Vinculum

Embedded Host/Slave USB Controller

VINCULUM
BINDING USB TECHNOLOGIES

Prepare to….

FTDI Chip

Agenda

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- FTDI company introduction
- Current product range overview
- Vinculum Introduction, including demo
- Vinculum architecture
- Vinculum hardware specification
- Firmware
- Application areas
- Development modules
- Guest Speaker
- Summary
- Questions

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FTDI – Company Overview

VINCULUM
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- UK company founded in 1992
- Headquarters in Glasgow, Scotland
- Regional sales offices in Portland, Oregon and Taipei, Taiwan
- Fabless semiconductor company
- Manufacture using first tier foundry and assembly houses

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Company History

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- Moved from PC chipset design to peripheral sector in 1996
- USB developers since introduction of standard in 1996
- Worlds first USB hub controller IC with support for legacy serial and PS/2 keyboard and mouse
- Members of the USB Implementers Forum

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USB Interfacing Specialists

VINCULUM
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- Proven USB hardware, firmware and device driver software
- USB interface IC Solutions
  - Premier quality and performance
  - Royalty free software and firmware
- Easy to implement
  - Minimal design effort
  - Extensive technical support channels
  - Fast time to market

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FTDI USB Product History

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Year	Device	
1998	FT8U100AX	USB Hub controller with integrated serial and PS/2 ports
2000	FT8U232AM &FT8U245AM	First generation USB UART and FIFO interface IC's
2002	FT232B & FT245B	Second generation USB UART and FIFO interface IC's
2003	FT2232	Dual Channel USB UART / FIFO interface IC with multi-protocol interface controller
2005	FT232R & FT245R	Third generation USB UART and USB FIFO interface IC's
2006	Vinculum VNC1L-1A	Embedded USB Host controller

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Vinculum Introduction

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- Embedded USB Host / Slave SoC
- Based on FTDI's unique 8 & 32-bit CPU cores
- Extensive hardware acceleration for optimum USB data transfer performance
- On board e-Flash pre-programmed with proven FTDI USB firmware
- Simple UART / SPI / FIFO hardware interface
- Simple command set eliminates the need for detailed knowledge of USB

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VNC1L

VINCULUM
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First member of Vinculum family of embedded USB controller devices

- Features
  - 8 and 32 bit custom processor cores
  - Dual DMA controllers for hardware acceleration
  - 64k Embedded Flash program memory
  - 4k internal data SRAM

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VNC1L

VINCULUM
BINDING USB TECHNOLOGIES

First member of Vinculum family of embedded USB controller devices

- Features (continued)
  - 2 x USB 2.0 Low / Full Speed Host / Slave Ports
  - UART, SPI and Parallel FIFO interfaces
  - PS2 legacy Keyboard and Mouse Interfaces
  - Up to 28 GPIO pins depending on configuration

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VNC1L

VINCULUM
BINDING USB TECHNOLOGIES

First member of Vinculum family of embedded USB controller devices

- Features (continued)
  - 3.3V operation with 5V safe inputs
  - Low power operation (25mA running / 2mA standby)
  - Inbuilt FTDI firmware easily updated in the field
  - LQFP-48 RoHS compliant package
  - Multi-processor configuration capable

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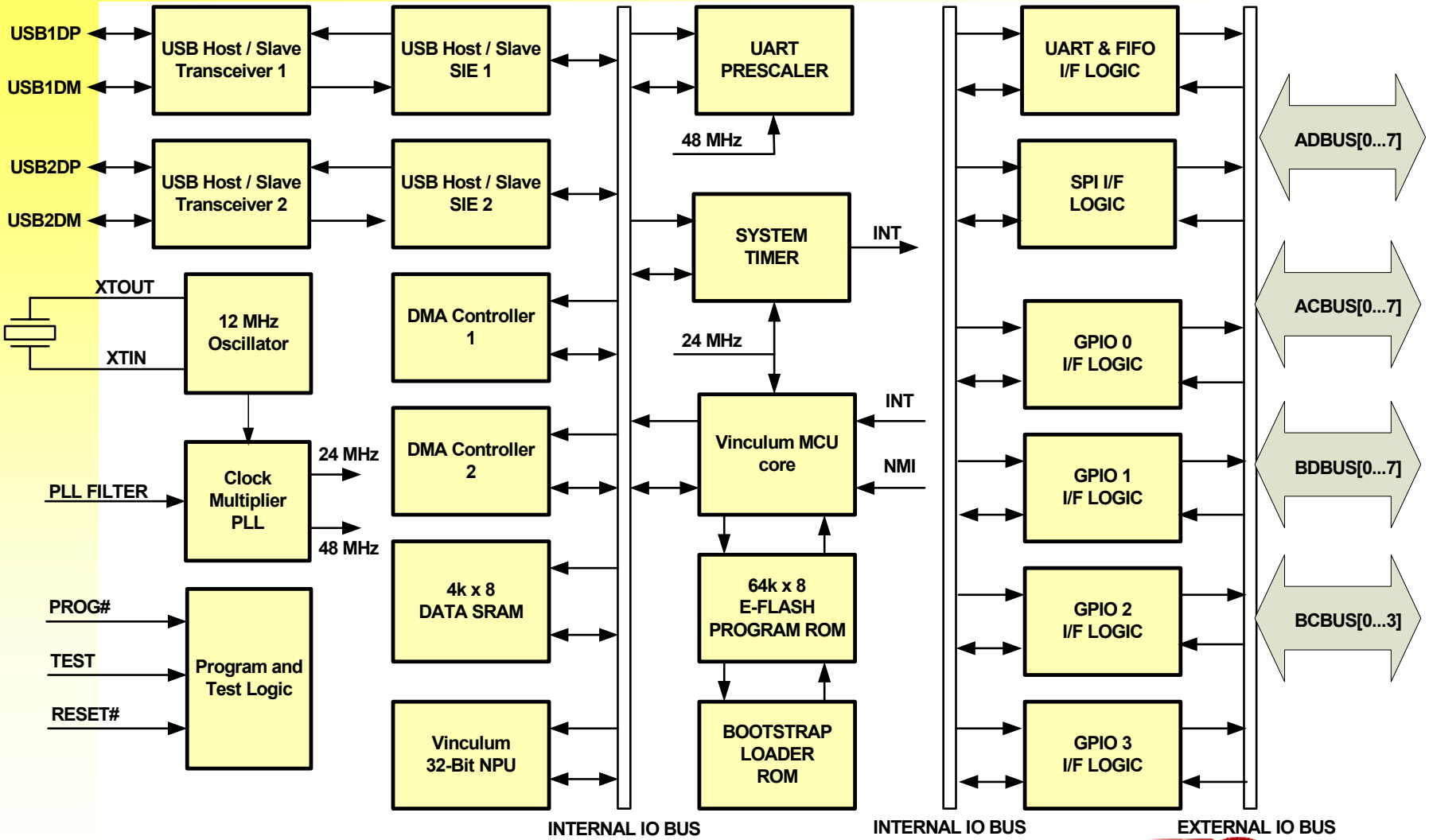
VNC1L Architecture



VNC1L Firmware Interface

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Firmware Monitor

- Simple interface to your hardware
- Simple DOS-like commands

Hardware Interfaces

- Microcontroller – Logic-Level
  - UART
  - FIFO
  - SPI
- Smart Peripheral (PDA, Phone, MP3, etc.)
  - USB

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VNC1L Firmware Interface

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VDIF (Vinculum Disk InterFace)

- Add a USB Flash disk to your device
  - USB Flash disk on VNC1L USB Port 2
  - Device Interface choices
    - MCU connects through the UART, FIFO or SPI interface
    - USB peripheral such as PDA, Mobile Phone, MP3 player on VNC1L USB Port 1
      - Overrides MCU interface

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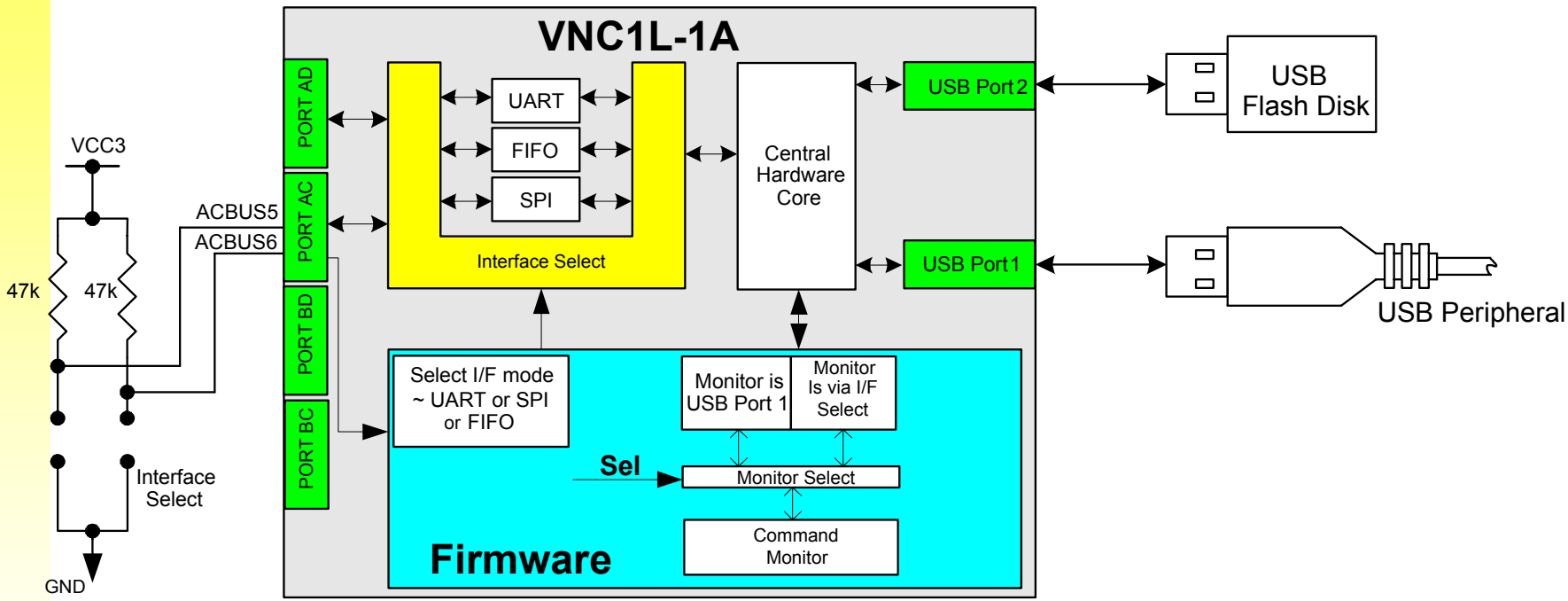
VDIF Firmware Model

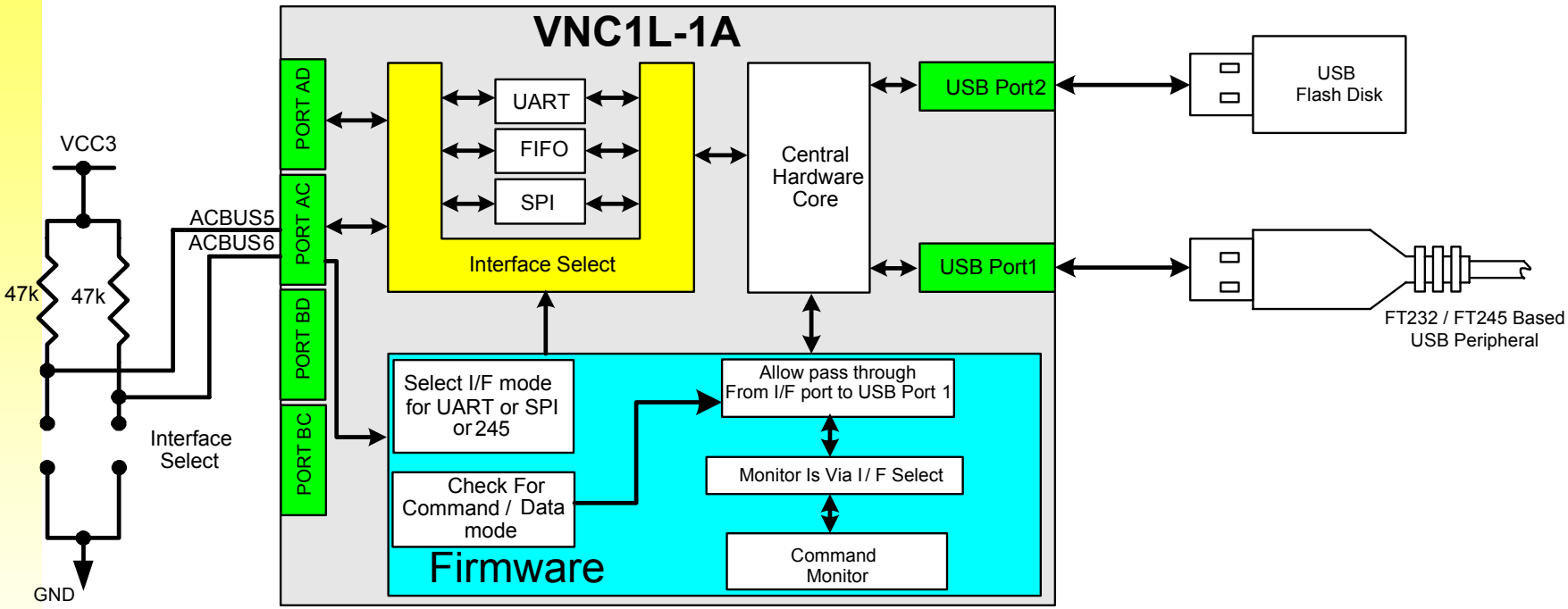


VNC1L Firmware Interface

VDAP (Vinculum Disk And Peripheral int.)

- Add a USB Flash disk to your hardware
- Add a USB Flash disk to a USB peripheral based on the FT232 or FT245
  - MCU required and connects through the UART, FIFO or SPI interfaceUSB Flash disk on VNC1L USB Port 2
  - Allows data transfer from a FTDI USB slave device to the USB Flash disk

VDAP Firmware Model



VNC1L Firmware

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Vinculum command set summary

- DOS-style ASCII commands (terminated with a <cr>)
  - Directory commands, e.g. DIR, CD, MKD, DLD
  - File commands, e.g. RDF, WRF, OPW, OPR
  - Power management commands, e.g. SUD, WKD
  - Debug commands, e.g. SD, IDD
  - Miscellaneous commands, e.g. ‘E’ and ‘e’ for synchronisation
- Shortened binary command set also available

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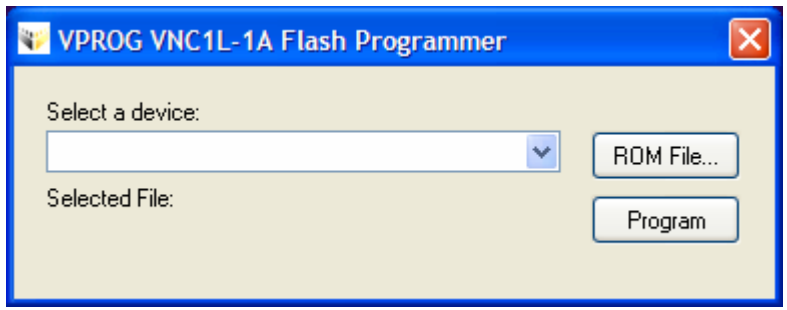
VNC1L Firmware Programmer



- VPROG Vinculum firmware programmer
- Simple user interface
- Program Vinculum firmware via FT232 devices

VF2F Reference Design

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- Stand alone reference design including VDFC firmware, schematic and PCB files
  - Backup USB Mass storage class digital cameras to a USB Flash disk
  - Easy to use push button operation
  - LED status and progress indicators
  - Battery powered design – Two AAA cells
  - Turnkey solution

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VF2F Reference Design

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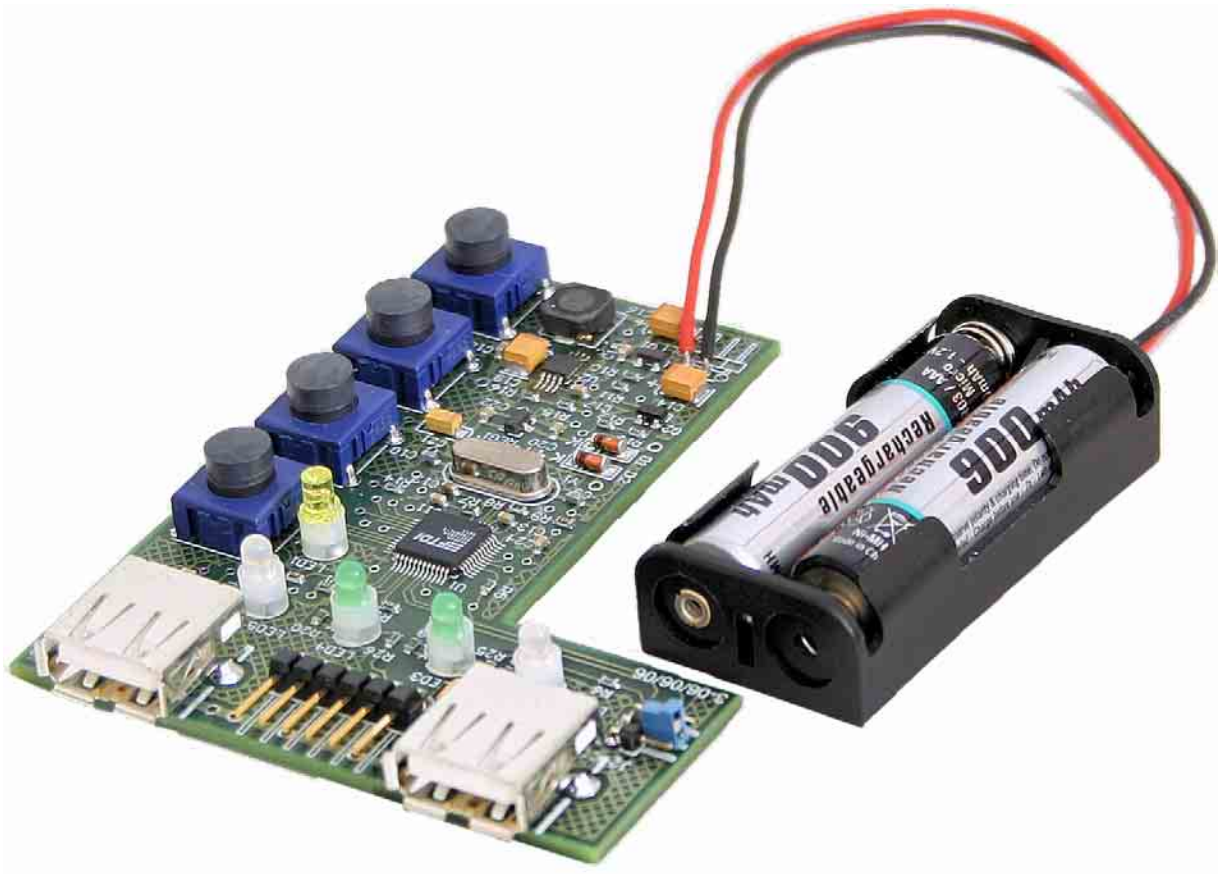

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Modules and Add-ins

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- VDIP1
  - 24 Pin DIP development module
  - Ideal for rapid prototyping

- VDRIVE1 and VDRIVE2
  - Add a USB Flash disk interface to an existing product
  - Only four interface signals required
  - Selectable UART or SPI interface
  - VDRIVE2 is panel mountable version

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Modules and Add-ins

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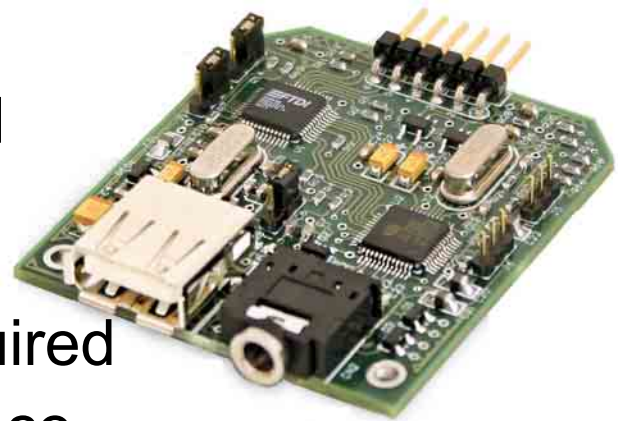
- VMUSIC1 and VMUSIC2
  - Add USB Flash disk interface and audio playback to an existing product
  - VDMP firmware uses extended VDIF command set for music playback
  - Only four interface signals required
  - Selectable UART or SPI interface
  - VMUSIC2 is panel mountable version



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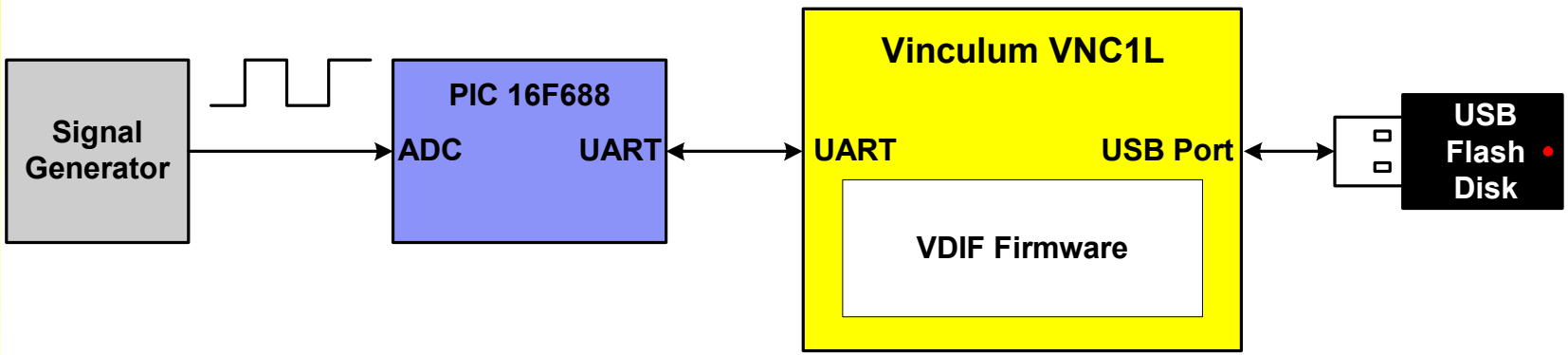
Demonstration

- Example of VNC1L interface to small PIC MCU



Don Powrie

DLP Design, Inc.

don@dlpdesign.com

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Two Vinculum-Based Designs:

- RFID Spokesman™
- DLP-VLOG™ Data Logger

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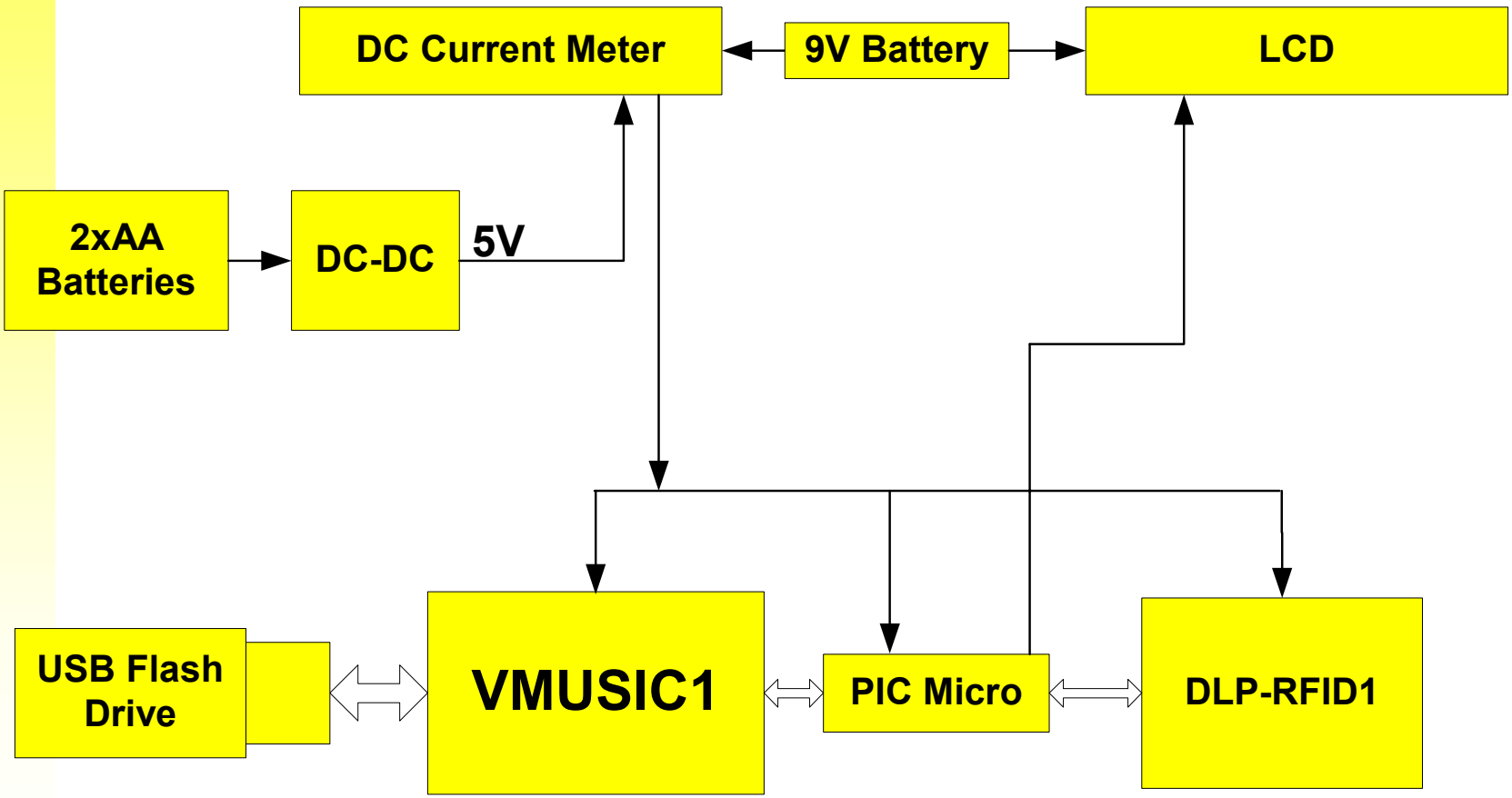
DC Current Meter
9V Battery
LCD
2xAA Batteries
DC-DC
5V
USB Flash Drive
VMUSIC1
PIC Micro
DLP-RFID1

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RFID Spokesman™ Primary Goals:

- Demonstrate VMUSIC1 Audio Quality
- Illustrate Ease of System Design
- Introduce a Potential Application

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RFID Spokesman™ Applications:

- Self-Guided Tours at Art Galleries, Museums and Special-Event Venues
- Children's Learning Tool / Game

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RFID Spokesman™

- Power On
- Press Play (10-Second Timeout)
- Present RFID Tag to Select an Audio File
- Press Play Again to Stop

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DLP-VLOG™ Primary Goal:

- **Demonstrate a Practical, Portable, Low-Power Data-Storage Solution**
  - **Small Microcontroller**
  - **Long Battery Life**

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DLP-VLOG™ Capabilities:

- Temperature Range: 0-70°C
- Humidity Range: 0-100%RH
- Voltage: Ch 1&2 (0-30V); Ch 3 (Battery Voltage)
- Time: Real-Time Clock IC
- Readings Taken Every 10 Seconds
- Data Stored to USB Flash Drive Every 60 Seconds

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VINCULUM
BINDING USB TECHNOLOGIES

DLP-VLOG™ Data:

- **All Temperature, Humidity & Voltage Data Stored as 16-Bit Integers**
- **Data Stored as 8-Bit & 16-Bit Integers:**

  08/26/06 15:26:00 6705 1091 0819 0226 0552

- **Conversion Software:**

  08/26/06 15:26:00 27.38 84.14 37.1 26.59 12.15 2.661

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Two Run Modes:

- Sleep Mode (100uA)
  - When No USB Flash Drive is Present
  - When Between Readings
- Data Write Mode (50-150mA)

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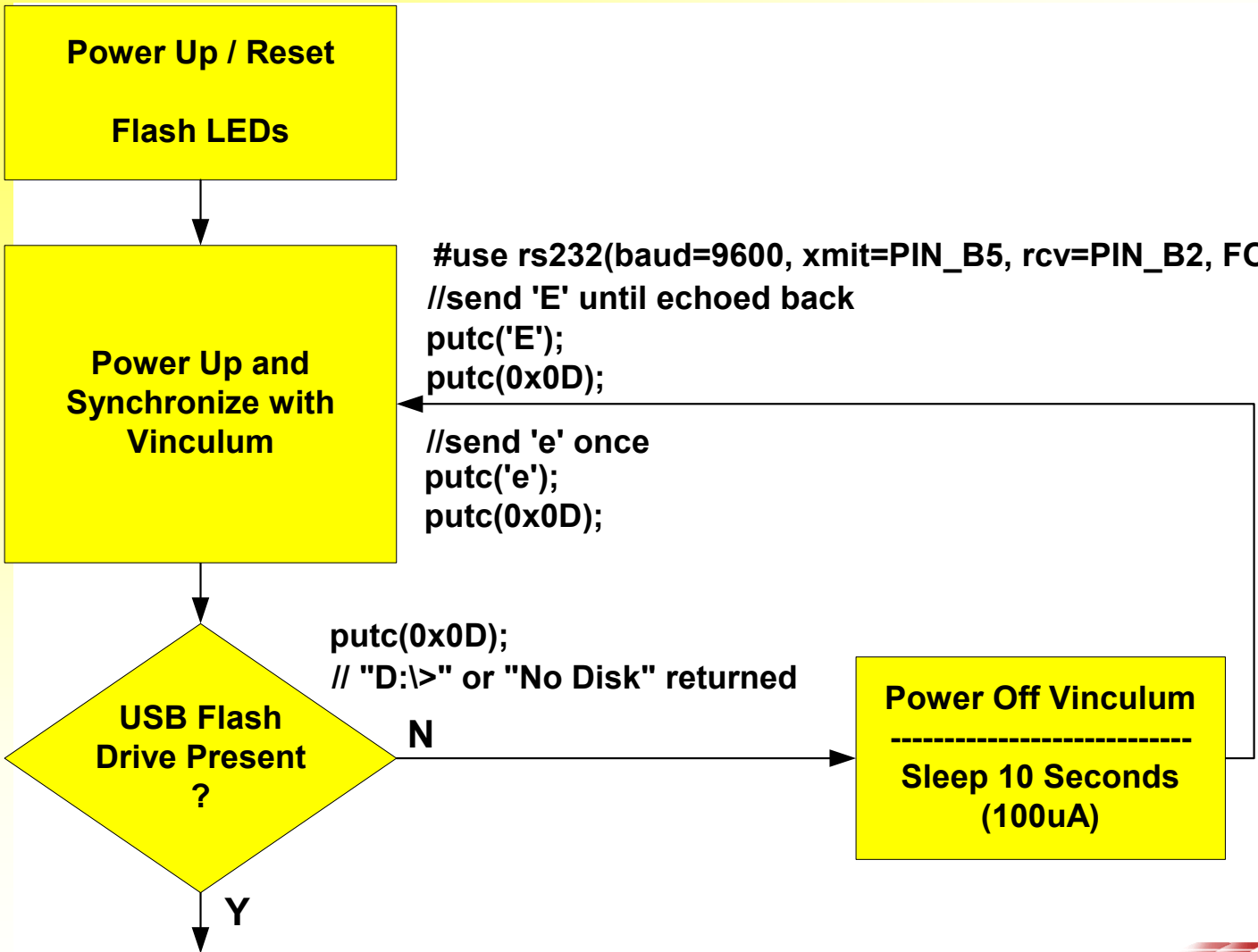
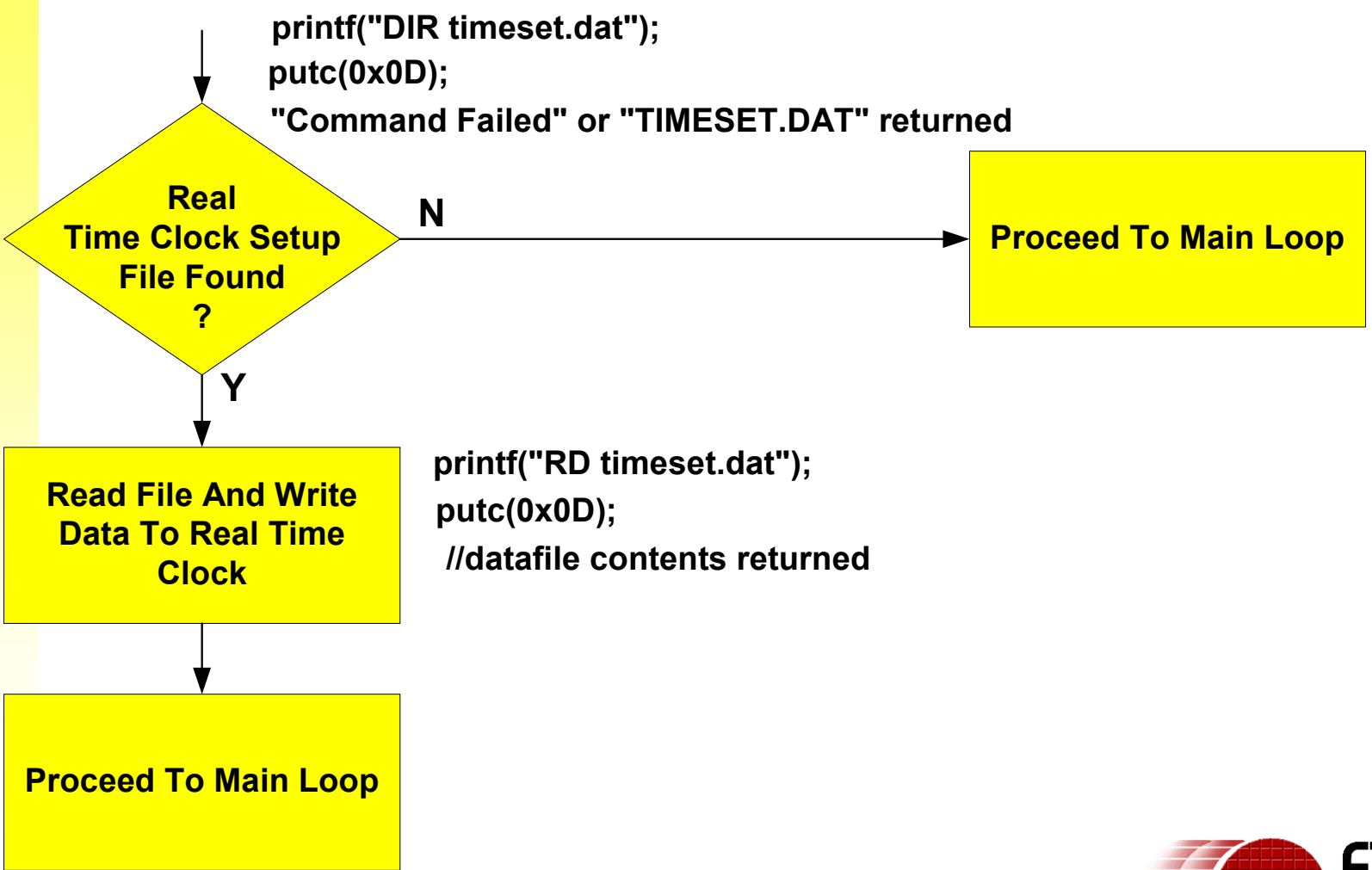
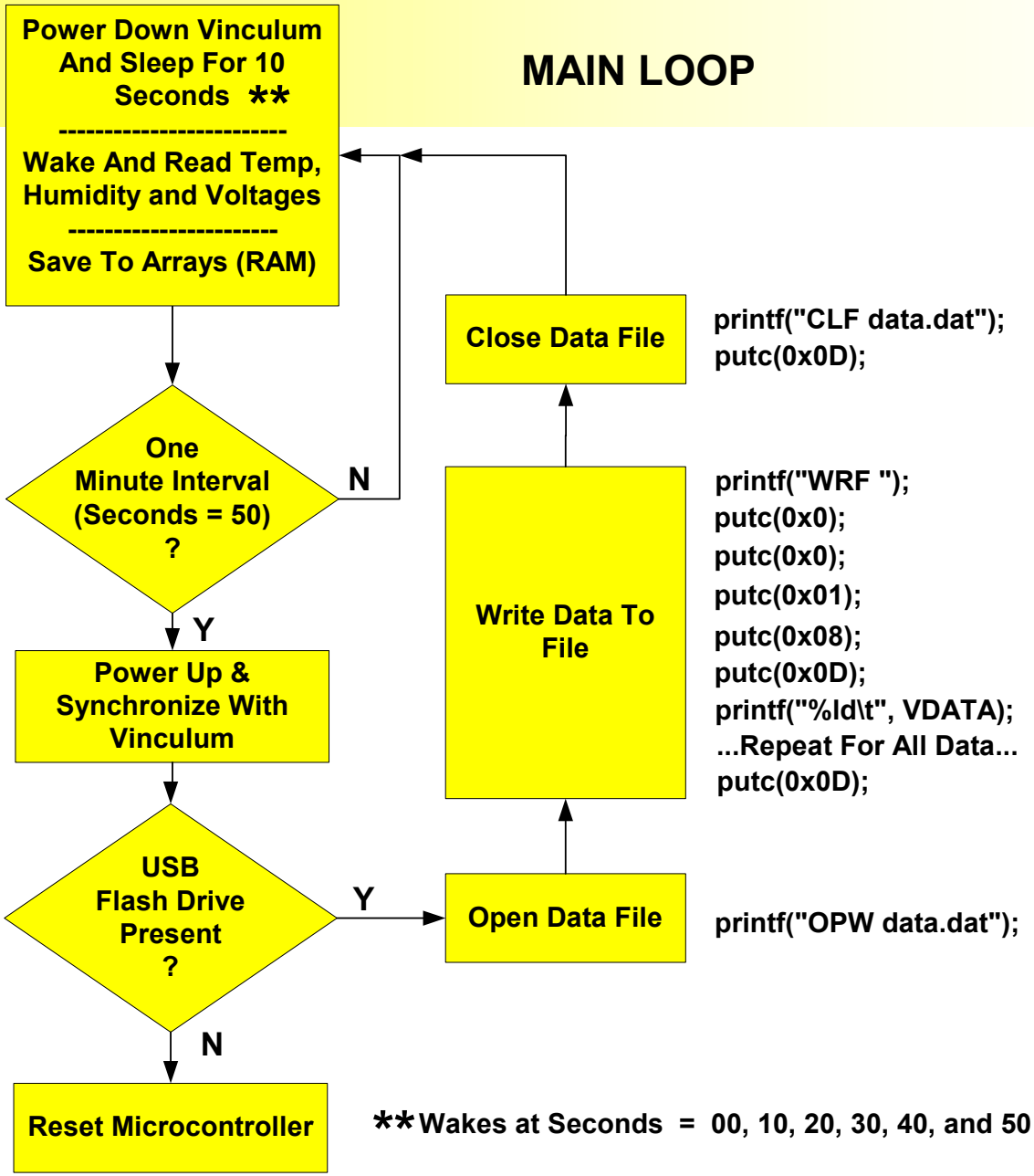

Power Up / Reset
Flash LEDs
Power Up and Synchronize with Vinculum
#use rs232(baud=9600, xmit=PIN_B5, rcv=PIN_B2, FORCE_SW)
//send 'E' until echoed back
putc('E');
putc(0x0D);
//send 'e' once
putc('e');
putc(0x0D);
USB Flash Drive Present ?
putc(0x0D);
// "D:\>" or "No Disk" returned
N
Y
Power Off Vinculum
Sleep 10 Seconds (100uA)

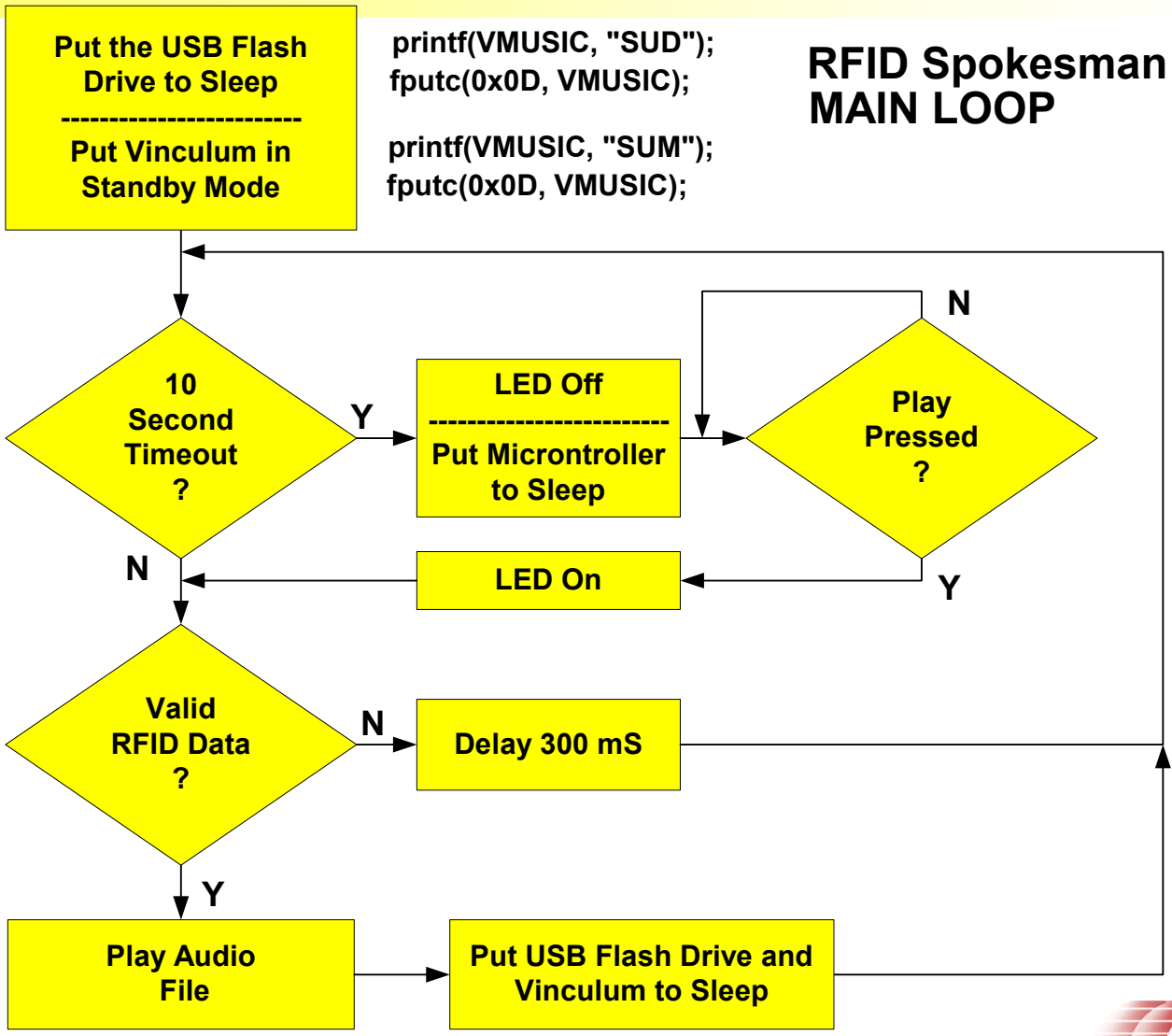

printf("DIR timeset.dat");
putc(0x0D);
"Command Failed" or "TIMESET.DAT" returned
Real Time Clock Setup File Found ?
N
Proceed To Main Loop
Y
Read File And Write Data To Real Time Clock
printf("RD timeset.dat");
putc(0x0D);
//datafile contents returned
Proceed To Main Loop

MAIN LOOP

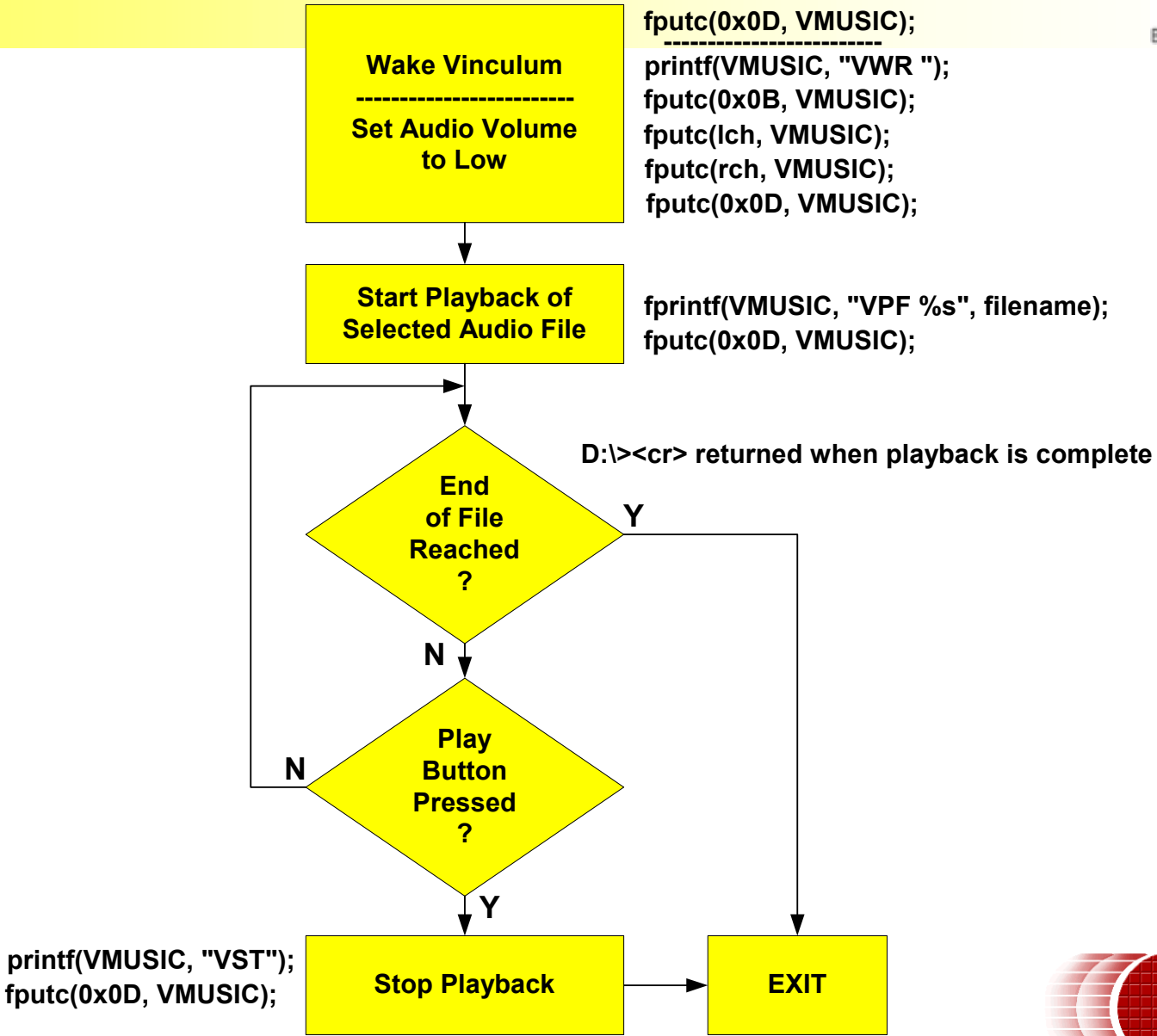


** Wakes at Seconds = 00, 10, 20, 30, 40, and 50

RFID Spokesman MAIN LOOP



PLAY AUDIO FILE



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Development Kit:

- Fully Assembled DLP-VLOG Module
- CCS C Compiler (IDE Version)
- Visual C++ Source for Time File Creation
- Visual C++ Source for Data File Conversion
- C Source for PIC Microcontroller

Note: USB Flash Drive & Batteries Not Included.

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Summary

VINCULUM
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- VNC1L is first in Vinculum family of Embedded Host/Slave USB devices
- FTDI supplied firmware allows for rapid development with no knowledge of USB
- No license or royalty fees for standard firmware
- Availability – Now

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Embedded Host/Slave USB Controller

….Thank you!

Contact Information

VINCULUM
BINDING USB TECHNOLOGIES

- **FTDI – UK Headquarters**

  373 Scotland Street, Glasgow G5 8QB, Scotland, UK.

  Tel : +44 (0) 141 429-2777

  Fax : +44 (0) 141 429-2758

  E-mail : vinculum.sales@ftdichip.com

- **FTDI Main Web Site : www.ftdichip.com**

- **Vinculum Web Site : www.vinculum.com**

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