DECADE ENGINEERING

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BOB-3 Application Guide ~ Firmware v2.00 ~ June 6, 2003

(*Please check our website for the latest version of this document.*)

Cautions:

Starting with v2.00, the termination character for the **{N** command has changed! See Control Protocol section.

ESD (electro-static discharge) safety precautions must be followed at all times when handling BOB-3 modules. Use a grounded wrist strap and grounded work surface. BOB-3 modules must be stored and shipped in static-shield (metallic, not pink poly) packaging. Use a SIMM socket! Soldering directly to the BOB-3 module voids the warranty.

Specifications:

Physical	BOB-3 is designed in the 30-pin SIMM form factor, 3.50 x 1.05 x 0.35 inches. Module weight is about 12 grams (0.42 ounces). Ambient operating temperature range is 0~50 degrees C.
Power Supply	Nominal supply voltage range is +5VDC ±5% or +8~15V at 70mA typical. An auxiliary +5V regulated output (pin 3) is rated at 50mA and ±5% voltage tolerance. Auxiliary supply output current adds to main supply current drain, when main supply input (pin 1) is used.
Data I/O	The data path is asynchronous serial with crystal-controlled rates of 2400, 4800, 9600, 19.2K or 38.4K bits per second, using 8 data bits, no parity, one stop bit (8N1), inverted data, and 5V logic levels. Default bit rate is 9600. Other rates are selectable via pin strapping—see Pin Descriptions. BOB-3 connects directly to the UART TXD/RXD pins of most microcontrollers. An inverting RS-232 interface (industry standard) is required for connection to PC COM ports. Six of the BOB-3 module pins can serve as software-controlled digital outputs.
Video I/O	BOB-3's video environment is RS-170A (NTSC) composite baseband, 1Vpp 75 ohms unbalanced. PAL video compatibility is available as an ordering option. The video input accommodates up to +2.5VDC bias mixed with incoming video. The video output contains a small DC bias (+1V), which is common to many video sources and is well tolerated at the inputs to most video equipment. An internal color video background signal is automatically generated if video input is not supplied, but application programs may enforce genlock or local video modes. Video control and timing signals are available by software command at six output pins.
Character Format	Up to 680 characters may be displayed on screen, in 40 columns and 17 rows (16 if vertical scrolling is active). 320 character patterns are provided as 12x13 pixel bitmaps, including upper & lower case, italics, European language support, and a set of graphics characters useful for lines, bar graphs, etc. Non-ASCII characters are accessible through a simple command protocol. 63 of the standard character patterns are stored in font RAM and may be replaced by user-defined bitmaps, to support character-based graphics displays or alternate languages.

Display Features	Only monochrome text is available in genlock/overlay mode. Characters from ROM are displayed by default in white with a thin black outline. Halftone (reduced video intensity) and black character backgrounds are optional. Characters from font RAM have less display flexibility. This includes European language support, which is part of the default RAM character set. Color display features, including character background control, are supported in local video generation mode. In local mode, blue matte background is supplied by default. Other background colors are available by command. Blinking may be selected for any character or group in either video mode. Manual adjustment of transparency as well as character and background brightness (gray scale) is optional, with external circuits. Vertical scrolling may be configured for any contiguous group of display rows. A single crawl (horizontal scroll) line at screen bottom can display up to 256 characters sequentially. No other display is possible when crawl mode is invoked. The entire text display may be toggled on or off without affecting the contents of display RAM. Writes to display RAM are permitted while the display is off.

Note: Product specifications, policies and prices are subject to change without notice. Contact Decade Engineering to confirm current status if any specified parameter is critical to your application.

Pin Description Table:

Pin	Description
1	+12VDC Supply; 8~16V acceptable, 70mA required (plus pin 3 load)
2	Ground (power & digital)
3	+5VDC ±5% auxiliary output. 50mA maximum load. Add decoupling capacitance if load current isn't constant! +5VDC ±5% system power may be applied here if pin 1 is left open.
4	PD5; Reserved (do not connect)
5	PD4; Reserved (do not connect)
6	PD3; Reserved (do not connect)
7	PD2; Input from crawl circuit (use is optional)
8	TXD; Transmit data output, 5V logic
9	RXD; Receive data input, 5V logic
10	CPU Reset\ input (low true, usually needed only for factory test)
11	ADC7; Reserved input (should be grounded)
12~14	Baud rate select inputs; defaults to 9600bps. 4.7K pullup resistors (to pin 3) must be connected to these pins if they're not tied permanently high or low. See baud rate table below.
15	Video detector output; low if input video is missing, can drive LED with series resistor of 330~680 ohms to +5V (pin 3).
16	P4/RED Output port (use is optional)
17	Factory test (do not connect)
18	Factory test (do not connect)
19	Factory test (do not connect)
20	P5/CSYNC Output port; CSYNC output function is required for crawl feature, if user intends to implement it. See notes under Control Protocol table.
21	Character intensity control input (use is optional). Leave open if unused. Not controlled by software. See notes for control hookup.
22	Background intensity control input (use is optional). Leave open if unused. Not controlled by software. See notes for control hookup.
23	Clamped video output (for optional external video mixing circuit)
24	P3/GRN Output port (use is optional)
25	P2/BLU Output port (use is optional)
26	P1/BLKG Output port (use is optional)
27	P0/YM Output port (use is optional)
28	Video output; drives 1Vpp into 75 ohms; see notes.
29	Ground (for video signals)
30	Video input; requires 1Vpp into 75 ohms (use is optional)

Notes:

- Only DC power, data input, and video output connections are mandatory. Video input is necessary for genlock/overlay functionality. Data input is not necessary if a start-up display has been programmed and it is the only required display. See basic hookup diagram.

- The video output (pin 28) includes a small DC bias; about +1V when properly terminated downstream.

- Character and background intensity control inputs (pins 21 & 22) are optional, and may be used to trim foreground and background brightness. Measure video output with an oscilloscope if precise level settings are required. Use 10K linear pots, and connect as follows:

    1. Counterclockwise end: ground (BOB-3 pin 29)
    2. Wiper: BOB-3 pin 21 or 22
    3. Clockwise end: +5VDC (BOB-3 pin 3)

- P0~5 are weak CMOS outputs and should not be used to drive LEDs without buffering.

- Decade Engineering now strongly recommends the addition of 4.7K pullup resistors to +5V at pins 12~14 (unless permanently grounded for baud rate selection). Weak internal pullups are provided, but a few customers have reported intermittently wrong baud rate selection until the external pullups were added. Strap one or more pins to ground as required to configure the serial communication rates listed below:

Pin 12	Pin 13	Pin 14	Baud Rate
Lo	Lo	Hi	2400
Hi	Lo	Hi	4800
Hi	Hi	Hi	9600
Lo	Hi	Hi	19,200
Hi	Hi	Lo	38,400

- Undefined pin strapping options default to 9600bps.

Video Modes:

This document makes references to the video operating modes offered by BOB-3. The basic modes are “Local” and “Genlock”. Genlock mode may also be called *overlay* mode, because video generator synchronization (genlock) must be achieved in order to superimpose characters on the image. A third video operating mode, “Automatic,” derives from BOB-3’s ability to switch between the basic modes by detecting video supplied to the input pin (pin 30).

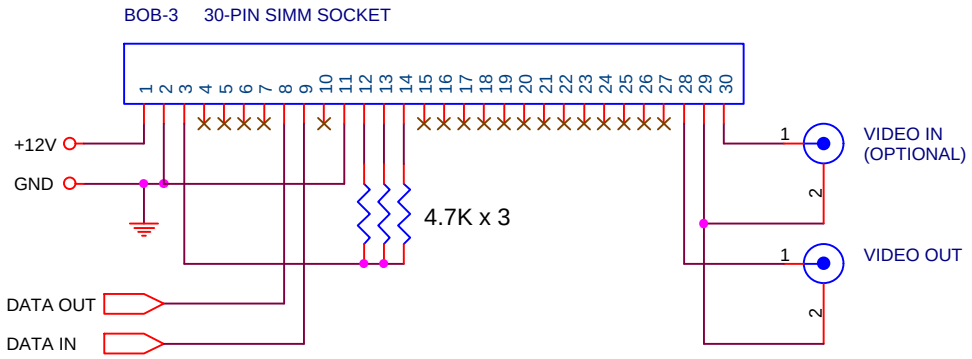
BOB-3 powers up in Automatic. If there’s no video input, it selects local mode. In this case, BOB-3 generates the complete video signal, and characters appear on a blue (by default) matte background. If video input is present, BOB-3 switches to genlock mode so that characters are superimposed on the externally generated video signal. BOB-3 continues to monitor incoming video and switch between the basic modes as required to maintain a video signal at the output.

Application programmers can force BOB-3 to stay in local or genlock modes if desired. Be aware, however, that video crosstalk artifacts can result from forcing local mode while video input is applied. Undesired mode switching (to local mode) due to incoming video signal dropouts or glitches can be avoided by forcing genlock mode. BOB-3 exhibits better behavior than BOB-II in this respect, so it’s unlikely that you will be compelled to deal with video mode control directly.

Basic Hookup:

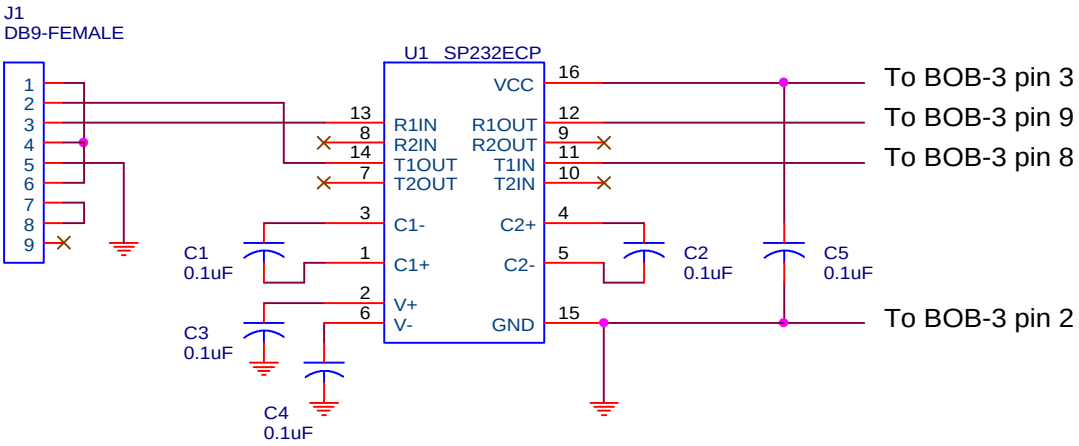
The schematic diagram below shows a typical BOB-3 installation. The serial data rate defaults to 9600bps. 4.7K pullup resistors (to pin 3) are required at pins 12, 13, and 14 unless those three socket contacts are left floating

(absolutely no metal attached). Note that an RS-232 hardware interface is required for connection to a PC COM port (see next section), but not for connection to a microcontroller. Some optional BOB-3 features are not implemented here, but are discussed in other parts of this document:



RS-232 Hardware Interface:

BOB-3's serial data I/O signals can connect directly to the UART TXD/RXD pins of most microcontrollers, but you need an inverting RS-232 hardware interface if you want to connect to a PC serial port or any other 'true' RS-232 host system. Here's a PC COM port interface circuit example:



The suggested Sipex SP232ECP (plastic DIP package) chip can use charge pump capacitors as low as 0.1uF. Maxim's old standard MAX232 requires 1.0uF, but the MAX202 works with 0.1uF. Chip pinout is identical. Even though the Sipex chip incorporates 15KV ESD protection, you should add protective networks in the RS-232 signal lines if your system environment isn't benign. EMI filtering may also be required. Be sure to add a power supply decoupling capacitor of at least 0.1uF across U1 pins 15~16 (C5 above).

Many other circuit variations are possible, including the simple receive-only transistor circuit described in the BOB-II literature, but most BOB-3 applications will benefit from bi-directional communication capability. This is especially true at any of the higher baud rates.

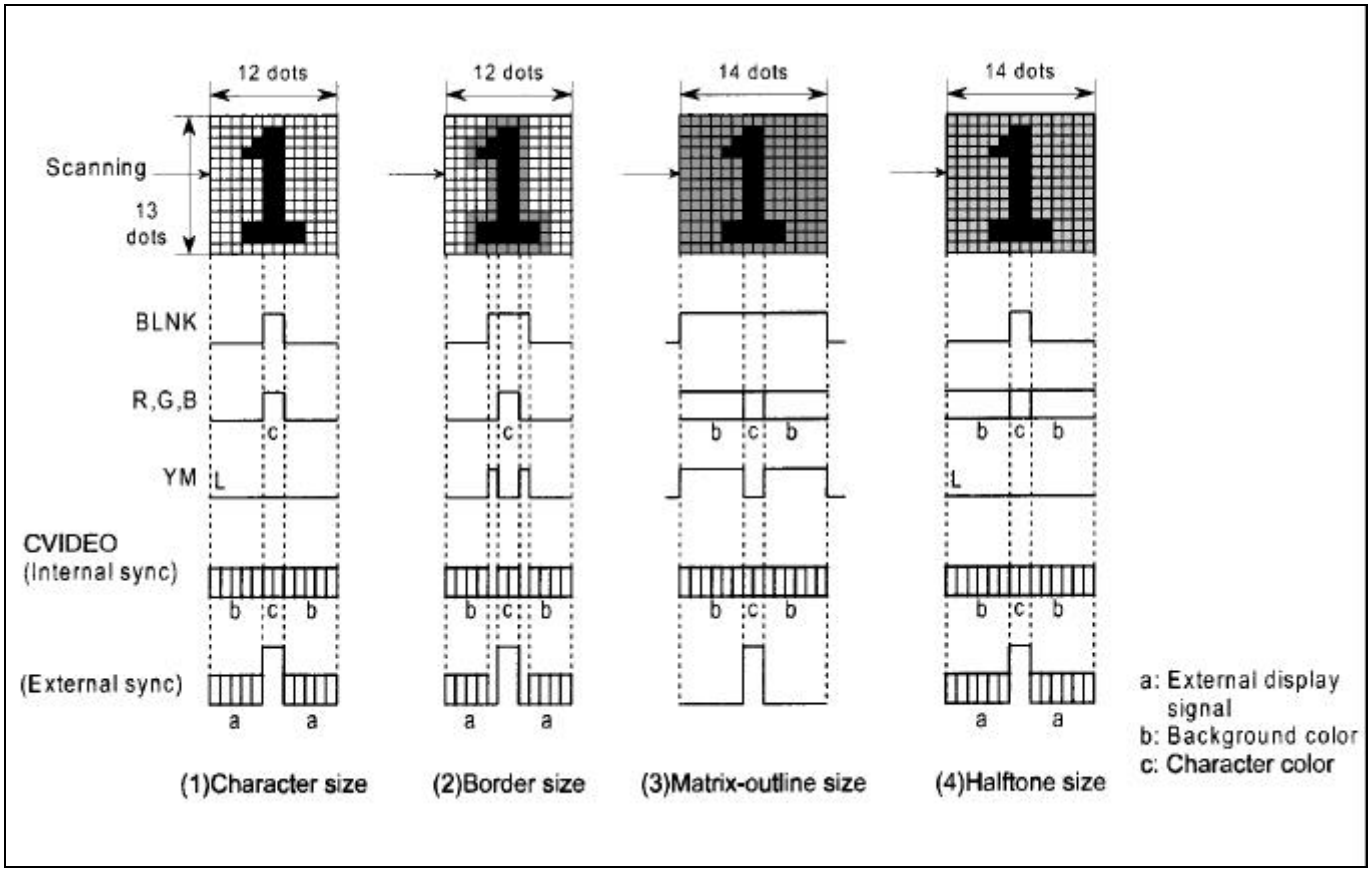
In the RS-232 interface example above, the PC's hardware handshake signals are looped back. This can simplify application programming, but it's not necessary if you know how to deal with each of those signals explicitly in software. BOB-3 relies on software flow control, so the only host connections actually *required* are serial data in/out and ground.

Also note that J1 pin connections above are drawn to match a standard male/female 9-pin serial modem cable with all pins wired straight through. This hookup will not work with null-modem cables, or any other serial cables with internal cross-connections.

Digital Output Ports:

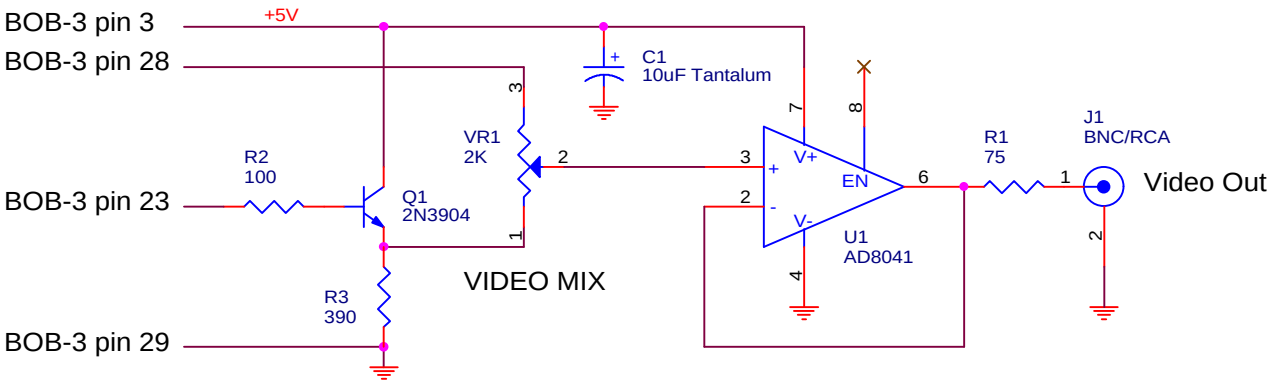
P0~5 may be used as general-purpose logic outputs to control circuitry external to the BOB-3 module. These are unbuffered CMOS outputs; don't attempt to drive heavy loads such as LEDs without buffering.

The alternate port output signals, selected by software, may be used in external video processing circuitry as shown in the drawing below. CSYNC (composite sync) may be used independently, to develop clamp pulses for DC restoration, etc. Note that CSYNC is reserved for use with external circuitry that must be installed to use the crawl feature of BOB-3 modules with firmware version 2.00 or higher.



Variable Transparency:

BOB-3 supports manually variable video overlay transparency, but this feature requires a bit of external application circuitry. The circuit below is an example of what's necessary (not tested at this writing):



Use the new video output at J1 instead of BOB-3 pin 28. Do not substitute Q1 with a buffer IC. The DC offset voltage across its base-emitter junction is an important feature of this application circuit design. The AD8041 is a video op-amp from Analog Devices that works well on 5V power. The enable pin is left unconnected, so it's always functional. All that's really needed here is a good unity-gain buffer that can drive 150 ohms to 2Vpp at 5MHz without distortion. The video blanking level is about +1.4V at the input to U1, so a simple emitter follower would cause sync tip compression. Note that some video amplifier chips also have trouble supplying adequate output current near the ground rail.

The Video Mix pot must be set for maximum contrast (wiper to pin 3) in local video mode.

Control Protocol

Serial communication parameters are: **8N1** (8 data bits, no parity, 1 stop bit). Bit rates other than 9600bps are configured by grounding pins 12~14 of the BOB-3 module at installation time. See pin descriptions.

No RS-232 interface is needed for use with a Parallax[tm] BASIC Stamp[tm] or any industry-standard microcontroller chip. If the Stamp is programmed for inverted data, it may be connected directly to BOB-3. BASIC Stamp SEROUT signal polarity conventions are opposite to that adopted here. Set BS2 Baudmode to 84 or 85 (for 9600bps). Set BS1 Baudmode to T2400. 2400bps is the only compatible bit rate available for BS1.

Your application program must manage the software handshake correctly if you transmit data to BOB-3 continuously at a high rate. BOB-3 transmits the **<XOFF>** character (hex 13, ctrl-S) if the receive data buffer (256 bytes) reaches 75% full, and transmits **<XON>** (hex 11, ctrl-Q) when it drops below 25% full. This is an industry-standard flow control technique that is fully compatible with common PC terminal emulation programs such as HyperTerminal[tm].

After a brief start-up delay (<300mS), BOB-3 transmits **{HR<CR>** (hardware reset) and **<XON>**, to inform the host controller that it's on-line. BOB-3 may send a garbage character or two during initialization.

BOB-3 always monitors incoming video. If video status changes, BOB-3 transmits **{Vv<CR>** where "v" is T or F, indicating presence or absence of incoming video.

Any received character not preceded by the command prefix (**{**) is interpreted as ASCII text and written to the screen at the current 'cursor' (print position) location. The cursor automatically advances to the next available character cell and wraps to the next line, or back up to the first line as required. Display rows (lines) are numbered

from the top down starting with zero. Display columns are numbered from left to right starting with zero. ROM characters are presented with white foreground and thin black outline by default.

Non-ASCII characters and unsupported ASCII characters are ignored in character translation modes other than 3 and 4. In those modes, transmit literal byte values (see character set illustrations) to specify each printable character. Do not send data containing the command prefix character (hex 7B) while in translation modes 3 or 4 unless you intend to send a command. Supported ASCII characters are:

A~Z a~z 0~9 ‘ ’ , : • . ; ” ( ) ? ! + - * / = % < > CR (carriage return) **SP** (space)

ASCII **<CR>** (carriage return) immediately moves the print position to the left end of the next available line.

Commands sent to BOB-3 must be prefixed by the left curly brace character: **{** All commands except **{N** and **{VW** employ a fixed-length format, and do not require a command suffix. Command salvos require a **{** prefix to each command in the string. Command letters are not case-sensitive.

Command	Description
{Ayy	Clears a single row of characters if “yy”=00~16. Clears the entire screen and sets the ‘cursor’ to top left home position if “yy”=17. Clears the scroll buffer if “yy”=18.
{BE & **{BD**	Display enable/disable. Enabled by default. Display RAM contents are not affected, and characters may be written to display RAM in either mode.
{Cxxyy	Moves print position (cursor). “xx” is the two-digit decimal ASCII column number (00~39) and “yy” is the row number (00~16). “yy” is ignored in scroll mode, but must be present.
{Dn	Character cell background color (local mode). “n” = 0~7. Defaults to blue.
{En	Character color for subsequent characters (local mode). “n” = 0~7. Defaults to white
{Fn	Screen color (local mode). “n” = 0~7. Defaults to blue.
{GE & **{GD**	Blink enable/disable. Subsequent characters flash or don’t flash in the display.
{GCn	Blink duty cycle. “n” = 0~3. 0: Off, 1: 25%, 2: 50%, 3: 75%. Defaults to 50%
{GMb	Blink mode. “b” = 0~1. 0: Default on/off flash, 1: Pixel data reversal
{GTb	Blink rate. “b” = 0~1. 0: Default slow (1S), 1: Fast (0.5S)
{HN & **{HX**	Not valid in BOB-3. External video levels are always active if the controls are installed.
{HHphh	Horizontal display position offset with single-pixel resolution. “p” is a polarity sign (+ or -). “hh” is a two-digit hex value in the range of 00~FF. Numeric letters may be either case. Range is limited internally, but limits vary with product version. For NTSC, the limits are –100 and +255.
{HVphh	Vertical display position offset with single-pixel resolution. “p” is a polarity sign (+ or -). “hh” is a two-digit hex value in the range of 00~FF. Numeric letters may be either case. Range is limited internally, but limits vary with product version. For NTSC, the limits are –9 and +226.
{Iyyn	Character outline mode by row. “yy” = 00~16 (row number), “n” = 0~3. 0: no outline, 1: black outline, 2: cell color with char outline, 3: cell halftone (dark video) with char outline. Defaults to mode 1 in every row. RAM characters do not follow these rules, but mode 2 is useful.
{JE & **{JD**	Scroll enable/disable. Defaults to disabled. While scrolling is enabled, received data goes into a 40-character line buffer. Buffer content scrolls into display when **<CR>** is received or buffer is filled. Only 16 lines may be displayed in scroll mode.
{JU & **{JO**	Scroll up/down. Defaults to scroll up.
{JSxx	Scroll block starting line. “xx”=00~14. Defaults to 14.
{JNxx	Scroll block ending line +1. “xx”=02~17. Minimum setting is starting line +2. Defaults to 17.
{JAn	Scroll buffer autoerase. “n”=0~1. 0: off, 1: on. On is the default setting.
{JT	Scroll status query. BOB-3 returns: **{SS <E/D> S=hh E=hh D=<U/D> L=hh<CR>** where E/D indicates scrolling enabled/disabled, S parameter is the starting row, E parameter is the ending row, U/D indicates up/down scroll direction, and L parameter is the buffer line number. Numeric parameters are in hex.
{Lyyhv	Sets character size by row. “yy” = 00~16 (row number), “h” = 0~1 (horizontal size), “v” = 0~1 (vertical size). Size value 1 doubles the character size in either or both directions. Defaults to minimum character size in every row.
{MF	Video mode locked to Local Generation.

<table>
<tr><td>{ML</td><td>Video mode locked to Genlock/Overlay.</td></tr>
<tr><td>{MM</td><td>Video automatic mode select (default). Allow time for lockup if external video is applied.</td></tr>
<tr><td>{N<data>|</td><td>Writes a start-up display and/or configuration commands into non-volatile memory. Send a zero-length string to disable (default). When the termination character (vertical bar symbol) is received, BOB-3 sends <XOFF>, then sends <XON> and {OK<CR> upon completion of the write operation (up to 3S later). Embedded command characters count toward the maximum string length of 256 characters. Do not include a system reset command! The start-up display always appears at power-up time, without a host controller, but BOB-3 also operates normally if a host is connected. Note: The termination character was <CR> in firmware versions previous to v2.00.</td></tr>
<tr><td>{ODh</td><td>Selects alternate functions of 6 logic output pins on the BOB-3 module. “h” is a single byte in the range of 0~3F which selects alternate video control functions of P0~P5 if bits are set true. Alternate function details are presented in the text.
<table>
<tr><th>Bit Position</th><th>Port Name</th><th>Alt. Function</th><th>Default</th></tr>
<tr><td>0</td><td>P0</td><td>YM</td><td>0</td></tr>
<tr><td>1</td><td>P1</td><td>BLNK</td><td>0</td></tr>
<tr><td>2</td><td>P2</td><td>BLU</td><td>0</td></tr>
<tr><td>3</td><td>P3</td><td>GRN</td><td>0</td></tr>
<tr><td>4</td><td>P4</td><td>RED</td><td>0</td></tr>
<tr><td>5</td><td>P5</td><td>CSYNC</td><td>0</td></tr>
</table></td></tr>
<tr><td>{OPh</td><td>Controls logic level (or polarity) of 6 output pins on the BOB-3 module, as listed above. “h” is a single byte in the range of 0~3F. P0~5 logic outputs match bit values of argument unless the alternate port function has been selected. In that case, the corresponding video signal is inverted if bit value is zero. All bits default to zero, so BOB-3 boots with P0~5 outputs low.</td></tr>
<tr><td>{P<data></td><td>Writes user-definable character memory (font RAM). This command must be followed by exactly 1638 bytes of data, which loads all 63 user-definable characters. The data is structured as follows: Each character is 12 pixels wide by 13 tall. Data bits set to 1 (true) indicate active foreground pixels in the display. 2 data bytes represent each pixel row, starting with MSB at left end of each row. The last 4 bits of the second byte for each row of pixels are always zero. Pixel rows are sampled top-to-bottom within each character, and characters are sampled sequentially from character number 00 to 3E (3F is a ‘transparent’ space char). Notes: [1] This command could overflow the receive buffer if transmitted at high speed without pacing or flow control. [2] See default RAM character set illustration. [3] A BOB-3 Font Editor utility program is available without charge from Decade Engineering. See <www.decadenet.com></td></tr>
<tr><td>{QT</td><td>If Q is true, {U controls RAM character background color (globally), and {E controls RAM character foreground color (globally) in local mode. In genlock mode, send {U0 for black backgrounds. Other settings yield white backgrounds, so RAM characters can be made visible only be sending {E0.</td></tr>
<tr><td>{QF</td><td>If Q is false, RAM character background is defeated and the {U command controls character foreground color instead.</td></tr>
<tr><td>{QA</td><td>Engages automatic Q control mode (default). Sets Q false in genlock video mode, true in local video mode. To achieve the appearance of transparent character backgrounds in both video modes, RAM character backgrounds are set to the screen color in local mode.</td></tr>
<tr><td>{R</td><td>Forces BOB-3 system re-initialization. Restores all defaults and clears display RAM.</td></tr>
<tr><td>{S</td><td>System status query. BOB-3 returns: {ST Vv Mm Dd<CR> where “v” is T or F (input video present or not), “m” is 0~3 (video mode; 0: auto/local, 1: auto/genlock, 2: local, 3: genlock), “d” is E or D (display enabled or disabled).</td></tr>
<tr><td>{Tn</td><td>Character translation mode select. “n” = 0~4. 0: standard ASCII (default), 1: italic ASCII, 2: spatially offset ASCII, 3: non-ASCII ROM characters, 4: user-definable RAM characters. See character set illustrations for ROM characters and default RAM characters.</td></tr>
<tr><td>{Un</td><td>Background color for RAM characters (local mode). “n” = 0~7. Defaults to 4 (blue). See {Q commands for important details!</td></tr>
</table>

{VE & **{VD**	Enable/Disable text crawl (horizontal scroll). When enabled, only a single line of text is displayed at screen bottom. Not compatible with vertical scrolling. Do not use wide characters. Do not change the mode or polarity of output ports P0~5 during crawl mode—when **{VD** is transmitted, they will be reset to the values in effect when **{VE** was sent. Color and blink controls are 'global' in crawl mode. P5 output must be available. Supplemental circuitry is required—see notes.
{VRn	Crawl rate control. "n" = 0~2. Defaults to 1.
{VW<data>}	Writes crawl buffer. Character string length may be up to 256. Do not embed any commands in the character string.

Notes:

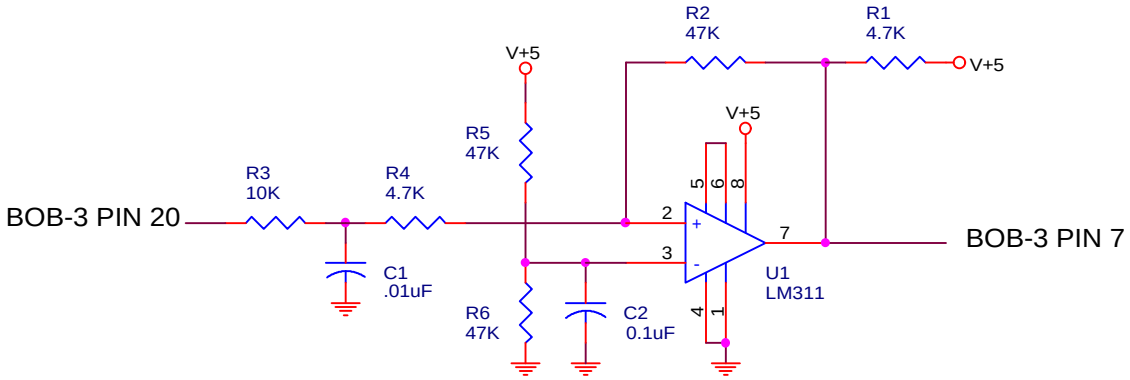
- If the command prefix is followed by an unknown command, BOB-3 responds with **{?<CR**>. If a command argument is out of range, BOB-3 responds with **{OR=0<CR>** and, in most cases, offending arguments are interpreted as zero. **{HH** and **{HV** parameters will be set to minimum. For **{JN** argument <2 it will be set to 2; if >17 it will be set to 17; if <= start value +1, it will be set to start +2. For **{JS** argument => end value –1, it will be set to end –2.

- In genlock/overlay mode, any color specification other than black causes a white display. The color controls operate normally only in local video generation mode. Command color parameters are as follows:

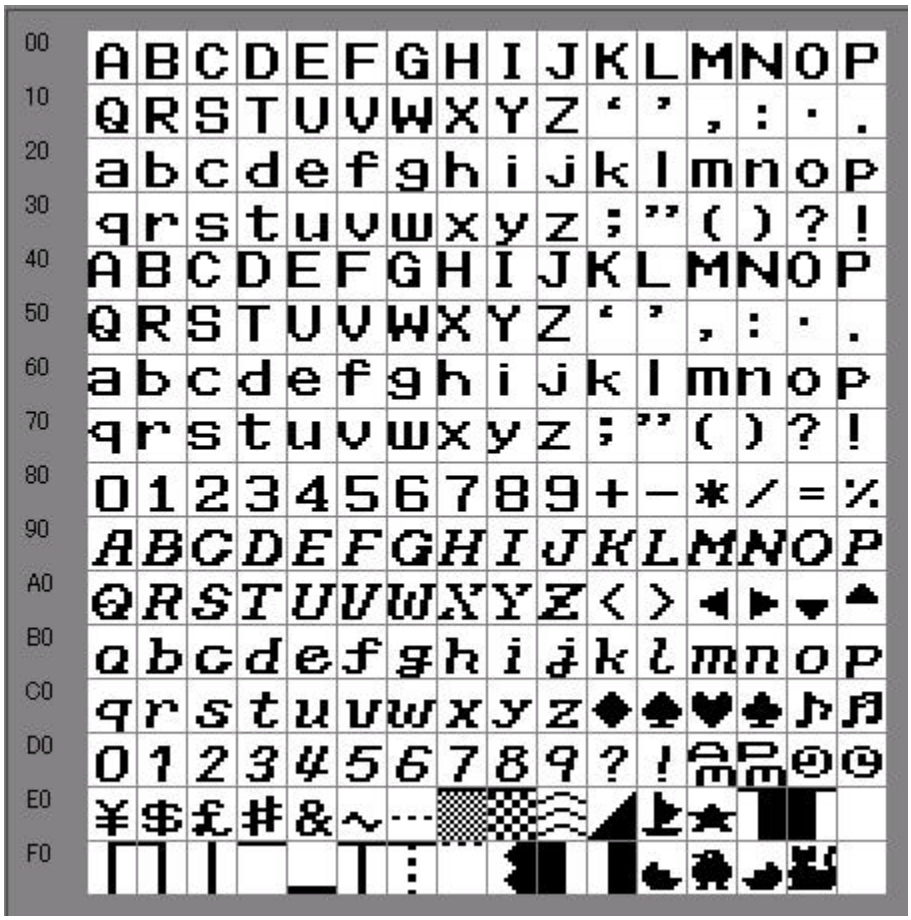
"n"	Color
0	Black
1	Red
2	Green
3	Yellow
4	Blue
5	Magenta
6	Cyan
7	White

- RAM characters are not treated the same as ROM characters in the display. Outlines are not available. See **{I**, **{Q** and **{U** commands for additional discussion. Include a space character in custom character sets, to avoid frequent **{T** mode switching. The space character at 3F in RAM behaves like the space character at FF in ROM. They both show screen color instead of character cell background color.

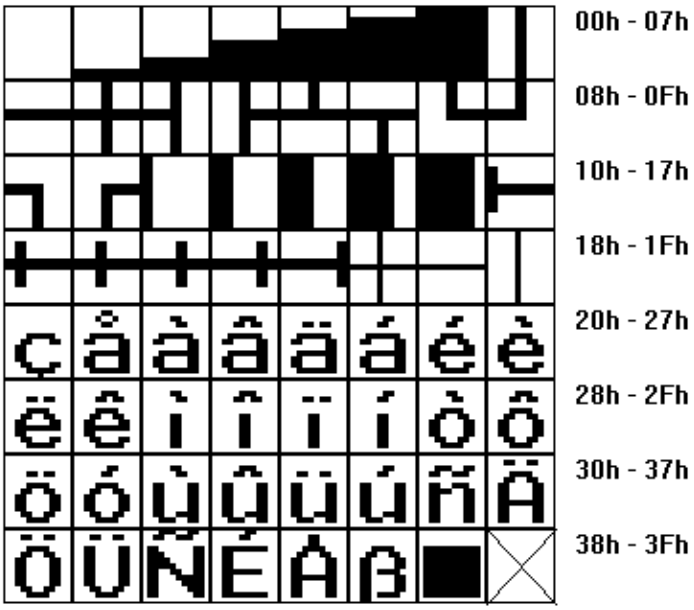
- Crawl mode: The missing video indication at pin 15 is not currently functional in text crawl mode. P5 cannot serve as a digital output port when crawl is used. This is the required supplemental circuitry for crawl mode with BOB-3 modules (R4~6 values changed March 17, 2003):



ROM Character Set:



Default RAM Character Set:



Application Programming:

Here's a simple QuickBASIC[tm] programming example:

```
' BOB-3 Test Program   ....Provides a very brief exercise....
OPEN "com1: 9600,n,8,1,cs0,ds0,cd0,op1000,rs" FOR OUTPUT AS #1
PRINT #1, "{A17"; 'Clear the screen, in case we've been playing
PRINT #1, "{C1101"; 'Print title in center of 2nd line...
PRINT #1, "BOB-3 Test Program"
PRINT #1,
PRINT #1, "Time: "; TIME$
PRINT #1, "Date: "; DATE$
PRINT #1, "{U0{D0" 'Set background attribute for RAM & ROM chars
PRINT #1, "RAM characters are next... ";
PRINT #1, "{T4"; 'Prepare to print a few RAM characters
PRINT #1, CHR$(0); CHR$(1); CHR$(2); CHR$(3); CHR$(4); CHR$(5); CHR$(6);
PRINT #1, CHR$(33); CHR$(34); CHR$(35); CHR$(36); CHR$(37); CHR$(38);
PRINT #1, "{T0"  'Return to normal ASCII translation mode
CLOSE #1
END
```

Note that RAM character codes were entered as decimal values in this example, but hex values are given as labels in the Default RAM Character Set illustration above.

If the overlay doesn't fit your monitor screen:

BOB-3 displays up to 17 lines of characters in both NTSC and PAL versions. The NTSC version, however, leaves little guard space at screen top and bottom, which could cause portions of these lines to be masked by video monitors that overscan excessively. If this happens to you, consider two possible solutions: [1] Don't write anything to line 0 or line 16. [2] Shift the overlay position downward with the **{HV** command and don't use line 16.

The PAL version could exhibit the opposite problem, in that excessive guard space appears above the top line and below the bottom line of displayed text. The best that can be done in this case is to move the overlay position up or down, allowing text to come closer to screen top or bottom but not both.

If the text overlay isn't stable:

Overlay jitters can be caused by weak and/or noisy video applied to pin 30. Typically, the video signal has been attenuated by passage through a long cable (or double termination). The best cure for long cable woes is a robust cable drive amplifier with pre-equalization for cable loss characteristics. Decade Engineering offers a Camera Adapter Board (CAB) with broad adjustment ranges and high drive capability for this purpose. A Cable Compensator or Video Processor at the receiving end may also be suitable. Bear in mind that long cables are subject to noise injection from a variety of sources, including ground loops, so the cable receiving circuit may have to deal with several kinds of signal defect simultaneously. Coaxial cable losses in the baseband video spectrum are notoriously nonlinear as a function of frequency, making long cable compensation a distinctly non-trivial exercise.

Note: BOB-3 was not designed to work with tape playback signals from VCRs. In many cases it will work as desired, but overlay stability can be unacceptable with some VCRs. It's generally worse in special effects modes (e.g. freeze frame).

If operation is intermittent:

Tin-plated contacts can become unreliable if an electrical contact treatment has not been applied. We suggest the widely available Cramolin R-2 or R-5, from Caig Laboratories. Apply the contact treatment to a cotton swab and polish all of the contact pads on your BOB-3 module, then reinstall it in the SIMM socket. This procedure should result in a permanent cure for intermittent operation due to poor socket contact.

SIMM socket Information:

Molex part numbers 15-46-3053 (Tin), and 15-46-3043 (Gold) are suitable. Amp 822056-2 (Tin) and 822061-2 (Gold), and Adam Technologies SIMM-130-VTL (Tin) and SIMM-130-VGL (Gold) are equivalent. At this writing, Amp and Molex have ceased production, but many component distributors will cross-reference to other manufacturer's part numbers. Note: The reliability of tin-plated contacts can be markedly improved by contact treatments. Cramolin R-2 and R-5 from Caig Laboratories are well accepted in the industry and widely distributed.

Using BOB-3 in a cable TV system:

It's not possible to insert a single BOB-3 in a cable TV system and display the same text on all channels at once. There are a number of reasons for this. In a cable system, video signals are modulated onto RF carriers at different frequencies (that's how the TV tuner is able to pick out just one). The signals often originate at widely separated locations with no regard for scan synchronization, and individual signal strengths may be poorly controlled.

BOB-3's input and output are both baseband video. This means that incoming TV channels must be demodulated from RF to baseband in order to place a text overlay on the image. To display the output from BOB-3 on a standard TV receiver, you must use an RF modulator to re-create a TV broadcast channel, which may then be fed into your cable system for distribution to as many TV sets as required. Each TV set must be tuned to the modulator's output channel in order to view the text.

Of course, you need a demodulator, a BOB-3, and a modulator for each TV channel requiring a text overlay. A side-benefit of this arrangement is that you may freely restructure channel assignments in your local cable system. A potential problem is that low-cost modulators are often poorly filtered and may generate interference on adjacent channels. Be sure to use modulators that are designed for adjacent channel operation, or else leave dead channels between the ones you place in service.

Using BOB-3 with S-Video:

The alternate output function of pin 26 is a fast blanking signal that may be used in external video processing circuitry to suppress chroma during character insertion times. Locally generated video would lack the color component, but this isn’t a problem in many applications. Decade Engineering will supply additional details on an S-Video application circuit when it has been tested.