



Spartan™-3A / Spartan™-3AN Starter Kit Pre-Loaded Demo

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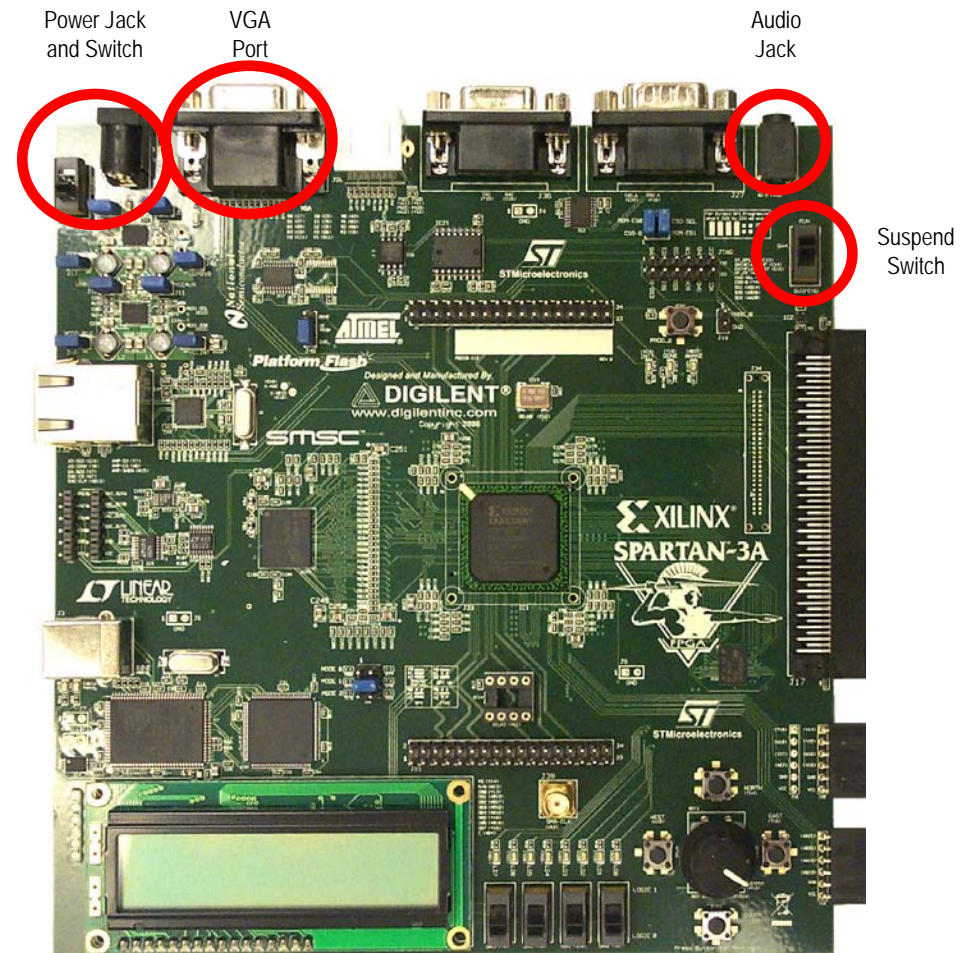


Agenda

- How to set up the demonstration
- How to operate the demonstration
- Evaluating MultiBoot
- Evaluating Suspend
- Demo technical details

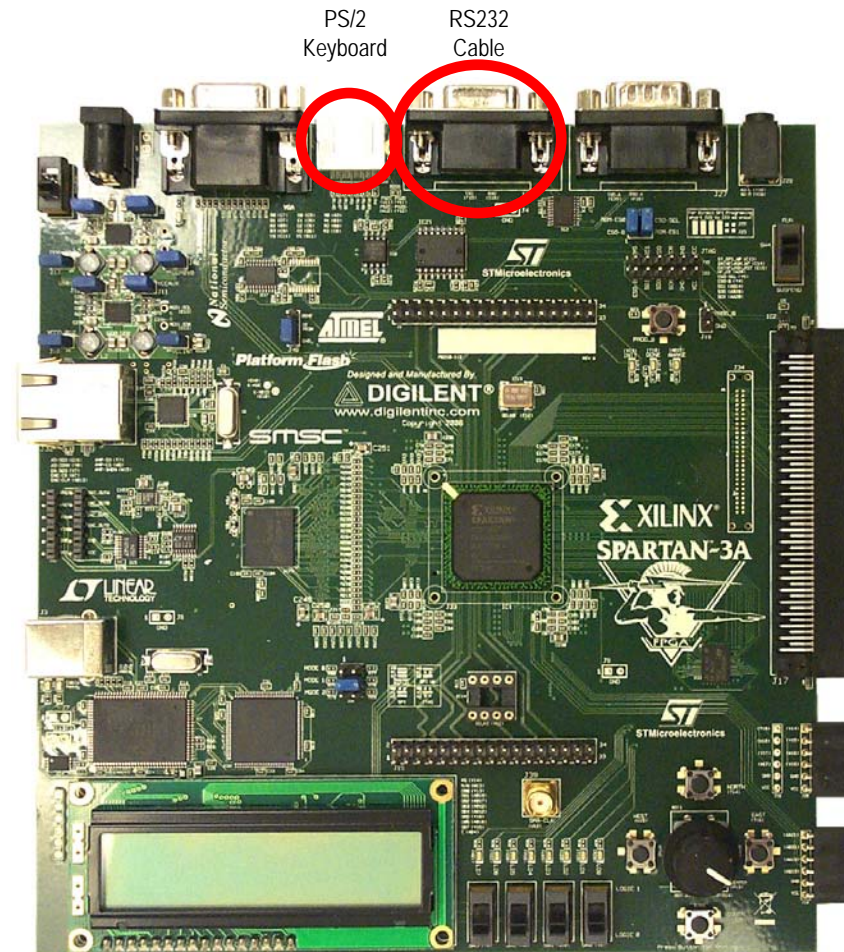
Demonstration Setup (1)

- Make sure power switch is turned off; connect power supply to circuit board
- Make sure suspend switch is set to run
- Connect suitable VGA display device to board
 - CRT
 - Projector
 - Flat panel
- Connect headphones or amplified speakers



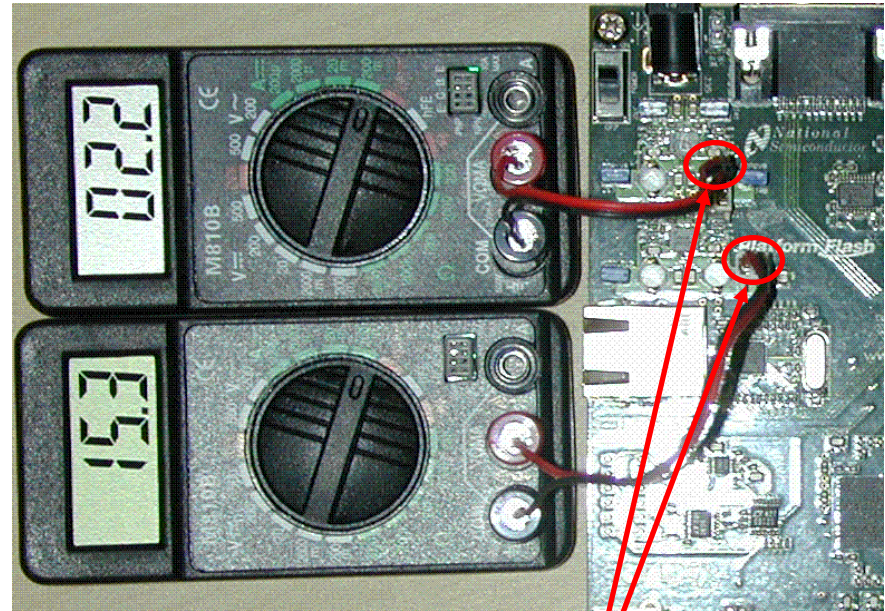
Demonstration Setup (2)

- Optional: Connect PS/2 keyboard to the board
- Optional: Connect serial cable between board and PC, start the provided HyperTerminal session



Demonstration Setup (3)

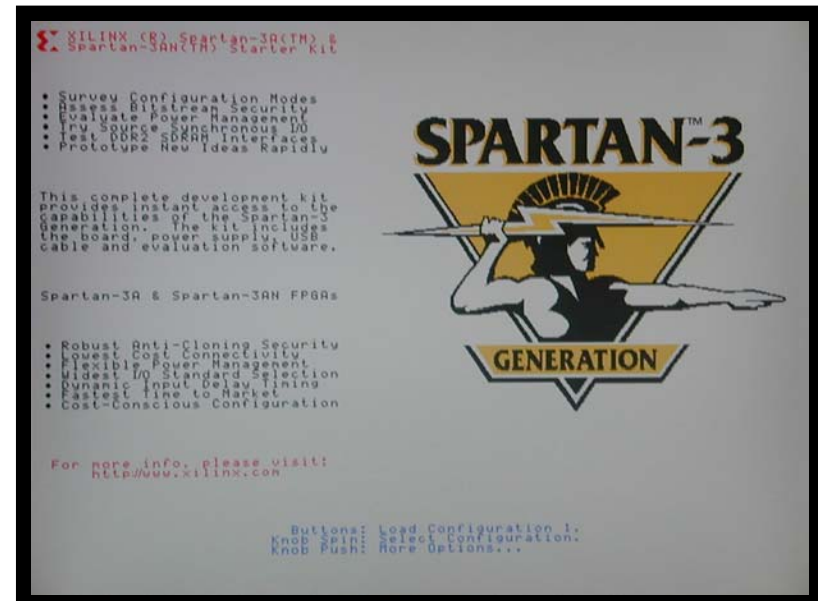
- Optional: Install meters for current measurement (meters not provided)
 - Meters must be set to 200mA or higher range
 - Meters must be on before board power is applied
 - Reverse connections if values shown during operation are negative



VCCAUX and VCCINT
shunts removed to
accommodate meters

Demonstration Setup (4)

- Turn on power
 - Audio and video output generation begins
 - Messages are sent to the on-board LCD and the serial port
- Several forms of user interaction are possible
 - Manipulate image in real time
 - MultiBoot to other designs
 - Enter and exit Suspend



You may need to adjust display device settings
(horizontal and vertical position) to center the display

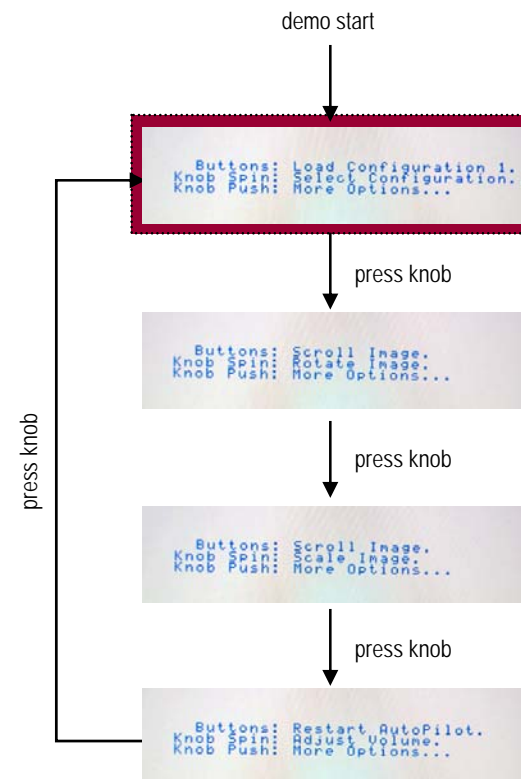


How to Operate

- There are different ways to “operate” the demo
 - Switches and buttons, while viewing the VGA output
 - Switches and buttons, while viewing the LCD output
 - Through the RS232 port, using HyperTerminal on PC
- Although the demo setup states that the VGA display is required, you can run a demonstration by other means...

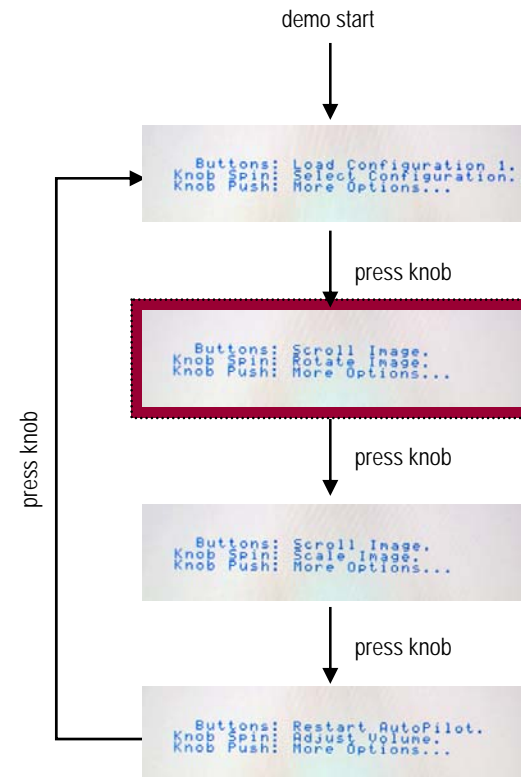
How to Operate (VGA - 1)

- A menu is displayed at the bottom of the display in **blue** text
- First, the MultiBoot menu
 - Spin knob to select next configuration to load
 - Press any N/E/W/S button to initiate MultiBoot
 - Press knob for next menu



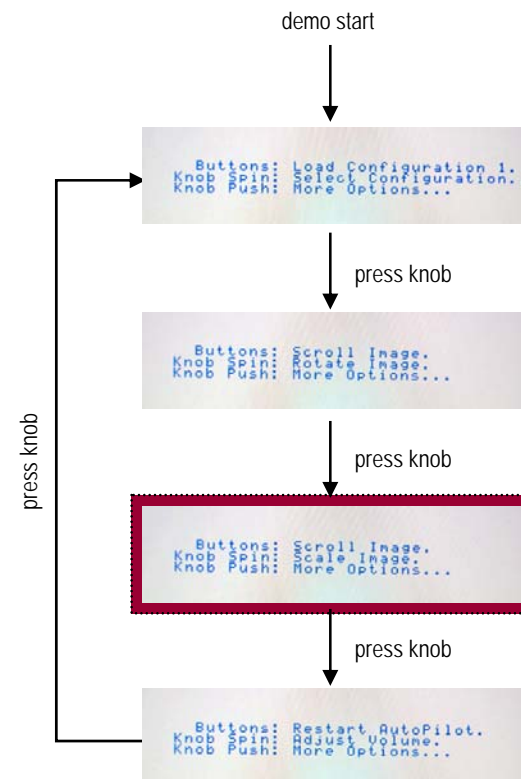
How to Operate (VGA - 2)

- Image control menu 1
 - Press N/E/W/S buttons to scroll displayed image
 - Spin knob to rotate image
 - Press knob for next menu
- The "autopilot" (automatic demo) will stop if the user performs manual image transformations



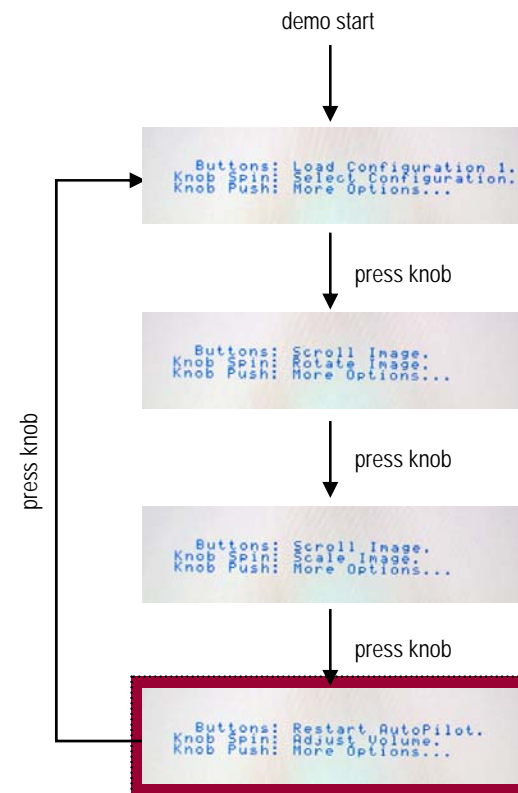
How to Operate (VGA - 3)

- Image control menu 2
 - Press N/E/W/S buttons to scroll displayed image
 - Spin knob to scale image
 - Press knob for next menu
- The “autopilot” (automatic demo) will stop if the user performs manual image transformations



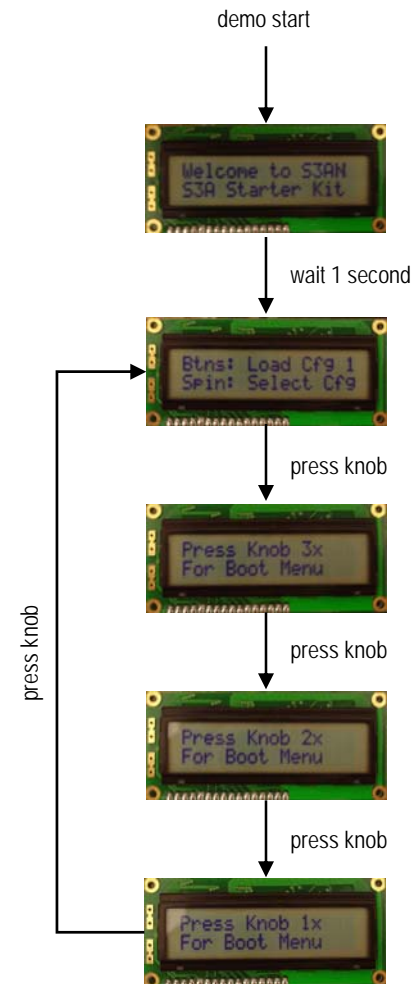
How to Operate (VGA - 4)

- Volume and Auto Menu
 - Press any N/E/W/S button to resume the “autopilot” (automatic demo)
 - Spin knob to adjust audio output volume (useful for headphones and speakers without volume control)
 - Press knob to return to MultiBoot menu



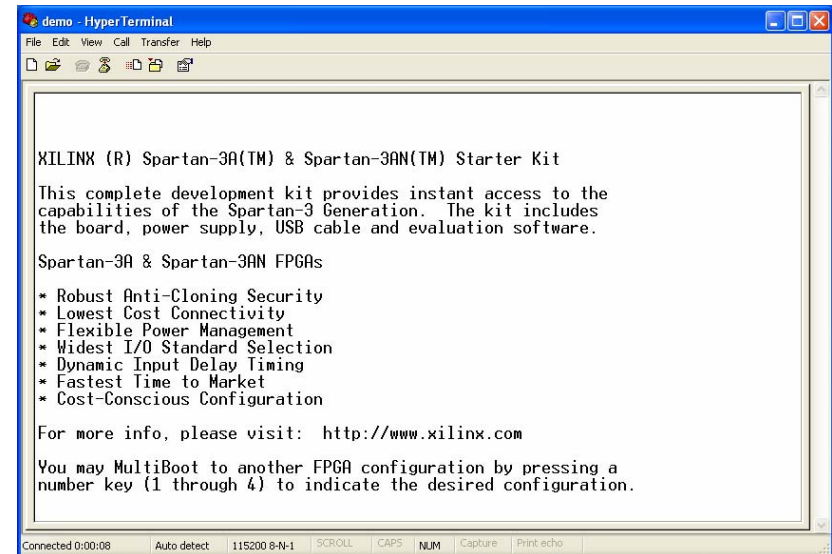
How to Operate (LCD)

- When the demo begins, it sends a greeting to the LCD for 1 second
- Next, a MultiBoot menu
 - Spin knob to select next configuration to load
 - Press any N/E/W/S button to initiate Multi-Boot
- LCD menu tracks VGA menu but only shows MultiBoot options



How to Operate (RS232)

- When the demo begins, it sends a message through the serial port
 - View with HyperTerminal
 - Use provided session file
- Pressing a number key will MultiBoot to other FPGA configurations



```
demo - HyperTerminal
File Edit View Call Transfer Help

XILINX (R) Spartan-3A(TM) & Spartan-3AN(TM) Starter Kit

This complete development kit provides instant access to the
capabilities of the Spartan-3 Generation. The kit includes
the board, power supply, USB cable and evaluation software.

Spartan-3A & Spartan-3AN FPGAs
* Robust Anti-Cloning Security
* Lowest Cost Connectivity
* Flexible Power Management
* Widest I/O Standard Selection
* Dynamic Input Delay Timing
* Fastest Time to Market
* Cost-Conscious Configuration

For more info, please visit: http://www.xilinx.com

You may MultiBoot to another FPGA configuration by pressing a
number key (1 through 4) to indicate the desired configuration.

Connected 0:00:08 Auto detect 115200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Evaluating MultiBoot

- Use the MultiBoot menu to select from one of the four additional FPGA configurations
- The LCD and RS232 outputs allow MultiBoot without the use of an attached VGA display
- To return to the demo from any of the additional FPGA configurations, press the rotary knob

Evaluating MultiBoot

- Configuration 1
 - DeviceDNA reader design
 - Provided by Ken Chapman, Xilinx
 - Reads Spartan-3A / Spartan-3AN identifier and displays on LCD
 - For more information, please download the original reference design on the Spartan-3A Starter Kit Reference Design Page
- Configuration 2
 - Fractal generator design
 - A user-contributed design by Matthias Alles
 - Computes image in real time and displays on VGA
 - Rotate knob to zoom, press N/E/S/W buttons to scroll
 - For more information, please download the original design from <http://www-user.rhrk.uni-kl.de/~alles/fpga/>



Evaluating MultiBoot

- Configuration 3
 - ASCII Terminal
 - Provided by Eric Crabill, Xilinx
 - Implements a terminal using a VGA display and PS/2 keyboard and will communicate with HyperTerminal on a PC
 - For more information, consult the provided design source
- Configuration 4
 - Parallel Flash Programmer
 - Provided by Ken Chapman, Xilinx
 - Enables user to exercise, erase, and program the parallel flash device on the board through HyperTerminal on a PC
 - For more information, please download the original reference design on the Spartan-3A Starter Kit Reference Design Page



Evaluating Suspend

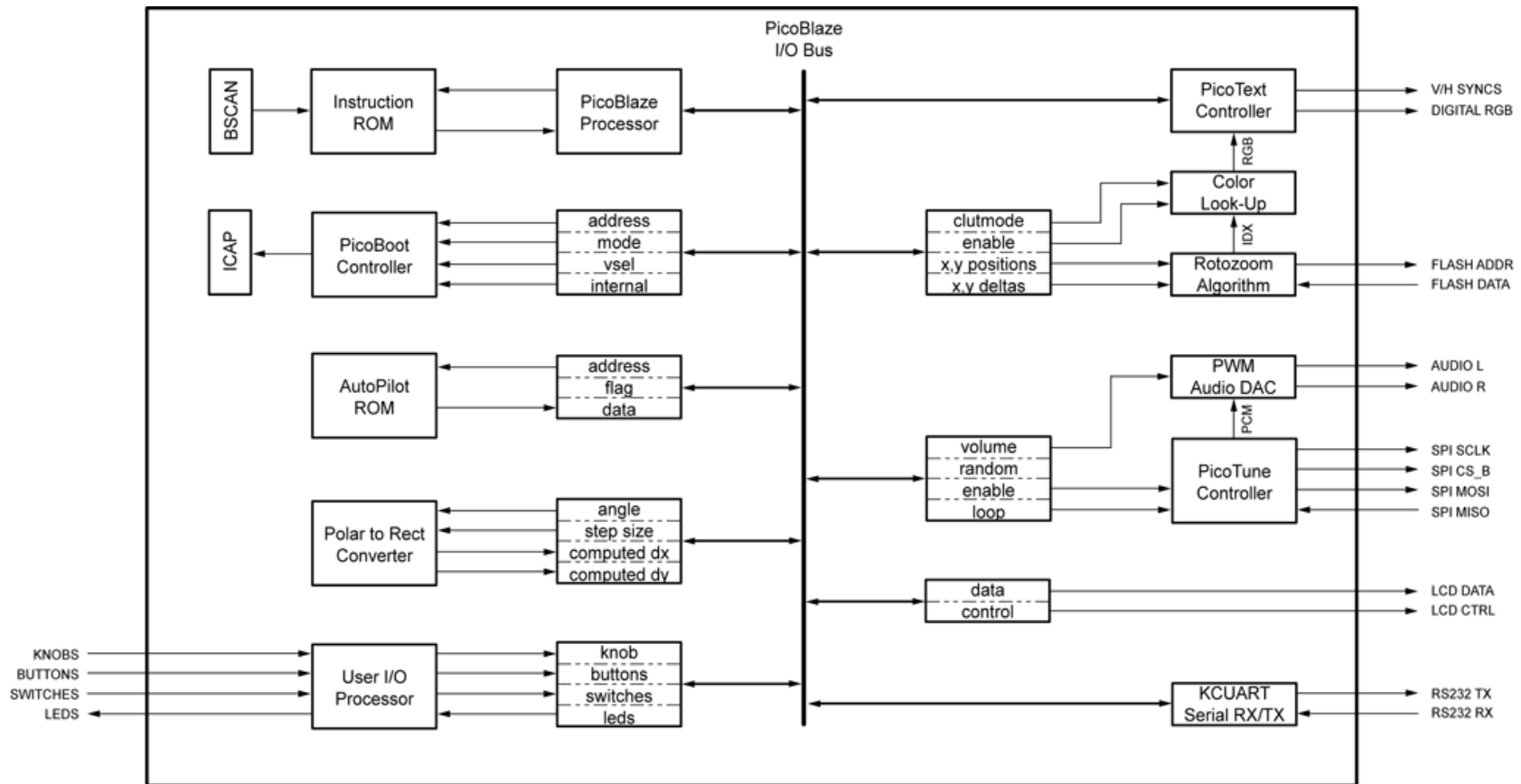
- All five of the designs may be suspended at any time
 - Observe demo state and optional meters prior to entering suspend
 - Move suspend switch to suspend; observe optional meters and note supply current reduction
 - Move suspend switch to run; observe that demo state has been preserved during suspend
- Do not suspend the flash programmer during a flash memory operation!

Demo Technical Details

- In the main demo, a PicoBlaze processor evaluates user inputs and programs the hardware peripherals to generate outputs
 - Video text from character mode video controller
 - Video bitmaps stored in parallel flash, and transformed using “rotozoom” (resampling)
 - Audio waveforms stored in serial flash, played back using digital I/O with XAPP154 technique
 - Other peripherals include ICAP-based MultiBoot controller and hardware trigonometric function



Demo Block Diagram



Tech: PicoBlaze / UART

- These modules were obtained from the Xilinx website, <http://www.xilinx.com/picoblaze> and are not included in the source download
- The primary function of PicoBlaze is to drive the hardware based on user inputs
 - Demo program is stored in a single BlockRAM
 - Excellent “programmed” alternative to an FSM
- UARTs are used for serial port communication

Tech: Video Generation

- PicoText is a video timing controller and character display generator that accepts images from the rotozoom hardware (data stored in parallel flash)
- May be programmed on-the-fly to virtualize the character display hardware
 - Reduces buffer size by eliminating storage of characters to represent “empty space”
 - Uses interrupt to advance the active region ahead of the raster; programmed by a display list stored in the character buffer

Tech: Audio Generation

- PicoTune is a simple audio controller that plays back stored audio waveforms from SPI flash
 - Data is retrieved in a burst during vertical blank while graphics fetch for rotozoom is idle; all flash memories on board share a data line
 - Buffered data is consumed at sample rate by PWM audio output scheme based on Xilinx XAPP154

Tech: PicoBoot

- PicoBoot is a simple counter-based ICAP interface which may be programmed with MultiBoot parameters by the processor
 - Internal mode, internal use, address, etc...
 - Single strobe event initiates MultiBoot
- For details on the ICAP command and data sequences, consult the Spartan-3 Generation Configuration User Guide

Tech: Lookup Tables

- Two large lookup tables are implemented
 - AutoPilot ROM stores a table of “scripted” user inputs to control the demonstration in the absence of interactive user input
 - Polar to Rectangular converter consists of a $\sin(x)/\cos(x)$ table followed by a multiplier to implement magnitude scaling; used to convert angle and step size (scale) into delta x,y values for rotozoom hardware



Tech: User and LCD

- User interface consists of quadrature decoder for rotary knob, plus synchronizers and debouncers for ordinary buttons
- LCD interface is effectively general purpose I/O controlled by software to drive this display

