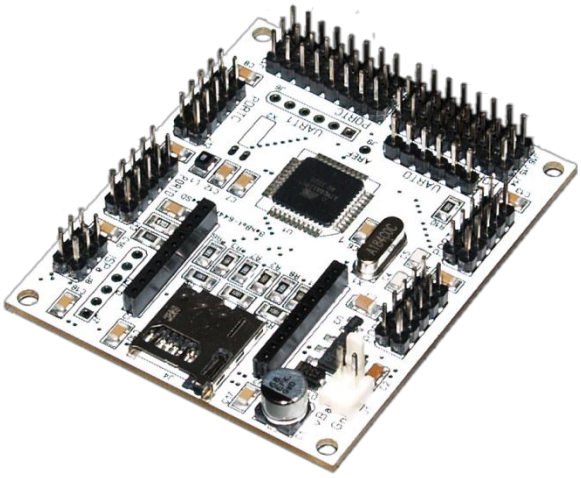
BahBots-1284P-xBeeSD Micro Controller Board

Setup and Usage Guide

BahBots.com
wrighthobbies.net



Rev 1.0
Sept 19, 2010

Introduction:

The BahBots-1284P-xBeeSD micro controller board was designed for beginners to advanced users of the Atmel AVR micro controllers. The board can be programmed in several different languages; Bascom-AVR Basic, C and others.

All examples here will use Bascom-AVR since it is the simplest to setup and get started with.

The BahBots controller is basically a breakout board for all of the features of the Atmel ATMega1284P MCU but also has more advanced capabilities making the board much more useful. Some of these features are:

- On board MicroSD socket for Fat16/32 read & writing capability
- On board socket for xBee wireless connectivity
- On board 5 volt, 1amp regulator. Power source should be between 7 and14 volts
- On board 3.3 volt regulator for xBee device and external devices like a 3.3volt GPS device. (250ma max)
- Support for remote flash programming via xBee wireless.
  Requires BahBots-USB-xBee-SBL board and two xBee modules
- Access to all GPIO Pins
- Use the on board 18.432 MHz crystals or use the internal 8MHz RC Oscillator
- Optional 32.768 KHz crystal can be added for Real Time Clock function

Powering the board:

Power for the board is connected via J1 and is recommended between 7 and 14volts (16v max!). *Note: There is reverse polarity protection on J1 to prevent damage due to a reverse connection.*

The board has a 5 volt LDO regulator that can supply a max of 1 Amp of current but should be limited to 500 mA or less without adding an external heat sink.

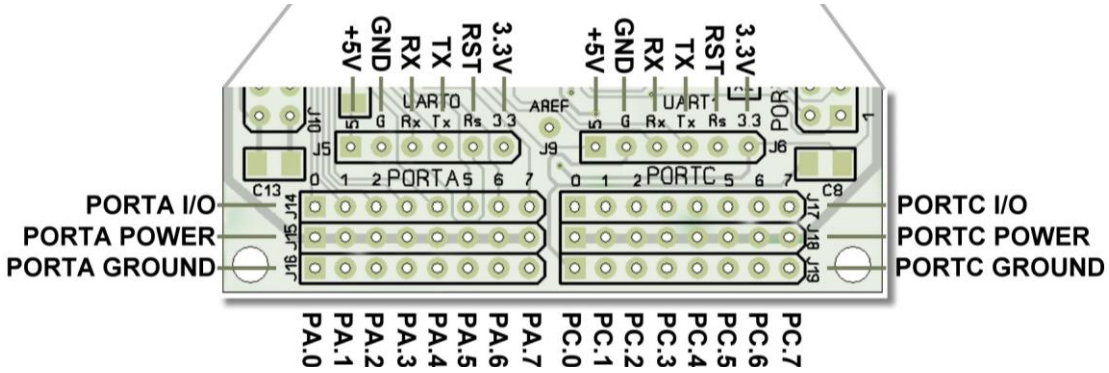
NOTE: Servos and motors can easily draw more than 1 amp during power spikes which could cause a reset on the processor so be careful not to use the 5 volt supply for servos or motors.

Powering external devices:

The controller board gives you access to the regulated 5volts at several locations. First you can access the 5volts on each of the 2x5 headers on pin 9 (+5v) and pin 10 (Gnd).

Another very useful way to access power is via the 3x8 headers on the lower part of the board. These headers are setup so that you can easily connect sensors or other devices that need one or more port pins and power to operate. An example might be a

sonar device like the MaxSonar range finder, were it needs 5volts, ground and an Analog input to the controller.

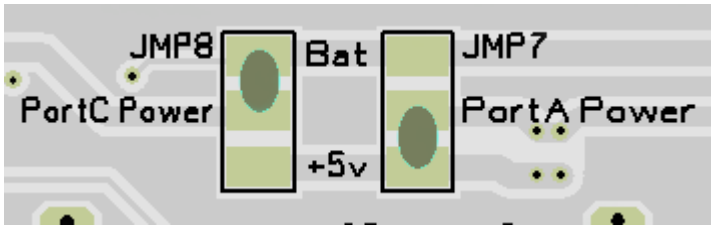


The power is connected on the lower two rows. Ground is the lower row and power is on the middle row. The individual port pins are on the top rows.

You are given the choice of connecting +5volts or connecting the vBat supply. Use vBat to connect voltage from the battery (this is before the protection diode). This will give more power to devices that need them (like servos).

Note: Power is not connected by default to these two rows.

The power is selected by placing a small solder blob between the power source and the Port power row (PortA or PortC).



In the above example we have a solder blob (light blue color) on JMP8 between the middle pad (PortC Power) and the upper pad vBat (labeled just Bat). This means that on the lower 3x8 header for PortC it will get power from vBat (the main power source).

For JMP7 we show a solder blob between the middle (PortA Power) and the lower pad (+5v). This means that on the lower 3x8 header that PortA will get the +5volt regulated power.

CAUTION: Do not solder together all three pads at the same time for either JMP7 or JMP8! Doing so will damage the board and other items connected to the board!

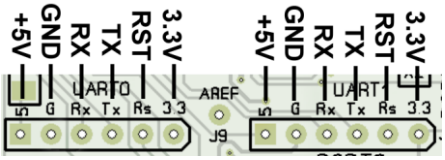
Since PortA is used for analog to digital conversions, connecting this to the regulated 5volt source might be best for most projects that require a steady power supply for

accurate conversions. PortC power bus might be better suited connected to vBat for powering servos or other items that need more power. Just make sure that the power needed is in the range of what you are intending to connect. If all you need if 5volts to all devices then just place a solder blob on the two lower pads and they will both get 5volts.

It is also possible to power external devices via the on board 3.3 volt regulator. This regulator can supply up to 250ma. **Note: This power will be shared by the MicroSD, xBee wireless device and any external device**. The 3.3volts can be accessed on pin 6 of both the UART connectors (J5 & J6). A common device that might be able to use this would be a GPS module that requires 3.3volts to operate. *See "Serial communication via UARTs" for more power connection details.*

Serial communication via UARTs:

The ATMega1284P has two TTL level UARTs which are accessible via J5 & J6.



Note: External devices connecting to the UARTs that need power can use Pin1 for 5volts or Pin6 for 3.3volts.

Wireless connection via xBee module:

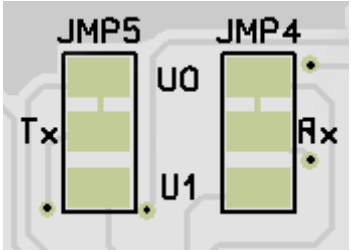
One of the more useful features of the BahBots controller is the ability to plug in an xBee (ZigBee) wireless module and communicate to a PC or other controllers without the need for wires.

Also, with the use of the BahBots-USB-xBee-SBL module you can not only communicate with the board from a PC but also remotely reprogram the AVR making development much easier!

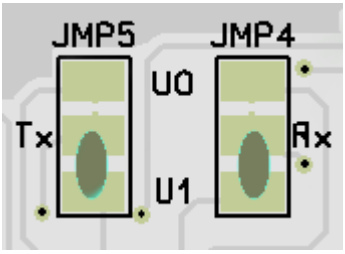
Note: For details on how to setup and use wireless remote programming see the documentation for the "BahBots-USB-xBee-SBL" board.

Jumpers for xBee UART assignment:

Since there are two UARTs, we have added solder jumpers so that you can choose which UART to connect the xBee too. The board is (by default) already jumpered to UART0 (U0). JMP5 is the Tx line and has a small trace between U0 and Tx. JMP5 has a small trace between U0 and Rx.



For projects were you may want the xBee to be able to talk over UART1, you can (with care!) cut these jumpers and then place a solder connection between U1to Tx and U1 to Tx.



If you do not intent to use an xBee module then you may want to leave both sides disconnected.

MicroSD Flash Drive:

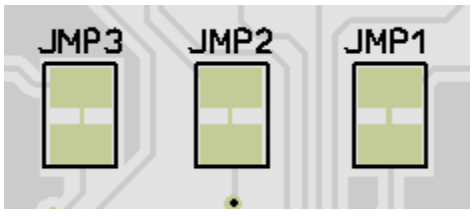
Another one of the main features of the controller board is the built-in MicroSD socket. This allows you to be able to read and write to FAT16/32 formatted MicroSD drives.

For examples on how to read and write to a MicroSD card go to the examples section on the bahbots.com web site.

Bascom-AVR has a library making it easy to read and write FAT16/32 flash drives but do to the code size limit for the free version of Bascom-AVR you will not be able to use this module.

See Bascom's site for additional info on licensing restriction of the Fat file system Library.

If you do not intend to use a flash drive but want to use the SPI interface for some other use, you may cut the jumpers JMP1, JMP2 & JMP3. These jumpers will cut out the resister dividers that are used for lowering the 5volt signals down to 3.3v for the MicroSD. Leaving them in might cause a conflict with some other SPI device or use of the GPIO pins (PB4, PB6& PB7). See Schematic on Page 8 for details.



Battery voltage monitor and Jumper:

In order to make it easy to detect the voltage of the Battery, we have included a voltage divider from vBat to PortA.7. With the use of the Analog To Digital converter (ADC) you are able to calculate the voltage being supplied to the board. This is useful for making sure to close files before power runs too low or other projects where monitoring the battery voltage is required. Refer to Table 1 below for expected voltage values on PortA.7.

Please visit http://www.bahbots.com for examples on using the battery monitor.

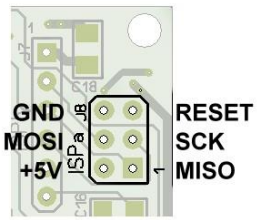
If you do not want to use this feature or want to use PortA.7 for some other purpose then cut the trace in jumper JMP6. A solder bridge can be placed on JMP6 to re-enable this feature later.

Input Voltage	Approximate Divider Voltage
14.4v	4.6v
13.8v	4.4v
12v	3.8v
9v	2.9v
7.2v	2.3v
Voltage monitor should not be used below 7.2v supply	

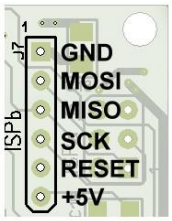
Table 1 – Voltage Monitoring

In System Programming (ISP):

The BahBots controller has two ISP connector headers for programming the board via an AVR compatible ISP cable. They are ISPa (standard 2x3 pin header) and ISPb (custom 6 pin single row header). ISPa is the standard 2x3 AVR ISP header. ISPb is provided as a convenience for custom/passive programming cables. ISPb may also be used as an SPI header.



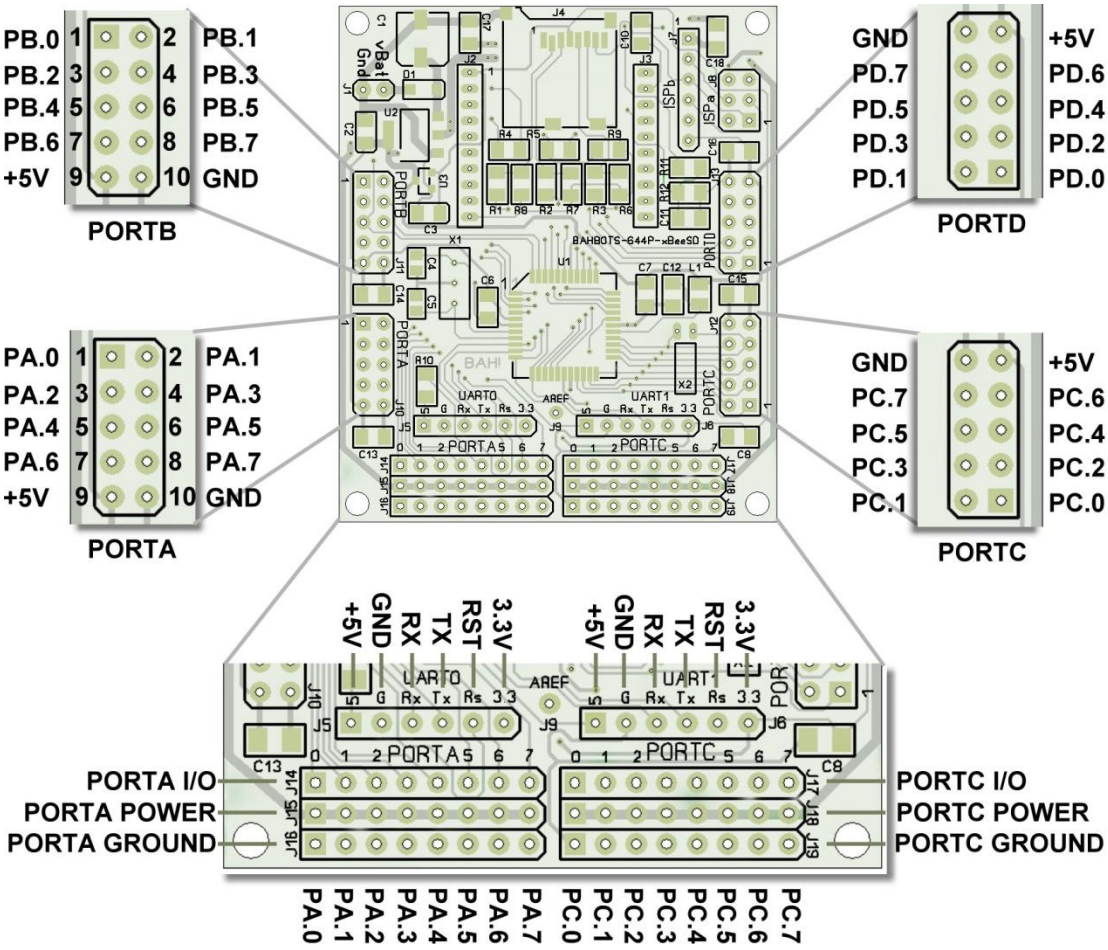
ISPa Header Pins



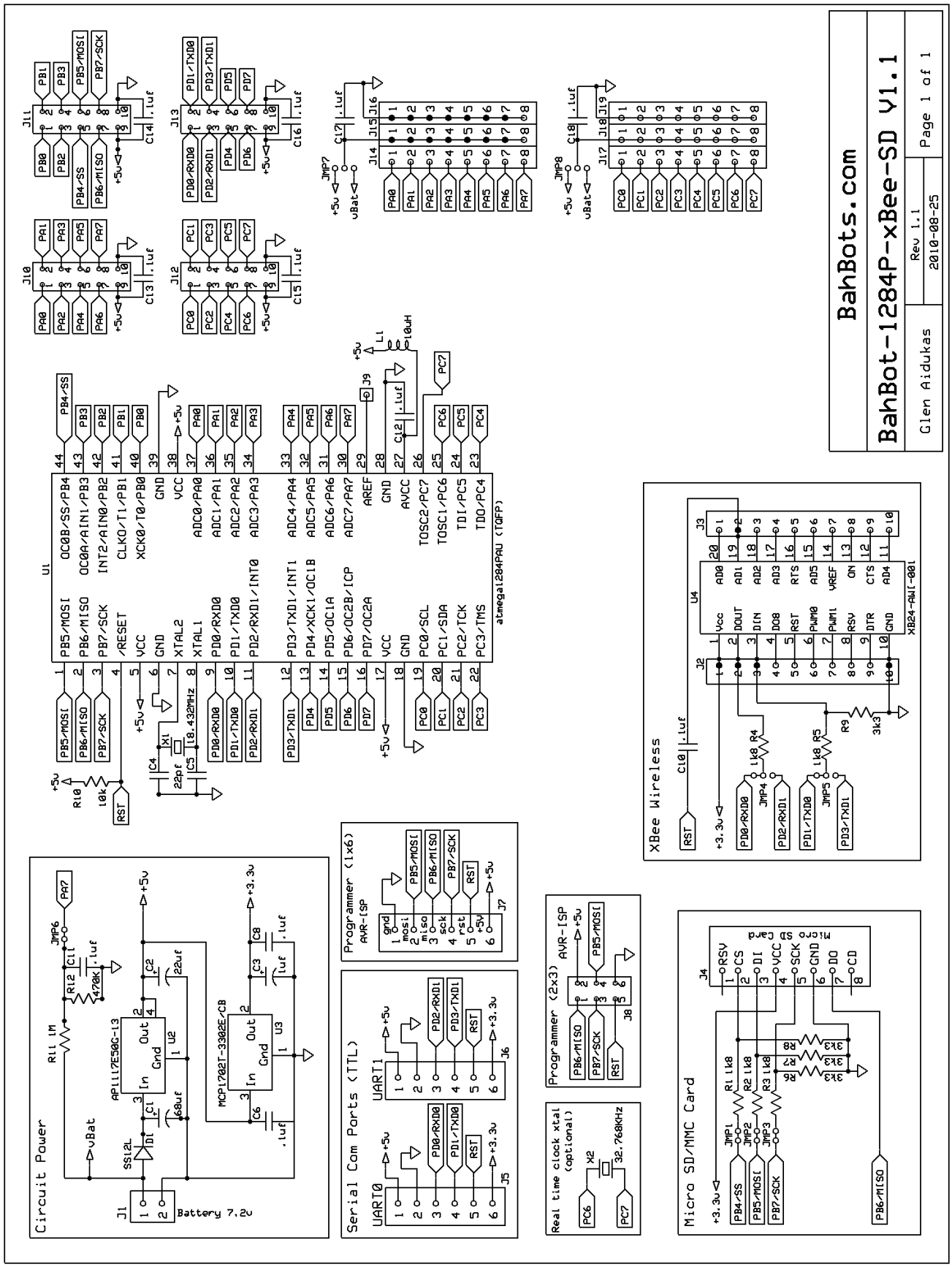
ISPb Header Pins

When connecting the ISP cable, make sure to connect pin 1 on the programmer cable to pin 1 on the header (*Note: pin 1 is designated with a square pad*).

BahBots Controller Pinouts



Schematic: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BahBot-1284P-xBee-SD V1.1
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Rev 1.1
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U1
atmega1284PAU (TQFP)
XBee Wireless
Circuit Power
Battery 7.2v
Serial Com Ports (TTL)
Programmer (1x6)
Programmer (2x3)
Real time clock xtal (optional)
Micro SD/MMC Card

Errata:

- The 5v pins on ISPa & ISPb are not connected to the board's 5 volt supply line. If you want to power these pins, place a jumper from pin 6 of ISPb to pin 9 of J13, Port D 2x3 header
- You will see the board part number referenced as either Bahbots-644P-xBee-SD or Bahbots-1284P-xBee-SD. The original design utilized the ATMega644P but was upgraded to the ATMega1284P when the MCU became available. Both part numbers refer to the same board