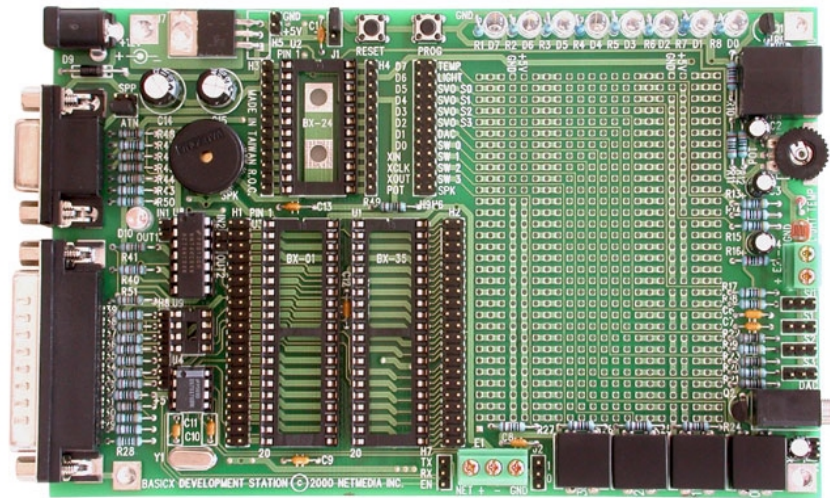


# BasicX Development Station Users Manual



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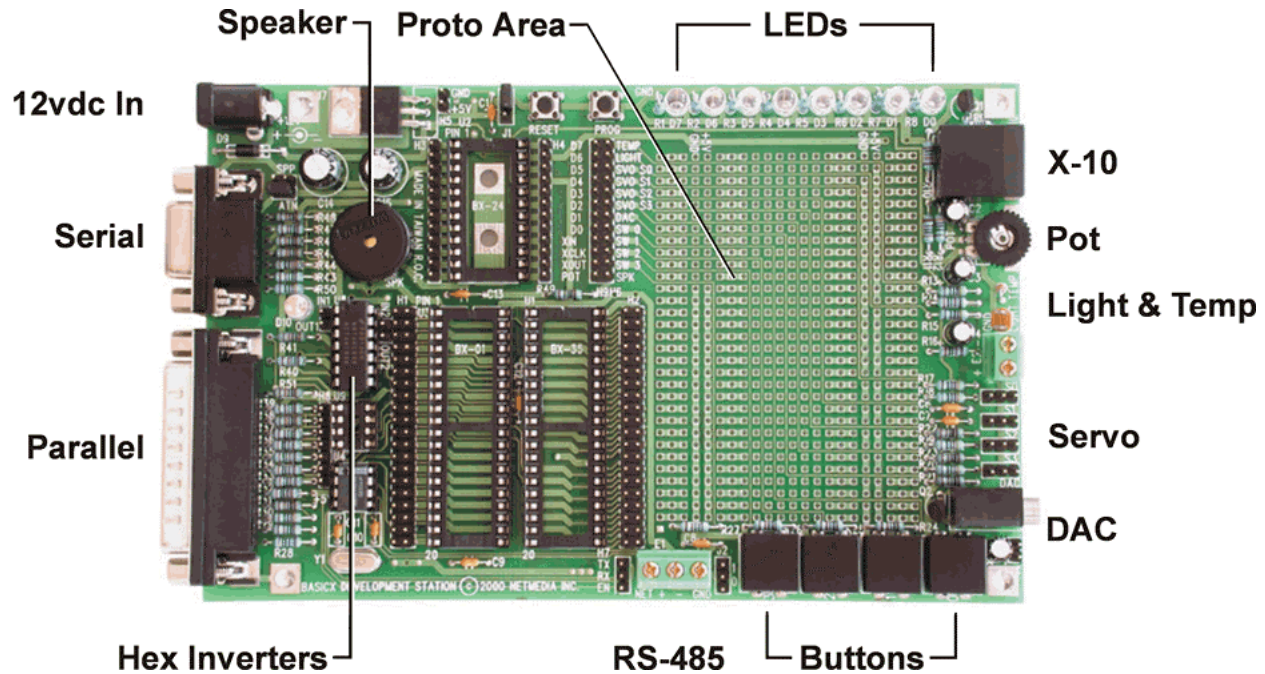
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# Table of Contents

|  |           |
|--|-----------|
| <b>INTRODUCTION</b> .....  | <b>4</b>  |
| <b>FEATURES</b> .....  | <b>4</b>  |
| <b>SUPPORTED PROCESSORS</b> .....                                | <b>5</b>  |
| <b>POWER REQUIREMENTS</b> .....                                  | <b>5</b>  |
| <b>BASICX-24 SOCKET AND CONNECTION HEADERS</b> .....             | <b>6</b>  |
| <b>BASICX-01, BASICX-35 SOCKETS AND CONNECTION HEADERS</b> ..... | <b>6</b>  |
| <b>RESET AND PROGRAM SWITCH</b> .....                            | <b>6</b>  |
| <b>ATN AND SPP JUMPERS</b> .....                                 | <b>6</b>  |
| <b>HEADER H8</b> .....   | <b>6</b>  |
| <b>DB-9 SERIAL CONNECTION</b> .....                              | <b>7</b>  |
| <b>PARALLEL PORT</b> .....                                       | <b>7</b>  |
| <b>ON BOARD PERIPHERALS</b> .....                                | <b>7</b>  |
| LEDs (D0 – D7) .....   | 7         |
| SPEAKER (SPK) .....  | 7         |
| BUTTONS (SW 0 – SW 3) .....                                      | 8         |
| SERVO INTERFACE (SVO 0 – SVO 3) .....                            | 8         |
| HEX INVERTER.....  | 9         |
| DAC .....  | 9         |
| X-10 .....   | 10        |
| RS-485.....  | 10        |
| <b>ANALOG DEVICES</b> .....                                      | <b>11</b> |
| POTENTIOMETER .....  | 11        |
| LIGHT SENSOR .....   | 11        |
| TEMPERATURE SENSOR .....   | 11        |
| <b>APPENDIX A -- SPECIAL BX-35 JUMPERS</b> .....                 | <b>12</b> |
| <b>APPENDIX B -- STAMP MODIFICATION</b> .....                    | <b>13</b> |
| <b>APPENDIX C -- CIRCUIT DIAGRAM</b> .....                       | <b>14</b> |

## Introduction

The BXDS (**B**asic**X** **D**evelopment **S**tation) utilizes a unique approach to development board design and layout. Unlike typical development boards, the Development Station's on-board features (LEDs, buttons, thermistor, etc.) are not pre-routed to the microcontroller. Instead, each of the on-board features is routed to a common 24-pin male header. From this 24-pin header the devices can be individually assigned via jumper wires to any microcontroller I/O pin.



## Features:

- Supports BX-01, BX-24, BX-35, BS2, BS2SX, BS2 EX and other future processors
- Eight controllable LEDs
- Four-servo interface supports popular hobby type servos
- Four buttons to simulate input
- On-board speaker for sound experiments
- X-10 interface supports both X-10 TX and RX
- Potentiometer for simulating analog input
- Thermistor provides an analog representation of temperature
- Light sensor for detecting light levels
- RS-485 interface transmits/receives serial data over 300-plus meters (1000-plus feet)
- Speaker output jack lets you use FreqOut and PlaySound with common computer speakers
- Two hex inverters
- DAC output

## Supported Processors

The BXDS is designed to support a wide variety of single chip microcontrollers, including BasicX-01, BasicX-24 and BasicX-35 systems. The BXDS also supports future BasicX models, as well as three different Parallax<sup>R</sup> BASIC Stamp<sup>R</sup> modules:

### BasicX processors:

BasicX-01  
BasicX-24  
BasicX-35

### Other supported processors:

BASIC Stamp II  
BASIC Stamp II SX  
BASIC Stamp II E

**Note** -- for Stamp processors, 2 pins need to be shorted on the DB-9. See appendix B for details.

## Power Requirements

The BXDS requires a power supply rated at 6 VDC to 12 VDC, 100 mA, center pole positive. A 12 VDC, 100 mA transformer is included with the BXDS kit. When power is applied, the green LED will light.

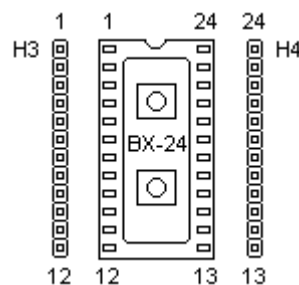
**Note:** Projects with large current loads may cause the built-in BXDS voltage regulator to become very hot. If regulator overheating becomes a problem, use a power supply with a lower output voltage, such as 6 VDC to 9 VDC.

## Testing the Jumper wires

To prevent future problems, you may want to test each of the included jumper wires for proper conductivity prior to starting your first project. Test each jumper wire using an ohmmeter or by using the wire to complete a circuit between a BXDS +5 V connection and an LED I/O pin, which will light the LED.

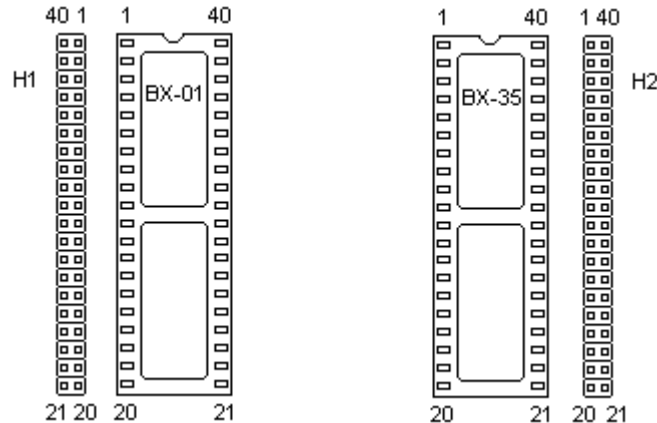
## BasicX-24 Socket and Connection Headers

BasicX-24 and 24 pin Stamp modules connect to the BXDS socket labeled BX-24. The pins of header H3 and H4 provide access to each of the installed module's 24 pins. Each header pin is electrically connected to the socket pin directly across from it (i.e. H3-1 is connected to pin 1 of the 24 pin socket). The illustration below shows the pin assignments for the BX-24 socket and its connection headers.



## BasicX-01, BasicX-35 Sockets and Connection Headers

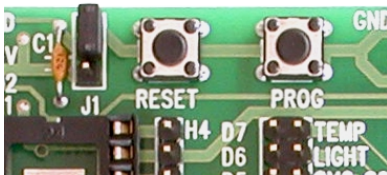
The H1 and H2 headers provide access to the pins of the BX-01 and BX-35 sockets. To maintain compatibility with the BX-01 RAMSandwich module, the pin rows of H1 are swapped. The illustration below shows the pin assignments for the BX-01 and BX-35 sockets and their corresponding headers:



**Note** – for BX-35 systems, see appendix A for special BX-35 jumpers.

## Reset and Program Switch

The momentary push button labeled “RESET” is the master reset for each of the microcontroller sockets. Jumper J1 selects the type of reset signal issued during a button press (high or low). Currently, all supported processors use a low going reset signal so no changes to J1 are required. The “PROG” button is reserved for future processors and is not currently used. The image below shows J1 in its default position (on the 2 pins nearest the outside of the board)

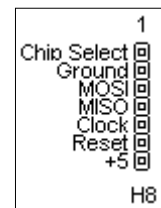


## ATN and SPP Jumpers

When in place the ATN jumper connects the DB-9 Attention line to the BX-24. The ATN jumper must be connected when programming the BX-24 or BX-35, but may be removed if the DB-9 port is used for other purposes. The SPP jumper is not currently implemented and should not be connected.

## Header H8

H8 contains the BX-01 and BX-35 socket’s SPI connections. The BX-24 is not connected to H8. The SPI header can be used to program and interface external SPI devices. The diagram on the right shows the pinout of H8.



## DB-9 Serial Connection

The DB-9 connection is used by BX-24, BX-35 and supported Stamp processors for program downloading and monitoring. This serial connection is also used by the BX-01 for program monitoring.

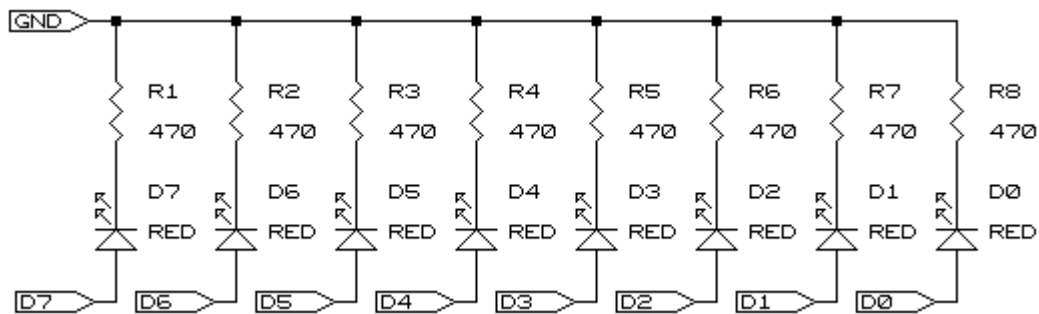
## Parallel Port

The DB-25 port is used for downloading programs to the BX-01. The DB-25 port is a programming interface, *not* a true parallel port and therefore cannot be used for any other purpose.

## On Board Peripherals

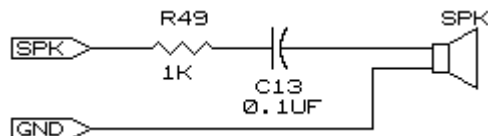
### LEDs (D0 – D7)

Each of the BXDS's eight red LED cathodes are tied to ground through a 470  $\Omega$  current limiting resistor. The LEDs are active high (i.e. applying +5 logic high to an LED I/O pin makes it light). The schematic below shows how the LEDs are connected:



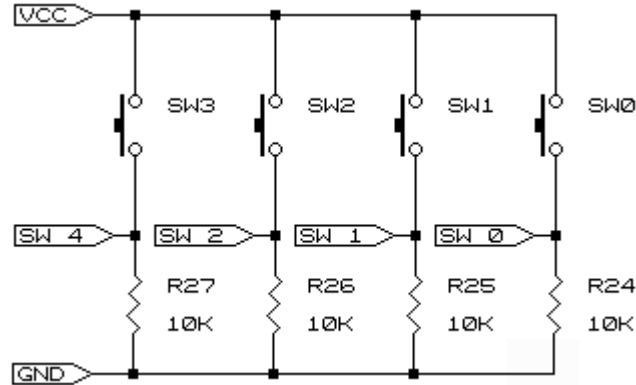
### Speaker (SPK)

The SPK I/O pin is connected to the speaker through a capacitor and resistor. This circuit transforms the digital output signal generated by the FreqOut and PlaySound functions into an analog signal. The schematic below shows how the speaker is wired:



### Buttons (SW 0 – SW 3)

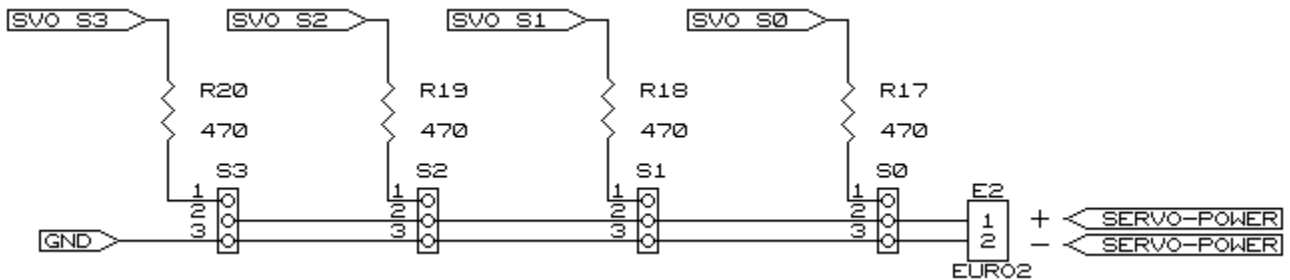
The BXDS's four momentary pushbutton switches can be used for sensing user input or for simulating I/O states when debugging programs. Each button's corresponding I/O pin will return logic 1 (high) while the button is pressed and logic 0 (low) otherwise. The schematic below shows how the buttons are wired:



### Servo Interface (SVO S0 – SVO S3)

The servo interface accepts standard hobby type servos. Servo power must be provided at terminal E2 and should be rated at 5 VDC to 6 VDC, 2 A. A smaller power supply may be used if only 1 servo is used. Pin1 (signal in) on servo connections (S0-S3) is the pin closest to the inside of the development board.

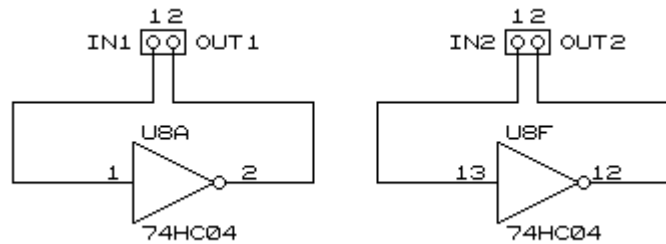
**Note:** Some older servos (mainly older Airtronics servos) have their positive and negative connections reversed. **Do not** connect these types of servos to the BXDS servo connections without first changing the servo's wiring. If you are unsure about your servo's compatibility or need help changing your servo's wiring, contact your local hobby store for assistance.





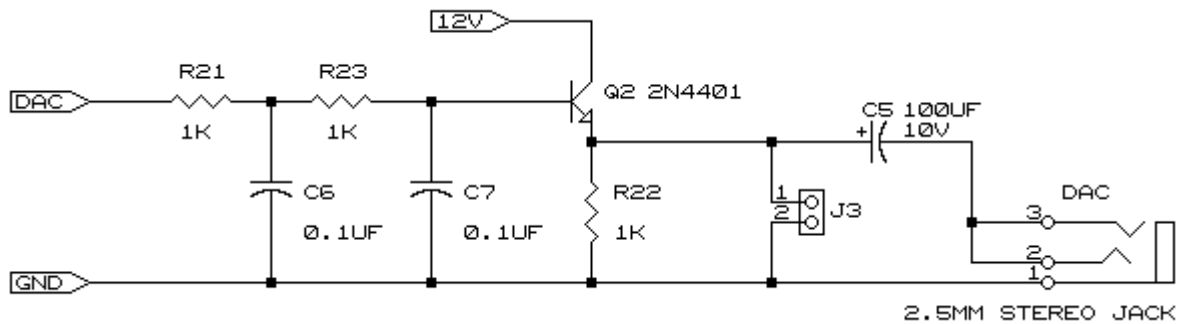
## Hex Inverter

The two onboard hex inverters (labeled IN 1, OUT 1 and IN 2, OUT 2) can be used to invert any 0 V and 5 V digital signal.



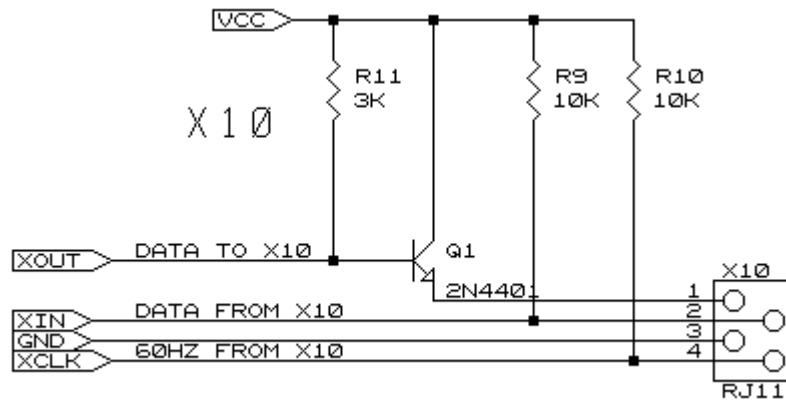
## DAC

The DAC (**D**igital to **A**nalog **C**onverter), when used in conjunction with the PutDAC, FreqOut or PlaySound functions will produce a 0.0 V to 4.3 V analog voltage. There are two DAC outputs. The first output option is the 2.5 mm stereo jack. This connection allows the DAC filtered outputs from PlaySound or FreqOut to be monitored over a pair of standard amplified computer speakers. The second connection J3 is a standard type DAC output. The schematic below details the DAC wiring.



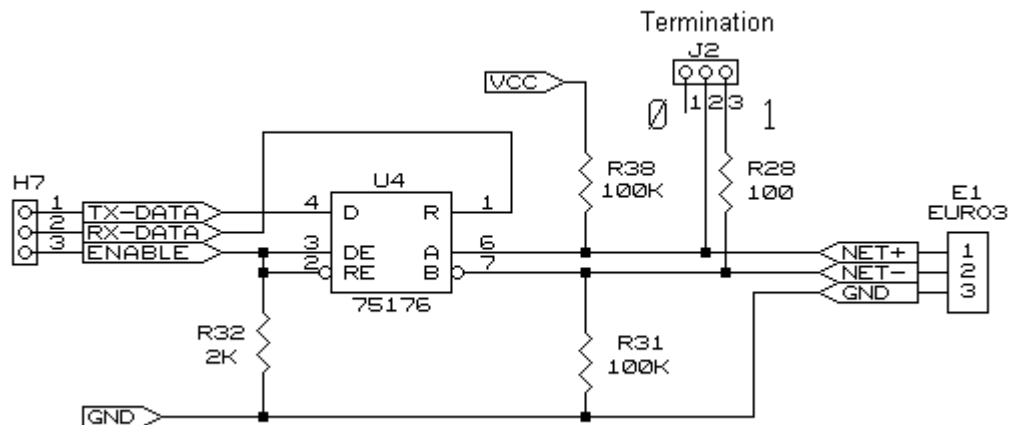
## X-10

The RJ-11 X-10 interface is designed to communicate with X-10 power line interface modules, part number TW523 or compatible.



## RS-485

The RS-485 transceiver interface converts logic level (0 V / 5 V) data signals into differential signals suitable for long distance transmission. All incoming and outgoing RS-485 data is routed through the 75176 converter chip. Data is sent and received using the TX, RX and Enable connections of H7.

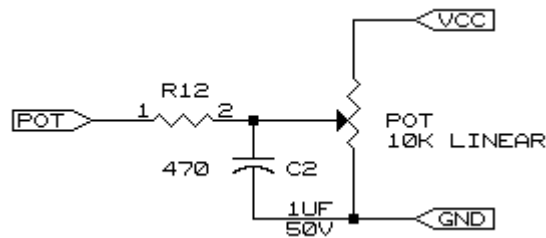


## Analog Devices

The BXDS analog devices are designed to work with microcontrollers having either true analog inputs, or digital inputs that are used in conjunction with RCTime or similar functions.

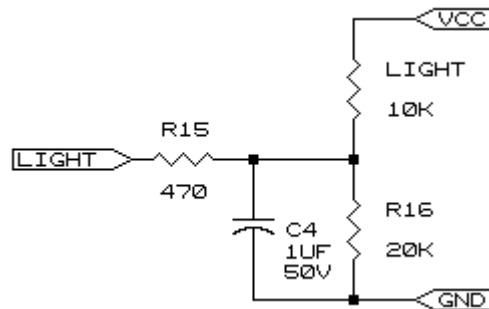
### Potentiometer

Either GetADC or RCTime can be used to read the position of the 10 k $\Omega$  thumb-wheel potentiometer.



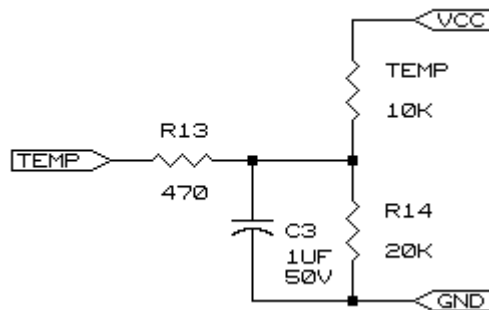
### Light Sensor

Either GetADC or RCTime can be used to read the light level detected by the photocell.



### Temperature sensor

Either GetADC or RCTime can be used to read the 10 k $\Omega$  thermistor.



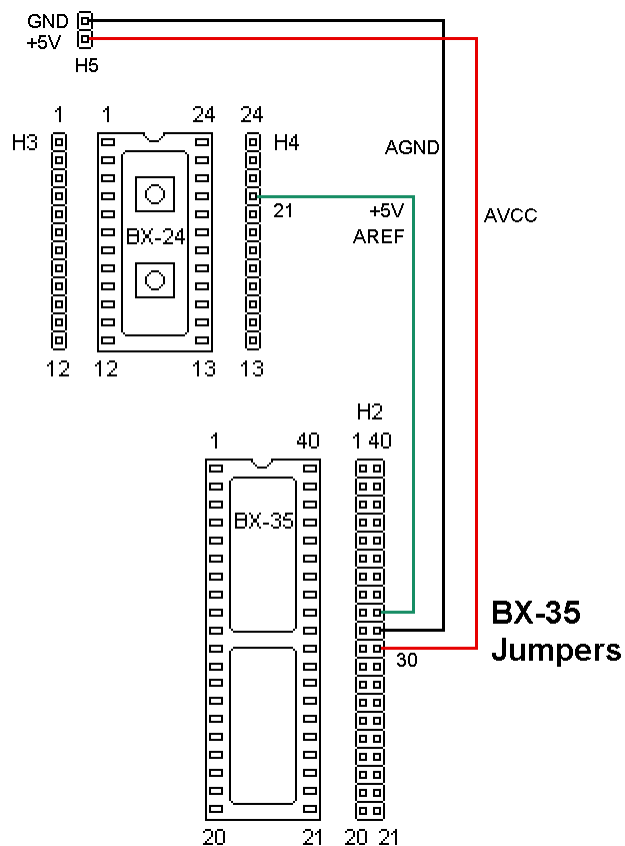
## Appendix A -- Special BX-35 Jumpers

On the BX-35, pins 33 to 40 can be used for either ADC input or digital I/O. In either case, the following pins must be connected in order for these 8 pins to function:

| Pin | Name | Function         |
|-----|------|------------------|
| 30  | AVCC | Analog VCC       |
| 31  | AGND | Analog ground    |
| 32  | AREF | Analog reference |

These 3 pins are shipped unconnected on the BXDS board in order to give you maximum flexibility for implementing a low noise analog interface. For more information, refer to Atmel documentation in file AT90S\_8535.pdf, page 64, paragraph "ADC Noise Canceling Techniques."

If you don't need any special analog noise suppression, or if you don't need ADC capability, the following jumper configuration is suggested:

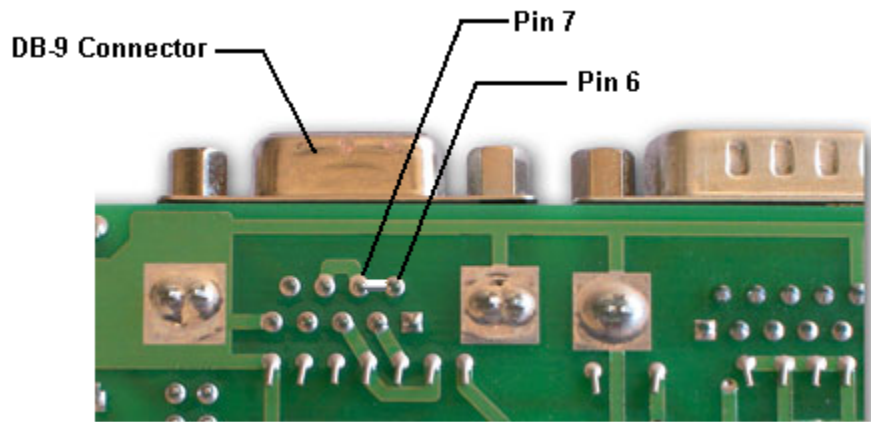


Note that pins 30 to 32 should be connected even if pins 33 to 40 are used for digital I/O. Otherwise these 8 pins won't function.

## Appendix B – Stamp Modification

To be compatible with PC software that is used to download programs to BASIC Stamps, the DB-9 serial connector needs to have pins 6 and 7 connected together.

A suggested method is to add a solder connection between traces on the BXDS circuit board as shown below (looking at the underside of the board):



### DB-9 Modification for Stamp

Note that this modification has no effect on BasicX compatibility.

# Appendix C – Circuit Diagram

