DECADE ENGINEERING

BOB-4 Quick-Start Guide
21 June 2012
See www.decadenet.com for the latest revision of this document.

BOB-4H (2x20 header format)

BOB-4S (30-pin SIMM 'legacy' format)

Introduction

BOB-4 lets your microcontroller or PC display text and vector graphics on standard TV monitors. This Quick-Start Guide provides instructions to get new BOB-4 users up and running with minimum fuss. The approach taken here is to quickly establish BOB-4 communication with a PC, so the user can type text onto the TV screen and begin experimenting with commands described in the BOB-4 Application Guide. Skills acquired in this way should transfer readily to the development of embedded applications, where most BOB-4 modules are eventually used.

Requirements

To follow these instructions precisely, you will need a Windows PC with available serial COM port or USB/Serial adapter, and HyperTerminal software. I/O Gear adapters are recommended, but most adapter brands are acceptable for this exercise. HyperTerminal usually comes pre-installed on Windows PCs, and is often found under *Start > All Programs > Accessories > Communications*. Bray's Terminal is a free download, and is more reliable than HyperTerminal, but the instructions in this document require interpretation to work with it (or any other terminal emulation program).

In addition to the BOB-4H or BOB-4S module, you will need a breadboard or proto board capable of mounting a connector for BOB-4 along with the RS-232 interface circuit in one of the drawings below. Decade Engineering sells 9-pin male/female serial data cables, RS-232 interface ICs, and 30-pin SIMM sockets (for BOB-4S). All other necessary components must be procured elsewhere. Order extra BOB-4 connectors if you plan to modify one for breadboard use. For BOB-4H customers, the SIS developer board is a convenient alternative to breadboard construction.

A video signal source is not required, because BOB-4 can generate video on-board, but you should have one if you wish to investigate video overlay performance. Cameras and DVD players with composite video output (yellow RCA jack) generally work well. A TV with video input or TV monitor is required in any case. It's best to have access to more than one TV monitor, because some of the newer flat-screen models can be quirky.

Finally, you will need a quality 5VDC power supply rated at 150mA or greater, with over-current protection. Don't take this requirement lightly. Modern high-density ICs, as used in BOB-4, are made on deep submicron fabrication processes that exhibit precious little tolerance for electrical abuse. These are NOT your father's 5V logic chips. Power supply over-voltage or spikes have damaged most of the BOB-4 modules returned to Decade Engineering for repair. Please read the **Cautions!** section of this document before proceeding.

Cautions!

Be certain that you have a stable 5VDC power supply, regulated to ±5% or better, BEFORE proceeding with BOB-4 operation. Applied voltage must never exceed +5.500V under any circumstances, however briefly. Excessive voltage and poor regulation can damage the BOB-4 module, and such damage is not covered by the warranty. Power supply voltage overshoots must not occur at turn-on or turn-off time, or when power supply load conditions change. Application circuits should include an electrolytic bypass capacitor of 100~470uF near the +5V power supply input pin to BOB-4. Switch-mode power supplies should include at least one extra L/C filter stage beyond the basic L/C components required for operation. Residual switching spikes should be suppressed to no more than 10 millivolts at BOB-4's power supply input pin.

BOB-4 Hookup

Header Connectors for BOB-4H

Here are a few example part numbers for 'BergStik' style male pin headers to mate with BOB-4H. These are all conventional THT (thru-hole technology) 40x2 pin headers with .025" square pins and .100" spacing that divide into a pair of 20x2 headers:

> NSH-80DB-S1-TG (Robinson-Nugent)
> 2380-6121TG (3M)
> 517-6121TG (Mouser)
> PH2-80-SGA (Adam Technologies)

SIMM Sockets for BOB-4S

Jameco catalog number 100302 has been tested with good results. 30-pin SIMM sockets are bundled with BOB-4S modules sold by Decade Engineering when the purchase quantity is 1~9 (only). Additional sockets may be ordered under Decade Engineering part number *SIMM-30*.

Hookup Notes

The drawings below show typical BOB-4 hookups to a PC using the asynchronous serial 'TTL-232' main port at 9600 bps. Many additional BOB-4 features are available through hookup options explained in the BOB-4 Application Guide. One option that can be especially useful during application development is a hookup to BOB-4's debug port, which is easily implemented with unused portions of the RS-232 interface IC in these drawings.

ACR0~ACR3 and CTSI are configuration shunt options. Install ACR3 and CTSI shunts or wire as shown.

BOB-4's primary ground pins must be linked through a PCB ground plane or other very-low-impedance connection. Use 22 AWG or larger wire (or multiple wires) in hand-wired installations.

PC COM port pin assignment is for a standard male/female 9-pin modem cable with all pins wired straight through. This hookup will not work with null-modem cables. The PC's data flow control signals are looped back in these examples, so that PC application programs may ignore handshake setup issues. The only PC COM port connections actually *required* are serial data in/out and ground. BOB-4 does support hardware and software flow control schemes, however.

Analog Devices' ADM3202ANZ is supplied in a conventional DIP-16 package (available from Decade Engineering). Substitutions are available from other manufacturers, but older RS-232 interface chips that are not specified for use on 3.3V power will not work correctly.

0.1uF (100nF) capacitor polarity generally isn't marked and doesn't matter, but if you wish to use some that *are* marked, please refer to Analog Devices' ADM3202 data sheet for guidance.

All of the +3.3V connection bubbles must be linked together. BOB-4S (the 30-pin SIMM version) does not output +3.3V power on pin-1 by default. Add a solder blob on the pads marked "J1" (bottom side, near pin number 1) of the BOB-4S module to enable this output.

When circuit construction is complete, remove the BOB-4 module from its static-shield bag and mount it in the application circuit, taking care to follow ESD safety procedures. Connect a high-quality +5VDC power source (see Cautions! section) and TV monitor. Double-check power supply polarity! Video input is optional; connect a camera, DVD player, video signal generator, or other composite video signal source if you wish to evaluate genlock-overlay performance. Connect the serial data cable to a COM port on your PC (or USB/Serial adapter device).

BOB-4H Hookup

BOB-4S Hookup

Sending Printable Characters to BOB-4 (or XBOB-4)

In this Quick-Start guide, we're going to use what is arguably the simplest and most direct method to make BOB-4 print text on the TV monitor: a terminal emulation program running on your PC. Terminal programs make the PC function like a dumb serial terminal — once the standard user interface for central 'mainframe' computers.

Power up the TV monitor and select its active video input if necessary. Make sure that your BOB-4 application circuit is connected to a PC serial COM port (or USB adapter) and power it up. A big "BOB-4" logo will appear on the TV screen.

Close any programs that could be using the chosen serial port, and then launch HyperTerminal. On many Windows PCs, HyperTerminal is found under *Start > All Programs > Accessories > Communications*. When the "Connection Description" dialog appears, type in a name for the BOB-4 connection, select an icon, and click "OK." When the "Connect To" dialog appears, drop down the "Connect using:" list, select the COM port to which BOB-4 is currently connected, and click "OK." A dialog titled "COM x Properties" should appear. In this window, select the following settings:

> Bits per second: 9600
> Data bits: 8
> Parity: None
> Stop bits: 1
> Flow control: None

Click "OK." HyperTerminal should now be "Connected" to BOB-4. Printable characters typed on your keyboard will clear the BOB-4 logo and immediately print in the upper left corner of the TV screen. These characters do not appear in the PC terminal window by default, but you can change that: File > Properties > Settings > ASCII Setup > Echo typed characters locally. Information transmitted by BOB-4 in response to certain commands will appear in the terminal window.

Let's do one final exercise before you proceed to full immersion in the [BOB-4 Application Guide](). To clear the screen, it's necessary to transmit a BOB-4 command. The App Guide uses <CSI> as the command prefix, which looks mysterious at first glance. It's merely an 'escape sequence' of two special characters that tells BOB-4 to suspend printing and execute the following instruction instead. Here's the entire clear-screen command, which is variant number 2 of the J command:

> <CSI>2J

To issue the command prefix, just strike the "**Esc**" key, then the "**[**" (open-bracket or left-square-bracket) key. Follow with "**2**" and capital "**J**." That's a total of four keystrokes. At this point, all printed characters on the TV screen are erased and the print position (for subsequent character printing) is restored to the upper left corner. If it didn't work, check the Caps-Lock indicator on your keyboard.

Have fun with BOB-4, but take care to avoid typing anything other than "**[**" after "**Esc**" until you achieve a good understanding of command structure. That little error can lead to unnecessary confusion.

$$\Omega$$

Decade Engineering Contact Information

Please check our website for the most recent version of this document before concluding that a defect exists. Hardware warranty and service information is posted within the online ordering system. See below for software warranty statement.

Phone	503-743-3194
Fax	503-743-2095
Post	5504 Val View Dr. SE, Turner, OR 97392 (USA)
Email	Use Feedback/Contact form at website
Web	www.decadenet.com

Obligatory Boilerplate

Trademarks owned by other companies are hereby acknowledged.

This product includes open source software developed by Neil Russell.

This product may include code developed by the Enlightenment Project.

Software Warranty Statement

All software in BOB-4 is provided "as-is," without warranty of any kind, express or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose and noninfringement. In no event shall Decade Engineering be liable for any direct, indirect, incidental, special, exemplary, or consequential damages (including, but not limited to, procurement of substitute goods or services; loss of use, data, or profits; or business interruption) however caused and on any theory of liability, whether in contract, strict liability, or tort (including negligence or otherwise) arising in any way out of the use of this software, even if Decade Engineering is advised of the possibility of such damage.