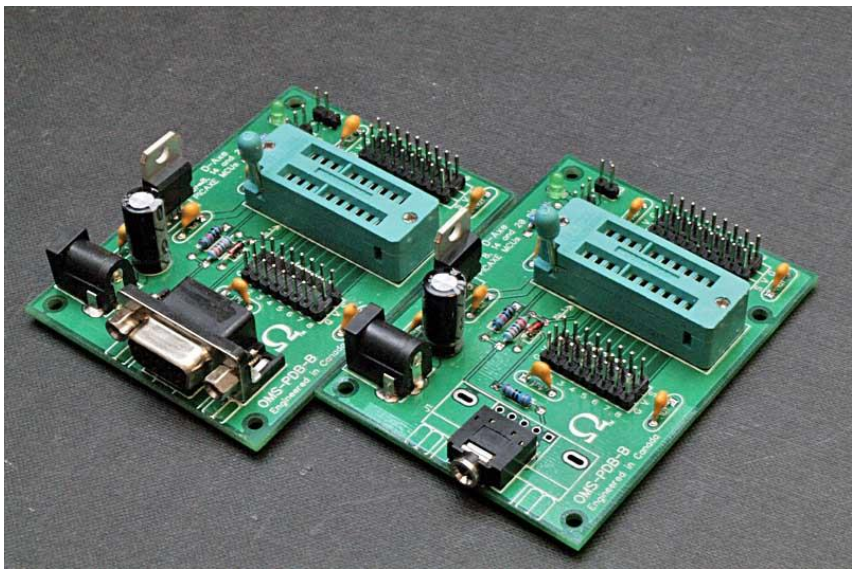
D-Axe

Rapid Prototyping tool for 8, 14 and 20 pin PICAXE® MCUs

User Manual

(Rev. 2)



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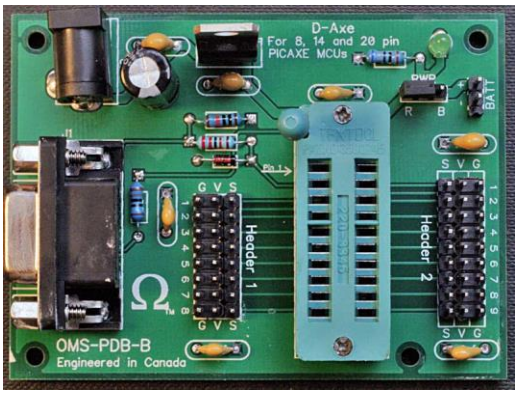
Introduction

The Omega MCU Systems D-Axe is primarily intended as a rapid prototyping tool for PICAXE® 8, 14 and 20 pin microcontrollers. It was specifically designed to offer professional level handling and the ability to directly attach popular and commonly available 3-wire sensors and actuators. This modular approach to prototyping allows proof-of-concept quality prototypes to be put together in a matter of hours instead of days or weeks. However, its many features which provide ease of handling, quick set-up and robust operation ensure it can easily be utilized as a programmer or in a more traditional development role as well.

Along with a PIC compatible ICSP programmer the D-Axe can also be used to program and develop projects using PIC microcontrollers. Any PIC that uses the same power and ICSP pin-out as well as the same programming voltage as the PICs on which the PICAXE chips are based can be utilized. For more information and a partial list of compatible PIC MCUs, see the Usage section.

D-Axe features

- 1.6mm FR4 fiberglass board with 1oz copper and HAL tinning for long life
- Zero Insertion Force (ZIF) MCU socket for ease of handling and reduced wear and tear on the MCU
- Built-in 1 amp, regulated power supply reduces workbench clutter, improves operational reliability, reduces set-up time and provides enough power for a variety of sensors and actuators.
- Standard 5.5mm x 2.1mm coaxial DC power socket.
- Available in 2 models. Either with an industry standard RS232 interface for use with serial cable/port or a USB to serial cable. Or with an AXE26®/AXE27® compatible 3.5mm Stereo Jack.



- All signals are available through SVG headers for use with commonly available sensor/actuator ‘bricks’.
- DuPont style wire jumpers can be used for attachment to other circuits or a solderless bread-board
- Uses a modified enhanced serial download circuit for better safety and more reliable operation

Usage

1. Connecting to the Host Computer

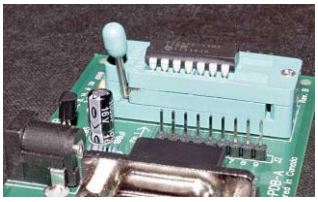
The D-Axe equipped with a standard pin-out 9 pin DBF connector can connect to a host computer either through a standard RS232 interface or a USB to Serial cable.

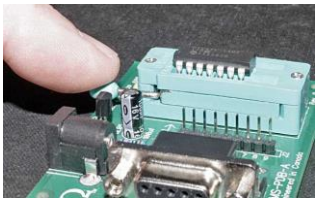
The D-Axe is configured as a data communications device so if connecting to an RS232 interface, a straight-through cable is required. Depending on the RS232 connector the host computer has, this will either be a 9-pin female to 9-pin male, as shown here. Or, in rare instances, you may need a 25-pin female to a 9-pin male cable. In either case, the 9-pin male end of the cable is connected to the D-Axe and the female end to the host computer.

Alternatively, or in the case your host computer does not have an RS232 serial port, you can use a better quality USB to serial cable. These have a USB-A connector at one end and a standard 9-pin DB9M (male) connector at the other. When installing the manufacturers driver for the USB to Serial cable, be sure to note which COM port has been associated with the USB to serial cable.

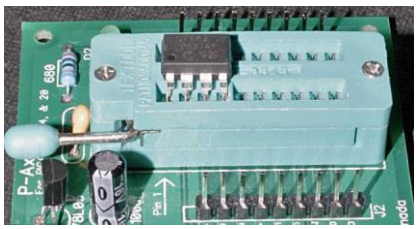
The D-Axe equipped with a 3.5mm can be connected to the host computer with either an AXE26® serial cable or an AXE27® USB cable.

2. Inserting the MCU

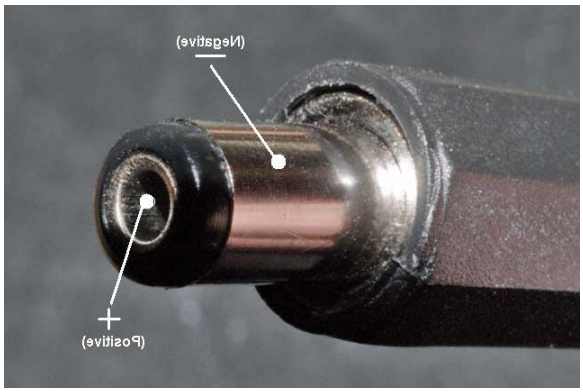




Make sure the lever on the ZIF socket is in the vertical position; place the MCU into the socket as shown with its pin 1 adjacent to the Pin 1 indicator on the board. Pin 1 is that pin closest to the ZIF socket lever. While steadying the board with one hand, lower the ZIF socket lever to the horizontal position using the index finger of your other hand. Whether you are using an 8 pin, 14 pin or 20 pin MCU, it is always inserted such that pin 1 of the MCU is aligned pin 1 of the ZIF Socket.



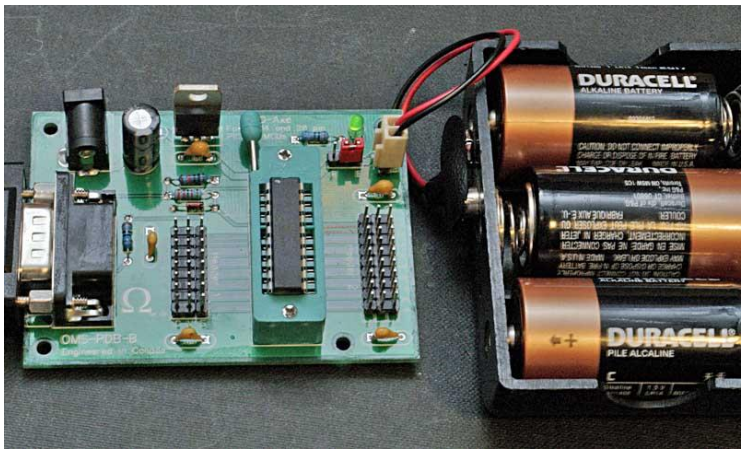
3. Attaching the power



The on-board regulator and standard DC power jack allow for a variety of power options. Any filtered DC source of between 7.5V and 14V can be used. Make sure the chosen power supply delivers positive voltage through the center conductor and negative through the outer sleeve as shown here.

The most convenient and popular power sources are a 9V AC-DC switching type (switchmode) adapter, a 6-cell 'AA' battery pack, or a 9V battery. Either is an excellent choice. The switching type adapters are preferred over the transformer

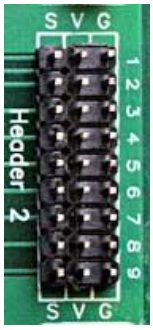
type adapters as they provide a more stable supply, are lighter, take up less space and are generally less expensive. You can also use a 4.5 V battery pack through the BATT connector near the upper right hand side of the board. If you choose this option you must move the PWR jumper from the 'R' pin to the 'B' pin. In this case the regulator is not used. ***Be sure to observe polarity as connecting a battery pack the wrong way may damage the PICAXE and any attached devices. Check before attaching the power source.***



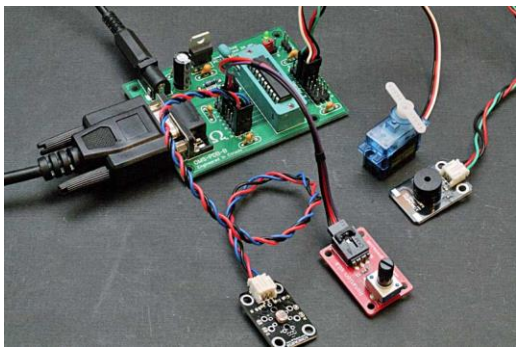
At this point you are ready to begin downloading programs to your PICAXE.

Building Prototypes

The main design feature of the D-Axe is it ability to directly attach sensor and actuator modules without any additional circuitry or connectivity boards. These modules, commonly know as 'bricks' use a 3-wire connection to the host controller. The three wires carry Signal, supply Voltage and Ground, and terminate in a standard 3-pin header connector. These can be directly attached to the headers on the D-Axe where each signal from the MCU is brought out and mated with a 5v and ground pair. As indicated by the markings on the headers, signal is the pin closest to the MCU socket, supply voltage is in the middle and ground is on the outside. Generally speaking, the connectors are not keyed and there is no discernable standard to the coloring of the wires. However, White – Signal, Red – Voltage, Black – Ground is a common. As well, placing Voltage between Signal and Ground virtually assures that damage to a module is unlikely. That not withstanding, it is advisable to consult the documentation supplied with the brick to ensure connections are made properly so that they function properly from the start.

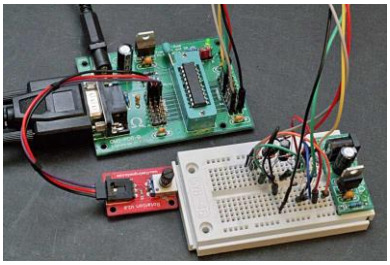


Using this modular approach, proof of concept prototypes can be assembled in mere minutes and the process of writing the code can begin just as quickly. The resulting prototypes are portable, repeatable and robust and not susceptible to damage like a solderless breadboard circuit.



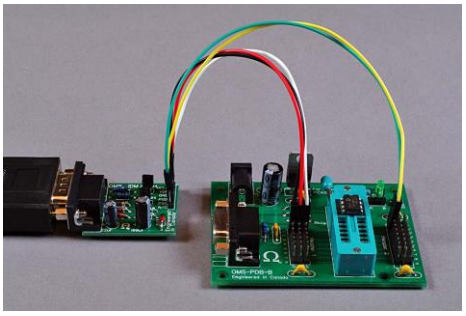
With a Vin of 9V, the D-Axe power supply is capable of supplying 200ma in free air and up to 1 amp with adequate heat sinking. The regulator is mounted vertically to allow for the addition of a heat sink, if required. This should easily be enough to meet needs of any number of sensors, as these generally have small power requirements. Actuators, on the other hand, such as motors, servos, buzzers, etc… have much higher power needs. Some planning and common sense are required in this respect. Small servos, motors and relays are generally okay, but it is advisable to know and take head of the specifications and the nature of these loads. In particular, larger motors, servos, relays and solenoids and other inductive loads can have very large peak current demands and are not suited to direct attachment to the D-Axe

Should there be a need to interface a custom circuit you may wish to attach the D-Axe to another device or a breadboard for simulation or verification. This can easily be accomplished using 'Dupont' style jumpers like those shown. Keep in mind that the ground of the D-Axe will need to be connected to the off-board circuit to ensure proper voltage reference.



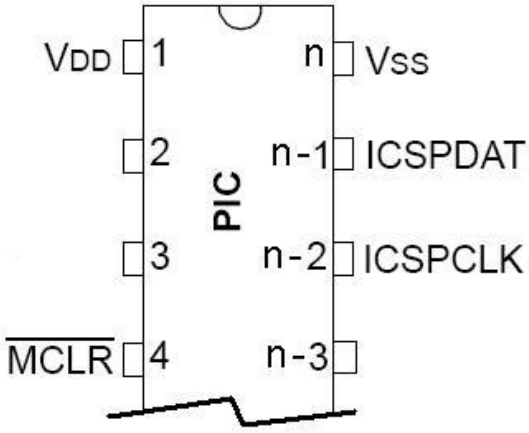
Using with PIC Microcontrollers

As previously mentioned, the D-Axe can also be used to program and develop projects using PIC microcontrollers. To do this you will need to use an ICSP programmer compatible with PIC microcontrollers. An ideal programmer for this purpose is the OMS JDM programmer. Most ICSP programmers will have specifics about how much and what kind of load can be on the microcontroller during programming. There is no single guideline regarding this as it depends both on the programmer in question and the nature of the circuitry that is attached to each lead the ICSP programmer will need to interact with. To completely avoid any problems it is strongly recommended that to following be done during programming via ICSP:



- Remove the power selector jumper on the D-Axe
- Remove all circuits or modules attached to the D-Axe on Header 1 - row 2. Header 2 – row 1 and Header 2 – row 2.
- Remove all modules and circuits that draw power form the D-Axe

You can use any PIC that uses a 13V programming voltage and has the following pertinent pin-out where n can be 8, 14 or 20.



The following is a partial list of PIC microcontrollers that can be used. Check Microchip's datasheets for others.

12F508, 12F509, 12F510, 12F519, 12F609, 12F615, 12F617, 12F629, 12F635, 12F675, 12F752, 12F683, 16F505, 16F506, 16F631, 16F636, 16F639, 16F677, 16F684, 16F685, 16F687, 16F690

Connect the PIC compatible ICSP programmer as follows:

ICSP Programmer pin	D-Axe Pin
VPP/Mclear	Header 1, row 2, S
VDD	Header 1, row 2, V
GND	Header 1 row 2, G
PGD (program data)	Header 2, row 1, S
PGC (program clock)	Header 2, row 2, S

Accessing the MCU I/O

When inserted into a D-Axe the I/O pins of the MCU map to the headers in the following fashion:

8 pin MCUs

MCU Pin	Pin Function	D-Axe Pin	Note
3	C.4	Header1-1	
4	C.3	Header1-2	VPP/Mclear
5	C.2	Header2-3	
6	C.1	Header2-2	PGC (program clock)
7	C.0	Header2-1	PGD (program data)

14 pin MCUs

MCU Pin	Pin Function	D-Axe Pin	Note
3	C.4	Header1-1	
4	C.3	Header1-2	VPP/Mclear
5	C.2	Header1-3	
6	C.1	Header1-4	
7	C.0	Header1-5	
8	B.5	Header2-6	
9	B.4	Header2-5	
10	B.3	Header2-4	
11	B.2	Header2-3	
12	B.1	Header2-2	PGC (program clock)
13	B.0	Header2-1	PGD (program data)

20 pin MCUs

MCU Pin	Pin Function	D-Axe Pin	Note
3	C.7	Header1-1	
4	C.6	Header1-2	VPP/Mclear
5	C.5	Header1-3	
6	C.4	Header1-4	
7	C.3	Header1-5	
8	C.2	Header1-6	
9	C.1	Header1-7	
10	C.0	Header1-8	
11	B.7	Header2-9	
12	B.6	Header2-8	
13	B.5	Header2-7	
14	B.4	Header2-6	
15	B.3	Header2-5	
16	B.2	Header2-4	
17	B.1	Header2-3	
18	B.0	Header2-2	PGC (program clock)
19	SO (A.0)	Header2-1	PGD (program data)

Note: The D-Axe has been designed to work with the PICAXE® Programming Editor, which is available at **www.picaxe.com/Software**. PICAXE®, AXE26®, and AXE27® are registered trademarks of Revolution Education Ltd.

Specifications

Power Requirements

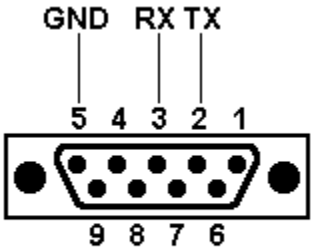
- Supply Voltage: 7.5V – 14V DC or 4.5v battery pack
- Supply Current: Typically between 9ma and 12ma with the MCU only
- Supply Connector: 5.5mm x 2.1mm center positive co-axial jack

NOTE: ***Supply voltage should never exceed 15V dc. Observe polarity – this board requires a center positive supply. Check before attaching the power source.***

Communications Requirements
(Note: Only applicable for use with PICAXE microcontrollers)

- Interface Type: RS232 serial
- Connection: Standard pin-out 9 pin DBF or 3.5mm Stereo Jack

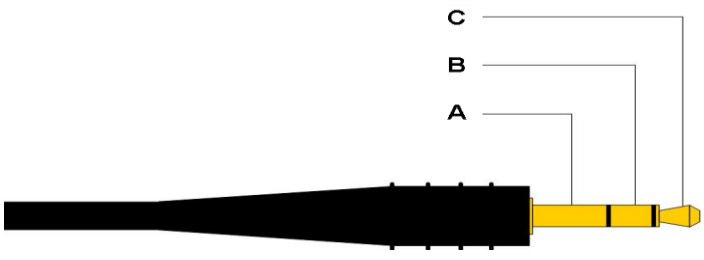
DB9F pin-out and function from the D-Axe perspective:



DB9F

- Pin 2: The D-Axe transmits data on this pin
- Pin 3: The D-Axe receives data on this pin
- Pin 5: Signal Ground

3.5mm cable pin-out:



- Pin A: The D-Axe transmits data on this pin
- Pin B: The D-Axe receives data on this pin
- Pin C: Signal Ground

Supply Capability

Regulated Voltage: 5V (4.8V – 5.2V)
Maximum current: 1A (with adequate heat sink)
Maximum Free-air current: 200mA @ Vin = 9V

Physical

- Length: 82mm
- Width: 61mm
- Height: 18mm
- Weight: 42g
- Operating Temp. $0^{o}C$ – $125^{o}C$

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