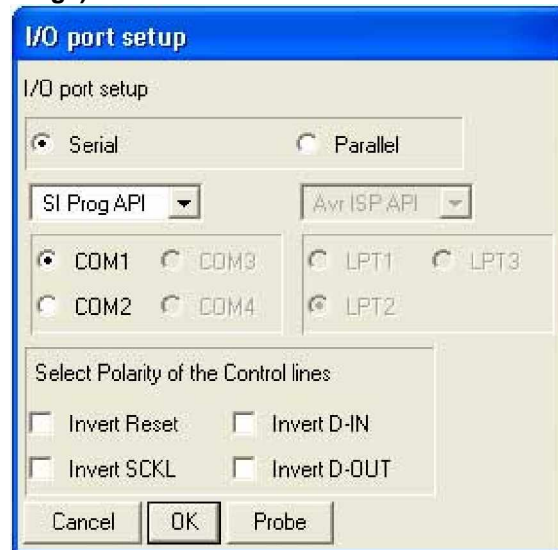


## Connecting the Serial Link

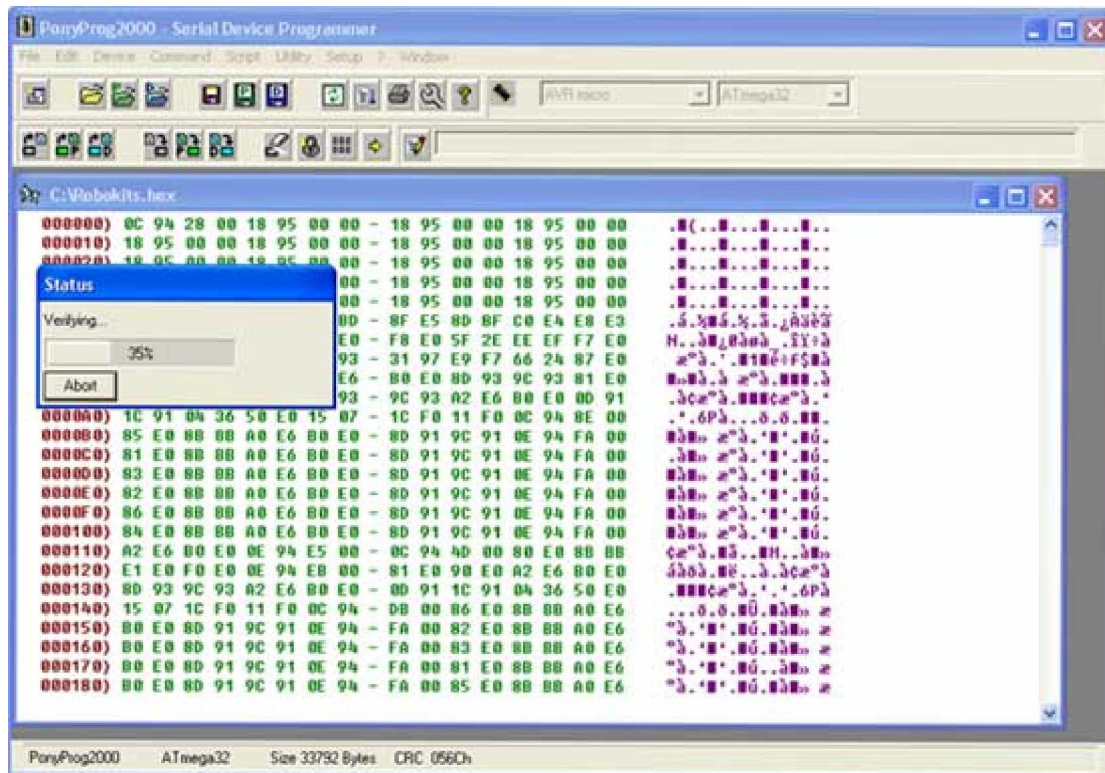
- Connect the PC-MCU serial link to serial port.
- Insert the female header in the board as shown in figure. (Keep black wire to Regulator side)
- You can communicate with microcontroller with PC software like Hyper Terminal. Set appropriate baud rate and com port to setup the communication.
- See sample code for more details.

## Programming the Microcontroller

- To program the microcontroller use the provided serial programmer.
- If any other programmer is selected please see help file of that programmer.
- Inset the programmer port to serial port of your pc.
- Inset the female header to the board as shown below. (Black wire at the Crystal side)
- You can use the programming software Pony Prog for programming. (Use following Settings)



- You can also directly program the microcontroller with WinAVR. Use tools - >Program option. If you find the error make correction in provided make file.



- To quickly program you can use Robokits.bat provided on the CD. Copy your compiled hex file and the bat file in a folder and rename the hex file as Robokits.hex. Run Robokits.bat to program the device through serial programmer.
- We suggest ponyprog to program the fuse bits. It can also be done by AVRdude. See the AVRdude manual for more information.
- If you are programming fuse bits thought AVRdude, you can use this link to calculate fuse bits. <http://palmavr.sourceforge.net/cgi-bin/fc.cgi>

## Using sample codes

- Sample codes are provided in WinAVR.
- WinAVR is free source GNU C compiler for AVR microcontroller series.
- First install WinAVR from CD.
- Open Programmers notepad which is IDE for WinAVR.
- Open any Robokits.c file provided in the CD in folder sample programs.
- Change related Makefile if using any different programmer or MCU (Need not to be changed for normal board with serial programmer).
- Use Programmer documentation which you are using.
- To compile use Tools – Make All
- To program use Tools – Program



**Service and Support**

Service and support for this product are available from Robokits India. The Robokits Web site (<http://www.robokits.org>) maintains current contact information for all Robokits products.

**Limitations and Warrantees**

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