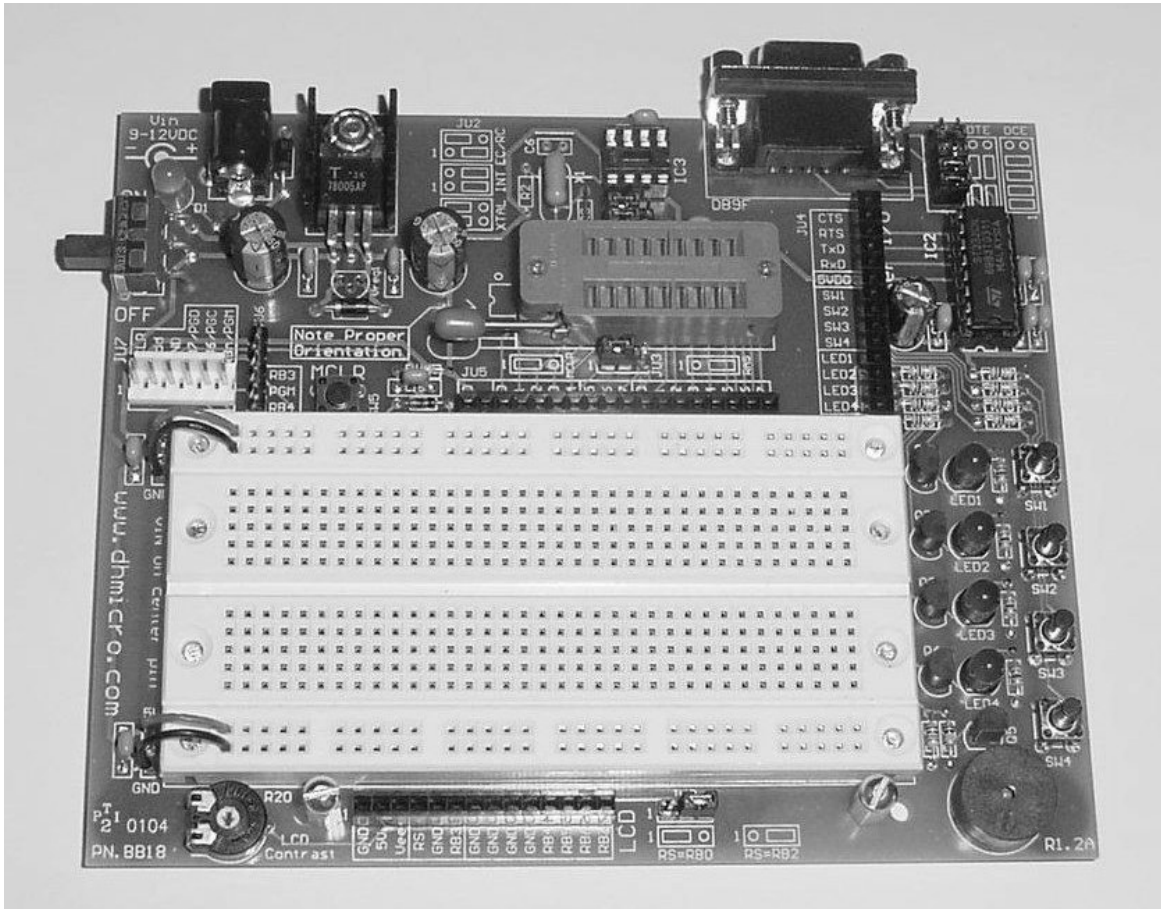


BB18™ PIC Development Board User Manual

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BB18™ PIC Development Board User Manual

Description

This is our first completely reusable hardware and software development board for 18 pin PIC microcontrollers.

This board features innovations that set it apart from other development boards; innovations like a solderless breadboard for test circuit construction, an 18 pin ZIF socket for the PIC, and socketed oscillator parts for supporting all PIC oscillator configurations (4MHz ceramic resonator ships with the board). Additionally, all microcontroller and I/O signals are available on 2 sockets (JU5 & JU4) which will accept standard wire jumpers used for breadboard prototyping making new design simple to setup and test.

For user I/O this board has 4 push buttons, 4 LEDs, a buzzer, an RS232 interface that can be jumper configured for DCE or DTE (no null modem cables required), and an LCD socket for 1x16, 2x16, and 4x16 LCD modules.

This board is an excellent starting point for any of your 18 pin PIC projects. You can develop your hardware and software on it and when you are satisfied with it you can migrate your design onto one of our other **RapidNN** prototyping boards for a more permanent prototype.

Additional Resources

Numerous sources of information are available for both beginning and advanced users.

Microchip Technology Inc. manufactures the PIC microcontroller line. Their website can be found at **www.microchip.com**. It contains datasheets for all of their microcontrollers, app-notes, and code samples for a variety of applications.

Another excellent on-line resource for Microchip PIC development is the Piclist at **www.piclist.com**. It contains project info, code examples, and links to PIC related sites.

Beginner users might also consider the books published by Square 1 Electronics. They can be found at **www.sq-1.com**.

This list is by no means comprehensive. Many other excellent websites and publications are available and this list is only intended as a starting point for the beginner.

Features

General:

- Overall board dimensions 5.50" x 4.50".
- Constructed on a 2-layer PCB with solder masks and an informative silk screen legends.
- 18 pin ZIF socket for the PIC.
- 350 pin solderless breadboard prototyping area.
- Power and GND pins run the length of the breadboard on both the top and bottom.
- All 16 microcontroller port pins brought out to an 18 pin inline socket at the top of the breadboard.
- ICSP header.
- 4 rubber feet on the corners.

Microprocessor:

- Compatible with all MicroChip PIC 18 pin DIP packaged microprocessors.
- PIC16C52, 54, 56, 58, 554, 556, 558, 61, 620, 621, 622, 71, 710, 711, 712, 715, 716, 717, 84, PIC16E623, 624, 625, PIC16F627, 628, 818, 819, 83, 84 (and others).

Oscillator Options:

- Crystal or ceramic resonator (DC-20MHz).
- RC oscillator (internal and external).
- TTL oscillator (DIP-8 packaged).
- All oscillator components are socketed for easy removal, and are onfigured via jumper block JU2.

Power Supply Options:

- T0-220 7805 installed with heatsink.
- Power switch and power-on LED.
- DC power receptacle.

User I/O Options:

- 4 push buttons.
- 4 LEDs (buffered with transistors).
- Piezo buzzer.
- RS232 interface.
- LCD socket with contrast adjustment pot.
- All I/O signals available on a 14 pin header.

Requirements

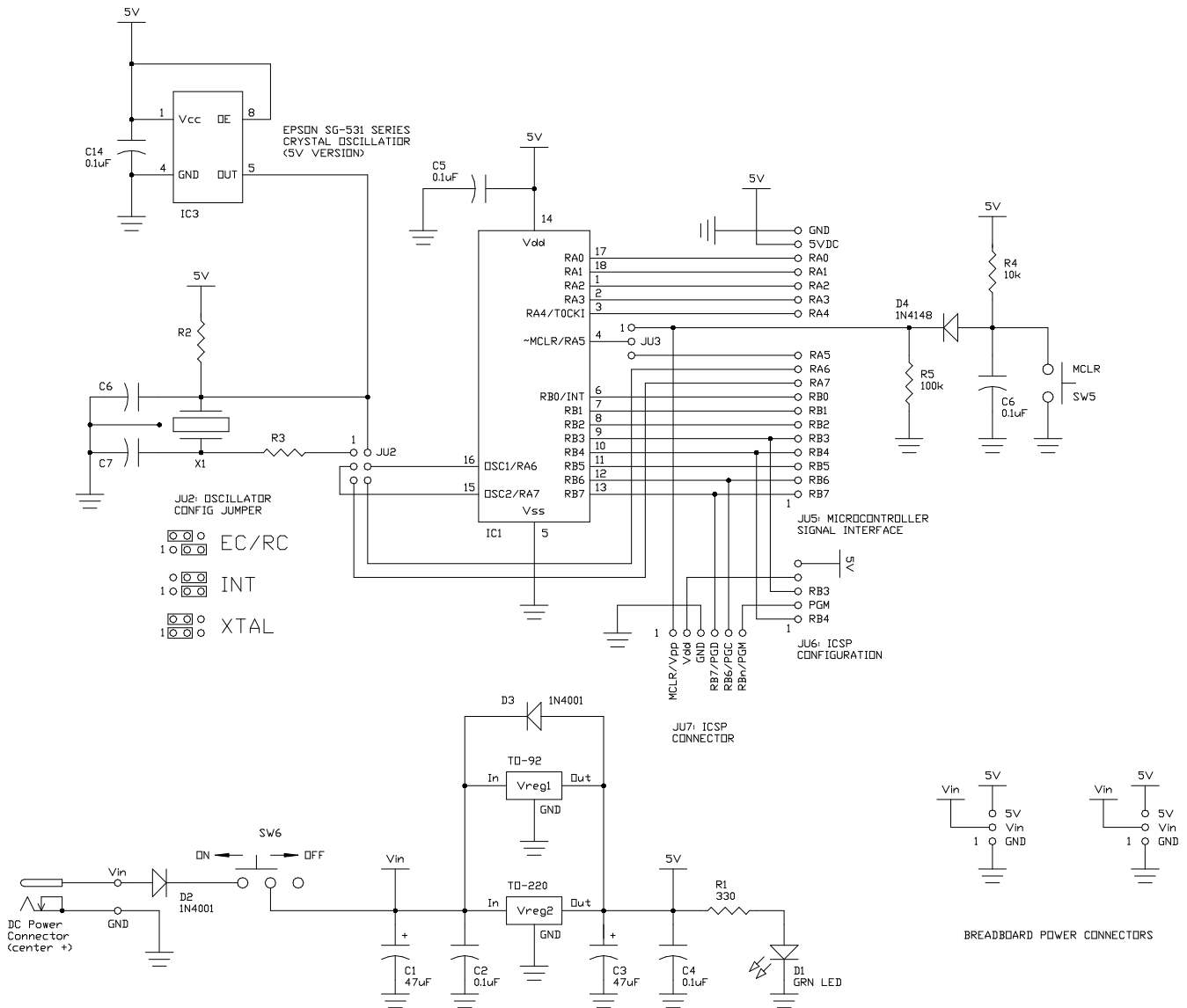
In order to use this board, you need to have a 9-12VDC wall adapter for power, an 18 pin PIC microcontroller, the tools to program it, and jumper wires to attach the PIC header (JU5) to the solderless breadboard and to the I/O header (JU4).

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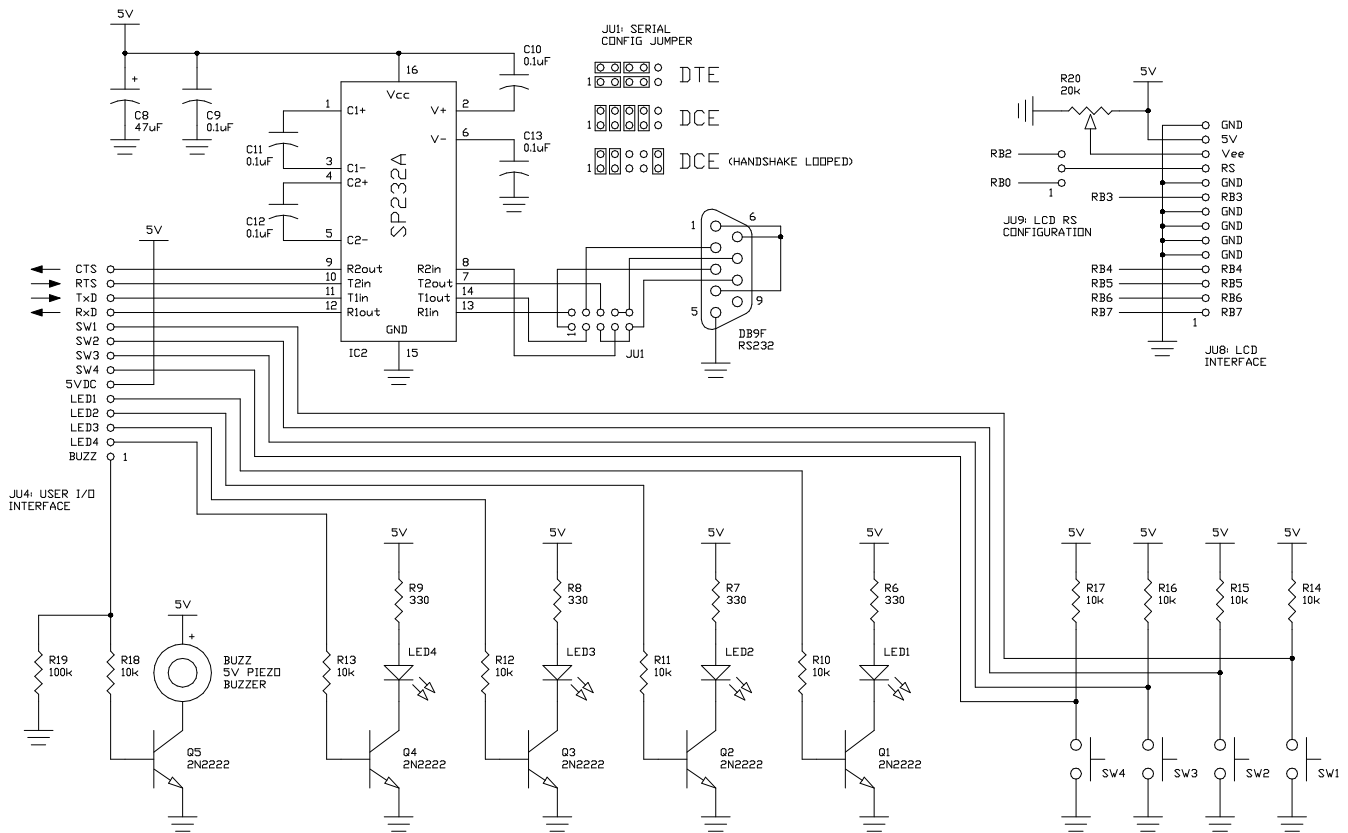
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Board Schematic-PIC Socket, Oscillator, & Power Supply



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Board Schematic-User I/O



Development Board Configuration & Usage

Microcontroller:

This board will support any 18 pin DIP packaged Microchip PIC microcontroller. The pin designations in the schematic on the previous page and on our PCB represent only basic port definitions for each pin. Refer to the Microchip datasheet for all the features and alternate pin definitions for the microcontroller that you select for use.

To open the ZIF socket lift the handle until it is straight up. The PIC can now be inserted or removed. To lock the PIC in place once inserted, just lower the handle all the way back down again. When inserting a PIC in the socket make sure that it is oriented properly; pin 1 should be closest to the lock/unlock lever (also see the silkscreen legend just to the left of the ZIF socket for an orientation reminder)

Some PIC variants allow the MCLR pin to be configured as port pin RA5; jumper block JU3 is used to configure the board for either. A shorting jumper on JU3 pins 1-2 enables the MCLR button; a jumper across pins 2-3 enables the RA5 pin on JU5. See the silkscreen legend between the PIC socket and JU5 for JU3 configuration details.

On some PIC variants the OSC1 and OSC2 PIC pins are also re-assignable as port pins RA6 & RA7. See oscillator section below for full setup details.

Connection of the PIC port pins to circuitry built up on the solderless breadboard is simple. Just insert one end of a jumper wire into the desired port pin on JU5 and the other end into one of the holes in the breadboard as pictured in the User I/O section on the following page.

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Oscillator Configuration:

This board supports all PIC oscillator modes: ceramic resonator, crystal, RC, and TTL oscillator (board ship with a 4MHZ ceramic resonator). Jumper block JU2 is used to configure the oscillator circuit. See the silkscreen legend between the heatsink and oscillator circuit for JU2 jumper configurations.

On some PIC variants different oscillator options free up additional port pins: EC/RC mode frees up RA7; INT mode frees up both RA6 & RA7. See the Microchip datasheet for the PIC that you want to use to see what options are available.

All oscillator circuit parts (both the IC and all discrete components) are socketed so they can be inserted and removed easily (no soldering required). Pertinent oscillator parts are R2, R3, C6, C7, X1, & IC3. Select these components per instructions found in Microchip datasheets for the microcontroller that you select for use.

ICSP Port:

The PIC ICSP (in circuit serial programming) signals are brought out to a pin header JU7. The pin assignments for this header are clearly labeled on the silkscreen legend. The ICSP header is configured by the jumper block JU6 (located to its right). The PGM pin can be set to RB4 with a 1-2 jumper setting; RB3 can be set as PGM by a 2-3 jumper setting. Refer to the datasheet for your PIC to see which pin is defined as PGM for your device. A jumper across pins 4 & 5 connects the ICSP Vdd pin to the 5VDC power bus on the board (default = 4-5 unjumpered).

In order to use the ICSP port you also need to have the MCLR pin setup as MCLR and not as RA5. To do this, make sure that JU3 has a jumper between pins 1 & 2.

Note: If you are going to use the ICSP header to program your PIC, then your breadboard circuitry needs to isolate all attached ICSP signals properly (no isolation is designed into this board). Microchip has several ICSP related appnotes that you should read that discuss this matter.

Power Supply:

A wall adapter is required to provide 9-12VDC power. The wall adapter needs to have a 2.1mm ID, 5MM OD plug with a positive center conductor. If your wall adapter is the wrong polarity (i.e. center negative) then the board will not power up at all due to a diode protecting against reverse polarity.

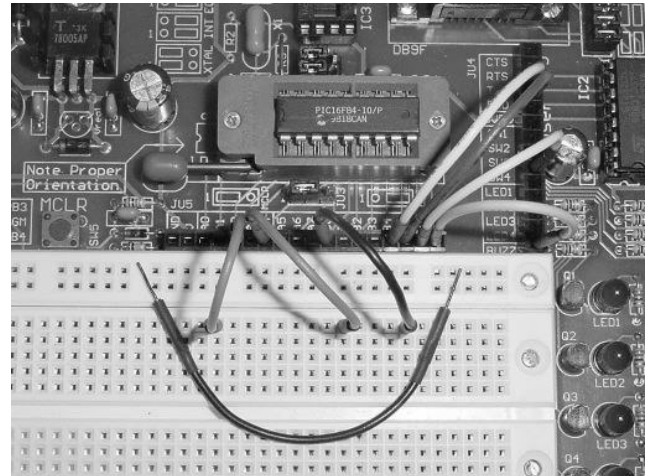
To power up the board, attach the wall adapter to

the DC jack at upper left corner of the board then flip the power switch (also at the upper left corner) to the "on" position (see silkscreen). When the board is powered the power on LED D1 will light up indicating that 5VDC power is available on the board.

This board ships with a TO-220 packaged 7805 voltage regulator with heatsink installed. There is also a footprint for a TO-92 packaged regulator should your design require it. Note: if you decide to add a TO-92 regulator, remove the TO-220 regulator first. Also keep in mind the current requirements of your circuitry plus the microcontroller when you are selecting an alternate voltage regulator (TO-92 packaged devices are typically only rated for 100mA output).

User I/O (general):

User I/O components are accessed through the 1x14 pin socket JU4. Connections are made to this header through the use of jumper wires as shown in the picture below:



The 4 push buttons are accessed through JU4 pins labeled SW1-SW4. The logic level on any of these pins when a button is not pressed is "1"; when a button is pressed the corresponding pin is pulled to a logic "0"

The 4 LEDs are all buffered with 2N2222 NPN transistors to limit the current drawn by any PIC port pin attached. For any LED a logic "1" will turn it on and a logic "0" will turn it off. LEDs are accessed through JU4 pins labeled LED1-LED4.

The buzzer is also driven by a 2N2222 transistor. It is accessed through the JU4 pin labeled BUZZ. A logic "1" on this pin will activate the buzzer, and a logic "0" will turn it off.

The LEDs and buzzer can be tested by attaching a jumper between their pins the 5VDC pin.

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232 Interface:

This board offers a jumper-configurable RS232 interface to allow the user to connect it to a PC or to another similarly equipped prototyping board. Details regarding configuring this board as DTE or DCE can be found in the 232 interface section below.

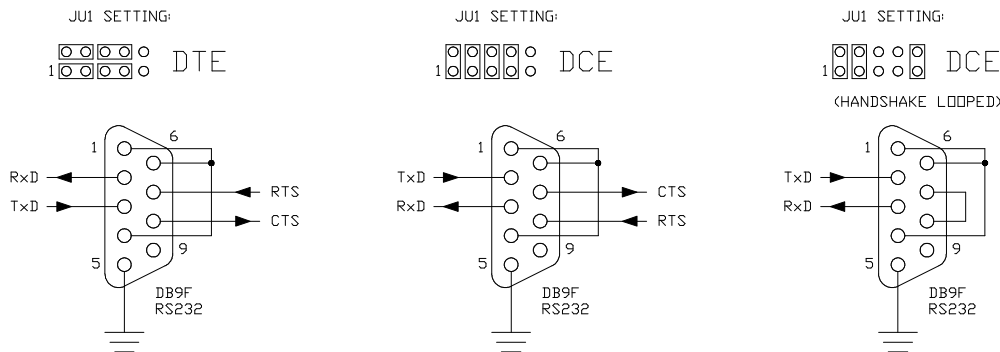
LCD Interface:

JU8, located on the bottom of this board, is setup to provide a 4 data bit, write only LCD interface for 1x16, 2x16, or 4x16 text based LCD display modules. We have also provided mounting holes and standoffs to secure your LCD in place. Use the inner holes for 1x16 and 2x16 displays; the outer holes are for 4x16 displays. Take care not to damage the LCD when it is attached to the board.

The LCD RS signal can be set to RB0 or RB2 through the setting of jumper JU9 located to the right of JU8: 1-2 for RB0, 2-3 for RB2 (see silkscreen legend for details). The default setting is for RS=RB2. This jumper is provided to either free up RB2 for use as a UART pin (available on some PIC variants) or RB0 for use as an interrupt. RB3 through RB7 are also assigned to the LCD interface see the legend below JU8 for pin assignments—keep these pin assignments in mind if you are using the LCD display in a project as these signals will not be available for other uses.

LCD contrast is adjusted by turning R20 located to the left of JU8.

232 Serial Interface Configuration



232 Interface Notes:

Note: the arrows in the above figure denote the signal direction between the processor and the DB9 connector. For example, the arrow on the Tx/D line shows it going to the DB9F connector from the processor; the arrow on the Rx/D line shows it going to the processor from the DB9F connector.

JU1 Jumper Settings:

DTE: Setting the JU1 jumpers as shown in the left figure above setups the DB9 in a DTE configuration. This configuration can be used to connect to another prototyping board configured as DCE. Note: while this configuration is labeled DTE, obviously the gender of the DB9 connector is not male. However, if one attaches a DB9M to DB9M straight-through wired serial cable to the DB9F

connector on the PCB, then the signals and gender on the opposite end of the serial cable is appropriate for DTE and can be plugged directly into a DCE configured board.

DCE: Setting the JU1 jumpers as shown in the center figure above setups the DB9 in a DCE configuration. This configuration can be used to connect to a PC serial port or another prototyping board configured as DTE. To connect to a PC use a straight-through wired DB9M to DB9F serial cable.

Both of the first examples have active RTS & CTS signals for half-duplex operation. The last figure above is DCE which is fully handshake looped (RTS and CTS lines are now shorted together). This configuration can be used for full-duplex serial communication with a PC; a similar arrangement can be used in the first DTE configuration.

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Notes

Contact Us

We maintain a website where you can get information on our products, obtain literature, and download support files. Visit us online at:

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Email your technical support questions to **support@dhmicro.com**. We try to respond to your questions within an hour if it is received Monday through Friday between the hours of 8am to 5pm (Mountain Time).

For sales questions or to place an order, direct your emails to **sales@dhmicro.com**. Refer to the order form and price list available on our website for product pricing, shipping rates, payment instructions, and for other info we need to complete your order.

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