



Embedded and Algorithm Experience with Texas Instruments DSP's

Pentad Design has engaged in four projects in the last three years using Texas Instruments DSP's:

1. Sybron Dental: Apex Locator -- (Texas Instruments DSP 320LF2407A) Used by endodontists during root canal procedure. Output stimulus waveform composed of two frequencies to an SPI DAC at a rate of 32k updates/sec, synchronously read back the response waveform using the ADC sequencer. Built optimized floating point FFT. Used FFT to determine phase and magnitude of component frequencies. Did some ugly math to determine the distance to the Apex (bottom of the tooth). DSP also handles keyboard scanning, CAN bus, LCD panel, LEDs, timers, power management, retained parameters in an SPI EEPROM, audio output (16k samples/sec) to DAC, User Interface, and serial communication with PC application.
2. Sybron Dental: Obturation Unit --(Texas Instruments DSP 320LF2407A) Used by endodontists during root canal procedure. PWM is used to drive heaters (with PI control). ADC sequencer is used to measure temperature of probe tips, synchronous with PWM. DSP also handles keyboard scanning, CAN bus, LCD panel, LEDs, timers, retained parameters in EEPROM, audio output (16k samples/sec), User Interface, and SCI serial communication with PC application.
3. DTS: 32-channel Analog/Digital data recorder -- (Texas Instruments DSP 320LF2403A) Used in crash-test-dummies. The 2403 configured a chain of SPI devices to setup gains and offsets on 32 analog channels. Sequenced the external 16-bit ADC converters and hardware FIFO to record one digital bit and 16 analog bits on 32 channels simultaneously at a sustained rate of 100k samples/sec. SCI serial communication with host CPU to send/receive commands and data.
4. DTS: Docking bay -- (Texas Instruments DSP 320LF2403A) Used in crash test. The 2403 configured a chain of SPI devices to setup excitation voltages on 32 analog channels. NiMH battery charger, using 500khz PWM (with PI control). Sequenced the analog mux/external 16-bit ADC converter to convert the 32 excitation voltages. SCI serial communication with host CPU to send/receive commands and data.