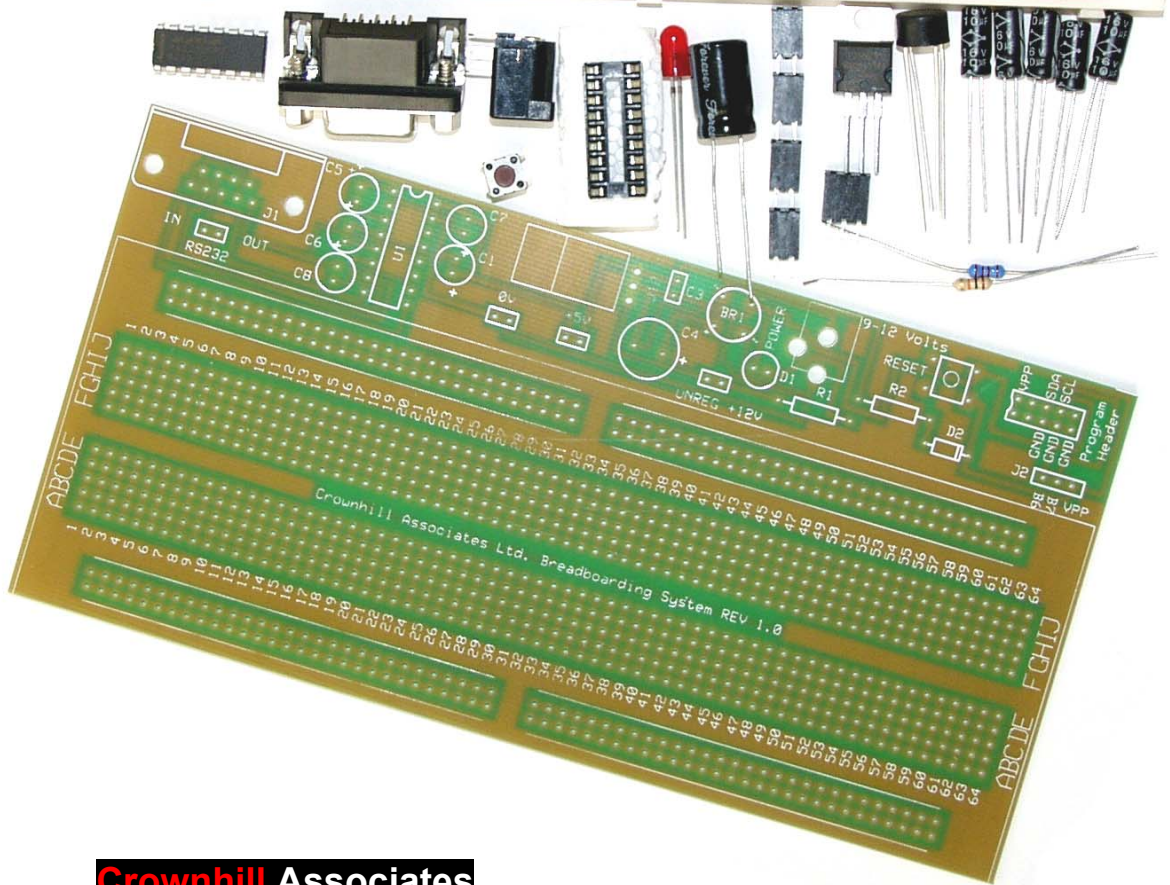


Crownhill

Breadboard Development System



Crownhill Associates
smart electronic solutions

Disclaimer

In order to comply with EMC directive 89/336/EEC, this product should not be used outside of a classroom or laboratory environment.

Any software supplied with this product is provided in an "as is" condition. No warranties, whether express, implied or statutory, including, but not limited to, implied warranties of merchantability and fitness for a particular purpose apply to this software. The company shall not, in any circumstances, be liable for special, incidental or consequential damages, for any reason whatsoever.

This product should not be used as a critical component in life support systems. Crownhill does not recommend the use of any of its products in life support applications where the failure or malfunction of the product can reasonably be expected to cause failure in the life support system or to significantly affect its safety or effectiveness.

In producing this document and the associated hardware we have spent a great deal of time to ensure the accuracy of the information presented. We constantly strive to improve the quality of our products and documentation. Crownhill operates a quality system conforming to the requirements of BS EN ISO9001 : 2000. Crownhill reserves the right to change the functionality and specifications of its products from time to time without prior notice.

If you should find any errors or omission in these documents or hardware, please contact us, we appreciate your assistance in improving our products and services.

Crownhill reserves the right to make changes to the products contained in this publication in order to improve design, performance or reliability. Crownhill assumes no responsibility for the use of any circuits described herein, conveys no license under any patent or other right, and makes no representation that the circuits are free of patent infringement. Charts and schedules contained herein reflect representative operating parameters, and may vary depending upon a user's specific application. While the information in this publication has been carefully checked, Crownhill shall not be liable for any damages arising as a result of any error or omission.

PICmicro™ is a trade name of Microchip Technologies Inc.

PICBASIC PLUS is a trade name of Crownhill Associates Ltd.

EPIC™ is a trade name of microEngineering Labs Inc.

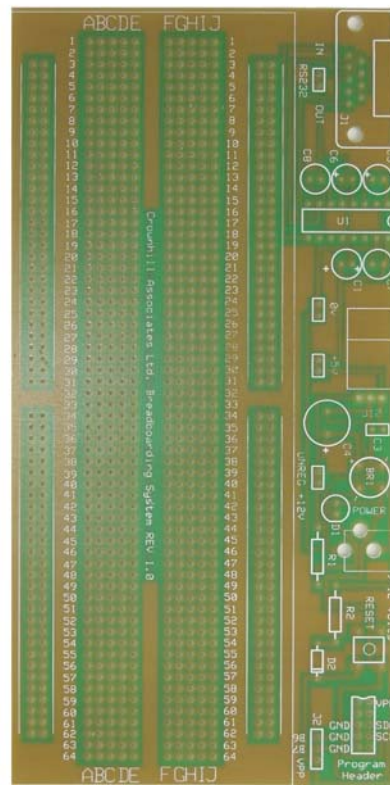
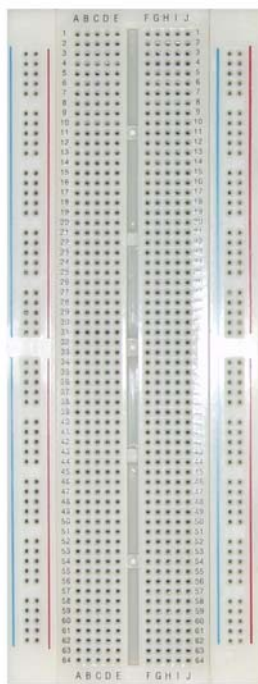
This document was published by Crownhill associates limited, Cambridge England, 2002

Introduction

The Crownhill Breadboard Development System allows projects to be assembled permanently without changing the working design of the prototype. Add to that, the on-board power supply and serial transceiver, and you have all you need for a quick and efficient process of design.

The Development system is ideal for schools or colleges, as it allows a temporary design that may be dismantled after use, thus allowing the salvage of expensive components.

The PCB pattern matches exactly the layout of the solderless breadboard, so you can transfer each component and wire from the temporary prototype to a more permanent and professional end product, for less than the price of getting a custom PCB made.



Building the kit

If you have the kit version of the development board then please read the following instructions carefully, as there is a preferred sequence of component placement that should be adhered to.

You should have the following components in the kit: -

	1 x Development PCB.
R1	1 x 1KΩ Resistor.
R2	1 x 10KΩ Resistor.
C4	1 x 470μF Electrolytic Capacitor.
C1,5,6,7,8	5 x 1μF Electrolytic Capacitors.
C3	1 x 100nF Capacitor.
D2	1 x 1N4148 Diode.
D1	1 x Red LED.
BR1	1 x Bridge Rectifier.
U12	1 x L7805 Voltage Regulator.
U1	1 x MAX232 Serial Transceiver IC.
RESET	1 x Push Switch.
	4 x 2 Pin Sockets.
	1 x 3 Pin Socket.
	1 x 10 Pin Header.
J1	1 x 9 Pin D-Socket.
POWER	1 x AC-DC Power Socket.
	1 x Solderless Breadboard.
	5 x Rubber Feet.

If any of these items are missing or incorrect, please contact Crownhill Associates for a replacement or assistance.

Before you begin building the board, make sure you have the correct tools at hand. You will require: -

A good soldering iron (preferably temperature controlled).
Approximately 1 metre of 60/40 flux cored solder.
A pair of side or wire cutters.
A pair of snipe-nosed (pointy) pliers.
A steady hand, and a good surface to work on. With adequate lighting and ventilation.

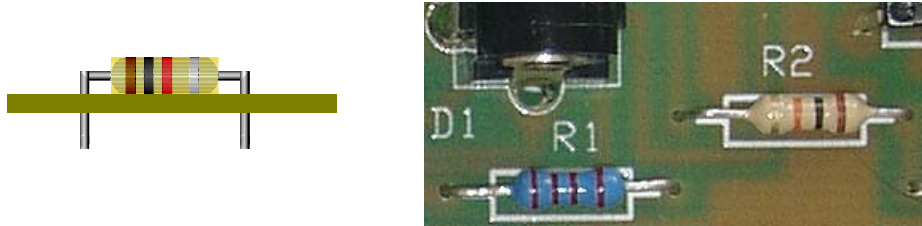
In order to check that the board is working correctly, you will need a multimeter capable of measuring DC Volts.

Breadboard Development System

Start by bending the resistor leads with the pliers to enable them to be placed snugly on the board. The positions for the resistors are marked R1, and R2.

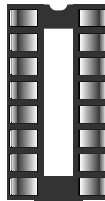
R1 is the 1K Ω Resistor. Colour banding is **BROWN, BLACK, RED**.

R2 is the 10K Ω Resistor. Colour banding is **BROWN, BLACK, ORANGE**.

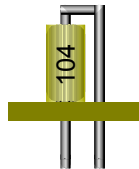


Solder these in place, remembering to bring both the solder and the soldering iron together at the same time. Make sure the joint has flowed correctly, and is a nice bright silver colour.

Now, insert and solder the 14 pin DIL socket at location U1, paying close attention to its orientation. The small indent points to the top of the board. See diagram below:-



Locate and insert the 100nF capacitor at position C3 on the board. Depending on which capacitor is supplied, you may need to bend the pins to accommodate the hole locations. There are two types of capacitor that may be supplied with the kit, a radial type that doesn't require any bending, and an axial type that will require bending into position.



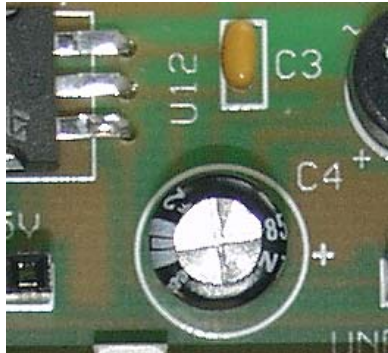
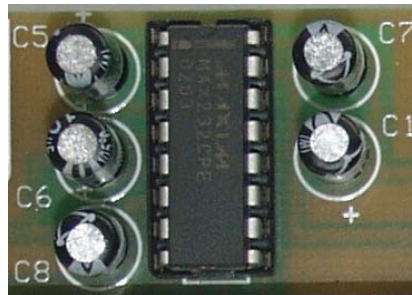
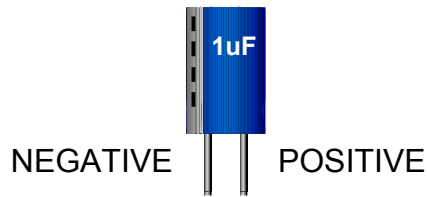
Axial



Radial

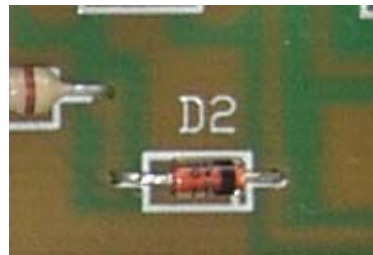
Breadboard Development System

Next, insert the 470uF Electrolytic capacitor C4. Then all five 1uF capacitors C1, C5, C6, C7, and C8. **NOTE:** please pay close attention to the polarity of these components, as prolonged reversal in the circuit **WILL** cause damage. The polarity on a capacitor is marked with the side strip indicating NEGATIVE. The polarity on the board is marked with a plus (+) symbol: -



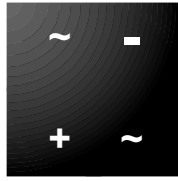
The picture above shows the orientation of the 470uF capacitor.

Now the diode D2 needs to be inserted and soldered, again taking note of its polarity. As with the resistors, the leads require bending into right angles for a snug fit to the board.

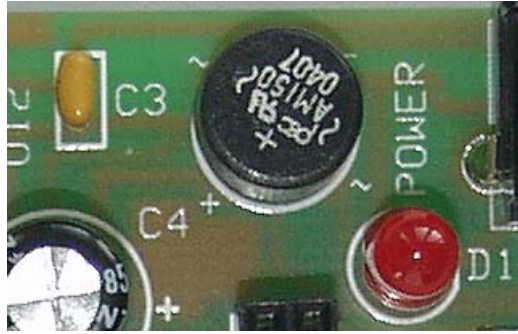


Breadboard Development System

Locate and insert the bridge rectifier at location BR1. This is another component that MUST be oriented correctly.

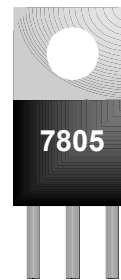


Note the four symbols on the top of the bridge rectifier, namely ~ , +, - , ~ .



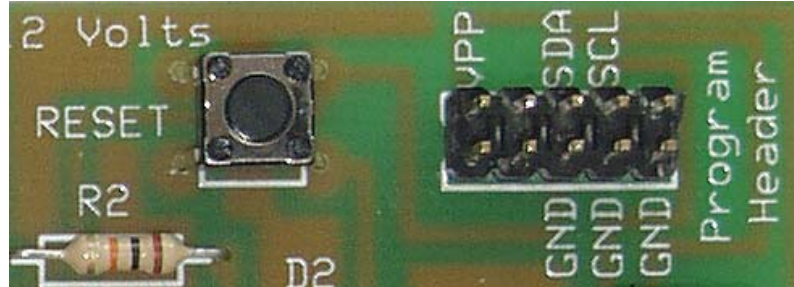
Ensure that these are in the correct alignment before soldering the component.

Now for some more bending. Locate the 7805 regulator, and bend its pins downward at a 90 degree angle, as shown below.



Next, solder the regulator into the board at location U12.

Now add the push switch, and the 10 pin programming header. The switch's pins may require some squeezing before it will fit in the holes.



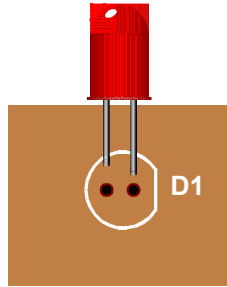
Breadboard Development System

Don't insert the switch too hard into the PCB, as it should stand off the board by a millimetre or so.



The 10-pin header has no preferred orientation, and can be simply inserted and soldered into place.

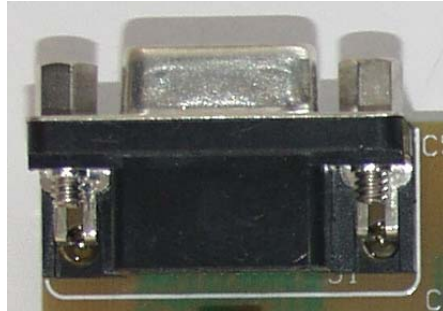
The LED can now be soldered into the board. This is another component that has to be placed in a specific orientation for it to work correctly. The illustration below shows the correct orientation: -



Notice the left side lead is shorter than the right side lead.

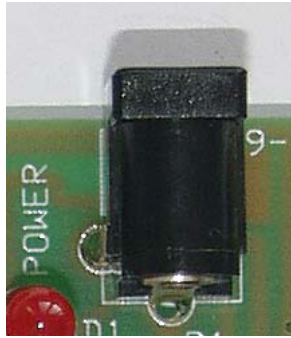
You're nearing completion now, only a few components to go...

One of those components is the 9-way D-socket. There's only one way that this will fit in the board, so this one's easy.

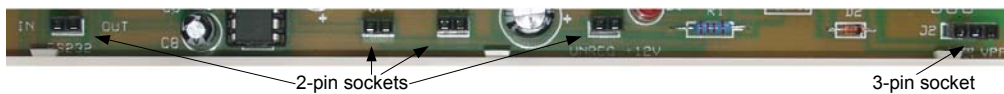


Breadboard Development System

Now fit the DC power socket at position POWER. Again, there is only one way that this component can fit on the board.



Now for the final components. Insert and solder the four two pin sockets at positions RS232, 0v, 5v, and UNREG + 12v. Then the three pin socket at position J2.

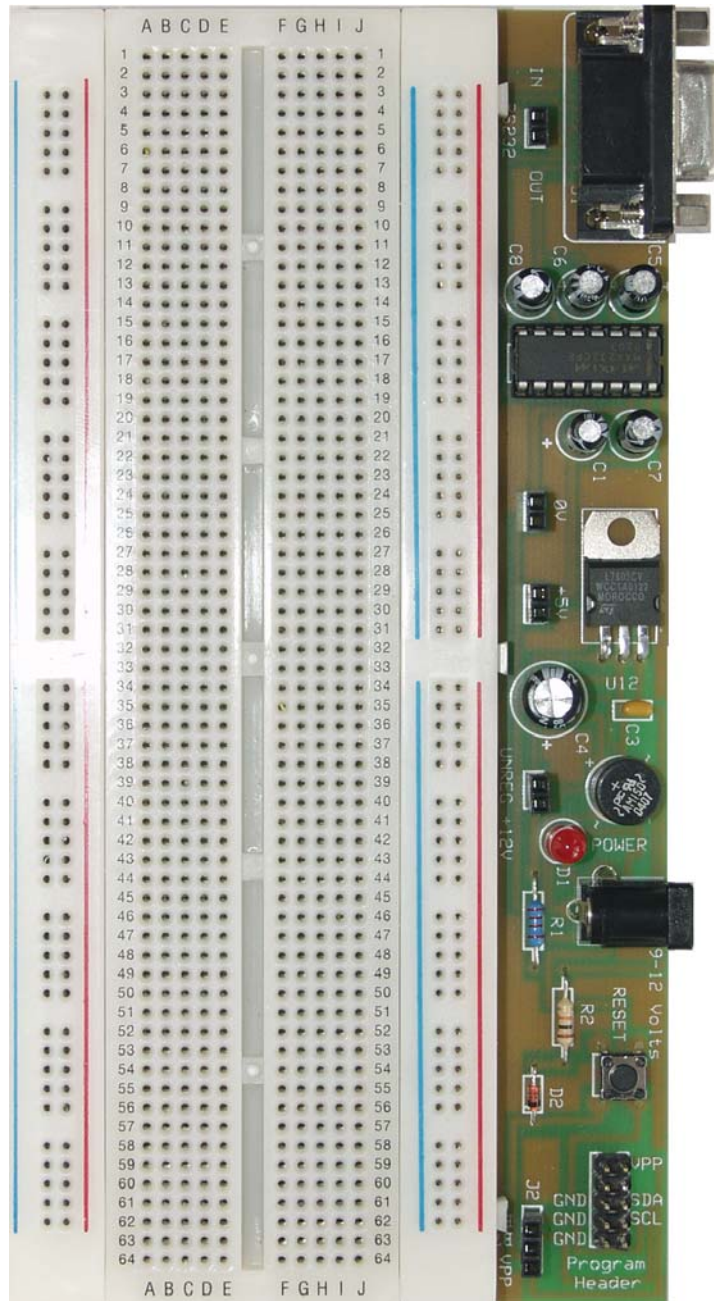


You are now faced with the decision whether or not to affix the solderless breadboard. If you are using the PCB for prototyping a temporary design, then you should attach the breadboard. However, once this is affixed, it's immovable, so if you should change your mind later, it will be impossible to remove easily, and damage will undoubtedly occur.

The alignment of the solderless breadboard should be in keeping with the legends on the PCB. The notches on the breadboard should be at the bottom of the PCB, and the nodules should be, what else, facing the top.

Breadboard Development System

The finished development board should look like the illustration below: -



Checking the Board

Before connecting the power to your completed board, it would be wise to make sure everything looks normal. i.e. diodes and capacitors are in the correct orientation.

If everything look OK, then connect a 9 to 12 Volts adapter to the POWER socket, and make sure the LED illuminates. If it does, then proceed to the next stage. However, if it doesn't, then disconnect the power, and check the LED's orientation. Also check the soldering, the DC adapter used, and the orientation of the bridge rectifier (BR1).

Once the LED is illuminated at power-up, you need to check if the correct voltages are present at the 5V and unregulated 12 Volts sockets.

Set up the multimeter to read a DC voltage, and connect it's negative lead to a ground. The 10-pin programming header has three pins that connect directly to ground, so you can use these.

Connect the positive lead of the multimeter to either of the 5V socket's pins. You should obtain a reading of just under or just over 5 Volts.

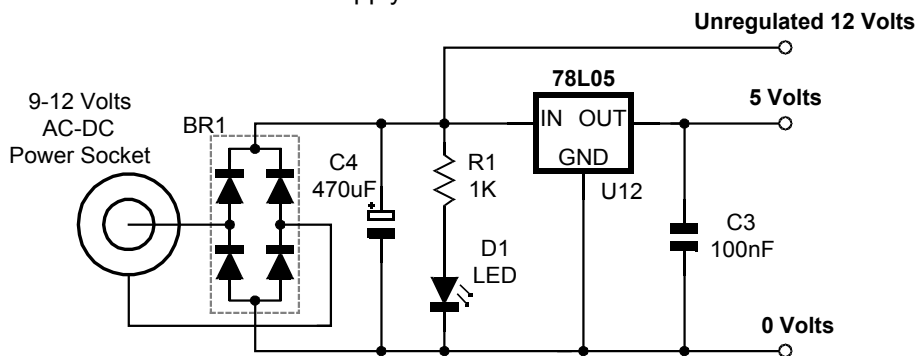
Now, connect the positive lead of the multimeter to either of the UNREG +12 v socket's pins. The voltage present here depends on the type of DC adapter used. However, you should obtain a reading of approx 10 to 13 Volts.

Circuit Diagram

The circuit of the development board is split into three separate sections.

- Power Supply.
- In-Circuit-Programming Section.
- RS232 Transceiver.

The power supply is a conventional rectifier – regulator type, supplying 5 Volts to the board with approx 500mA to 750mA of current. Using the bridge rectifier allows both an external AC or DC supply of between 9 and 12 Volts to be used. Any higher than 12 Volts will cause the 7805 regulator to become unreliably hot. The circuit of the Power supply is shown below: -

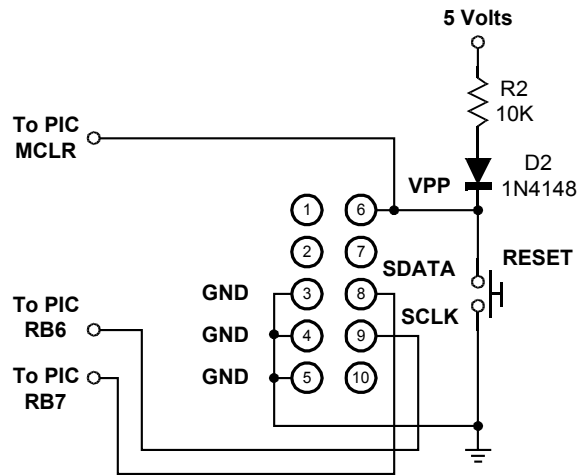


Power Supply Section.

The In-Circuit-Programming section, allows microcontrollers such as the Microchip™ PICmicro, to be programmed in circuit. A suitable programmer must be used, such as the microEngineering Labs EPIC™ programmer. The circuit for this section is shown on the next page: -

The Device programmer must be fitted to the 10-pin header, preferably using a short ribbon cable and suitable header sockets. The programming pins are brought out into the three pin socket J2. The inclusion of the push switch allows the PICmicro or other microcontroller to be RESET while developing software. D2 stops any high voltage leaking into the 5 Volt supply when the microcontroller is being programmed, as most devices require at least 12 Volts on their VPP or MCLR pins. And R2 stops the 5 Volt line from becoming short circuit when the RESET switch is operated.

Breadboard Development System



In-Circuit-Programming Section.

The RS232 Transceiver section, uses the ever popular MAX232 device from MAXIM semiconductors. Serial communication is a useful aid to debugging microcontroller code. The MAX232 ensures that the correct voltage levels are seen by both the computer and the microcontroller, as well as serving to isolate the two devices somewhat. This section is shown below: -

RS232 Transceiver

