Digital X-ray Pulse Signal Processor XBDPP60300

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1. Outline

Digital X-ray Pulse Signal Processor XBDPP60300 is designed to be built into small scale analytical X-ray instruments such as X-ray fluorescence spectrometer. It consists of two printed circuit assemblies. XBDPA64 DPP Analog board holds analog signal conditioning circuit and fast high resolution analog-to-digital converter. DE0-nano FPGA Board holds Field Programmable Gate Array (FPGA), memories and other digital chips. Digital Signal Processing Logics such as digital filters and multi-channel analyzers designed by X-Bridge Technologies are programmed on this board. In addition to those basic logics for DPP, control logics for standard peripherals in analytical X-ray instrument are also programmed. These additional logics are used to realize full control of an instrument through single USB (or other) connection to a PC or a board computer.

2. Features

1) High performance DPP function

    Multiple pile-up rejecters for superior pile-up rejection in wide energy range

    Flexible time constant settings for both slow and fast filters

    Accurate dead-time correction in wide dead-time ratio range

2) Smaller, lower cost and more flexible

    60% less board area in comparison to XBDPP50

    TTL level serial is standard and USB and Ethernet converters are available

    Low Cost

3) Firmware-free spectrometer control

    If a 'Mother Board' product such as XBXFMB10 is attached, following peripherals can be controlled through the same command interface as DPP.

        High Voltage Power Supply

        Tube Filament (to control tube current)

        X-ray shutter

        Pulse motor stages for filters, collimators, and sample

        X-ray interlock function

        User interfaces (switch, lamp, and buzzer)

3. Appearance and Dimensions

Figure 1　XBDPP60300　(Upper：XBDPA64　Lower：DE0-nano)

Fig. 1 shows XBDPP60300. DPP Analog board XBDPE64 and FPGA Board DE0-nano are stacked. The dimension is 49W 74D 40H in mm.
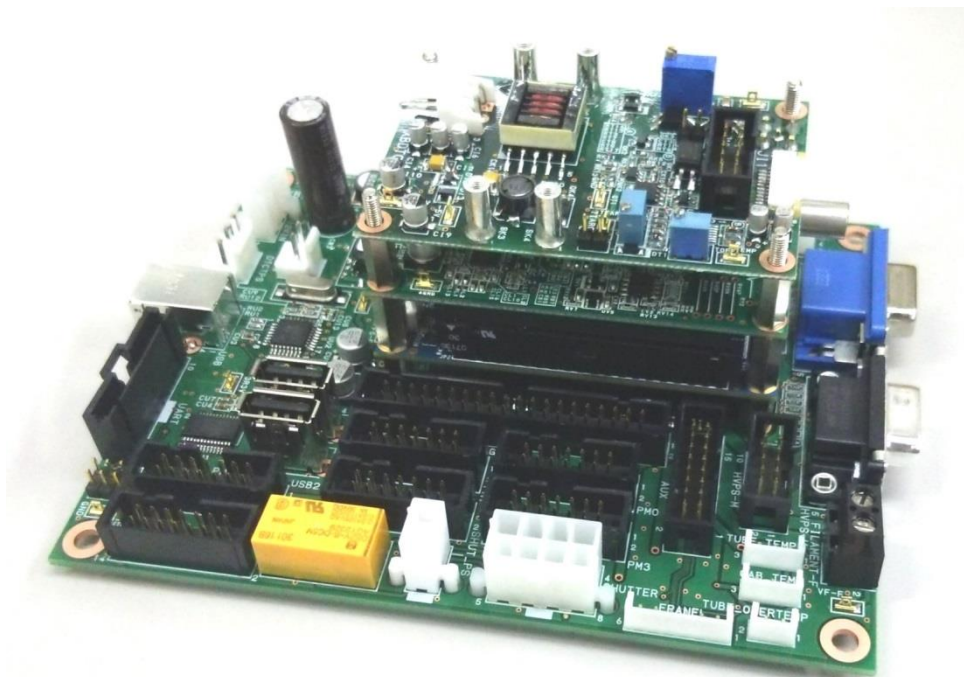

Figure 2　XBDPP60300 with optional spectrometer control boards
(Top：XBDTCT10　Bottom：XBXFMB10)

Fig. 2 shows XBDPP60300 with optional boards. XBDTCT10 is for controlling a detector. XBXFMB10 is for controlling HVPS and other peripherals. The overall dimension is 110W 140D 60H in mm.

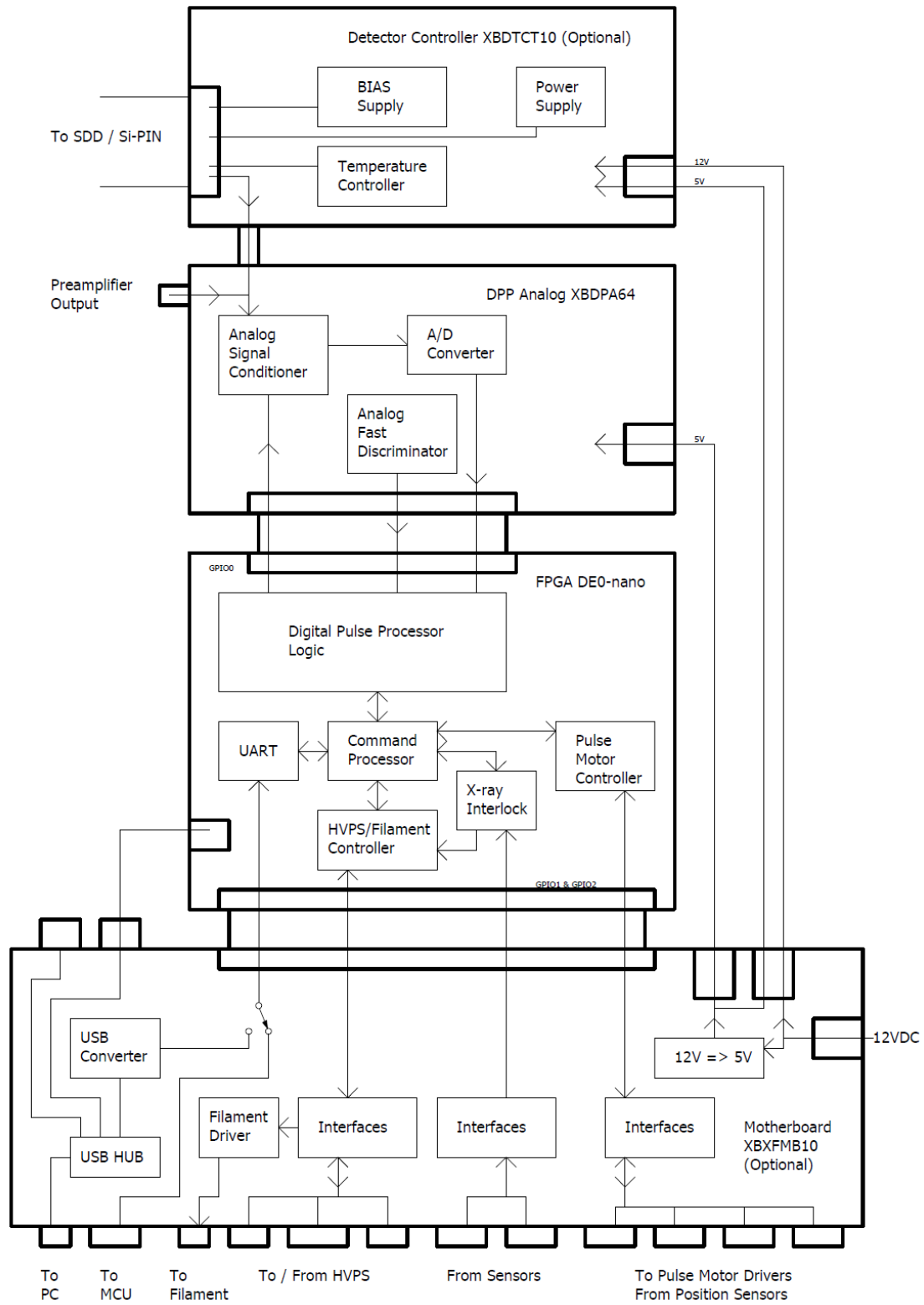## 4. Functions of each part

Figure 3   Functional block diagram of XBDPP60300

Fig. 3 show a functional block diagram of XBDPP60300 and optional boards.

1) XBDPA64 DPP Analog board

This board performs analog signal preprocessing and analog-to-digital conversion. It also has fast analog shaper and discriminator for pile-up rejection at high energy.

2) DE0-nano FPGA board (produced by Terasic Technologies)

Following logics designed by X-Bridge Technologies are programmed into a mass-production FPGA board.

A. DPP Logics

Slow Filter, Fast Filters, Base-line Restorers, Pile-up Rejecters, MCA and Timers

B. Spectrometer Control Logics

Pulse Motor Controller, HVPS Controller, Filament Controller, X-ray Interlock Controller, etc.

C. Command Interface Logics

ASCII based commands are executed.

3) XBDTCT10 Detector Controller board

This board is designed to control OEM type detectors produced by Moxtek and Amptek. Ask us for other type of detector. Temperature controller and bias supply are built in.

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XBDTCT10A	for Amptek Si-PIN
XBDTCT10S	for Amptek SDD
XBDTCT10M	for Moxtek Si-PIN

4) XBXFMB10 Mother board

Interface circuits, Drivers and Power Supplies for following peripherals are built in.

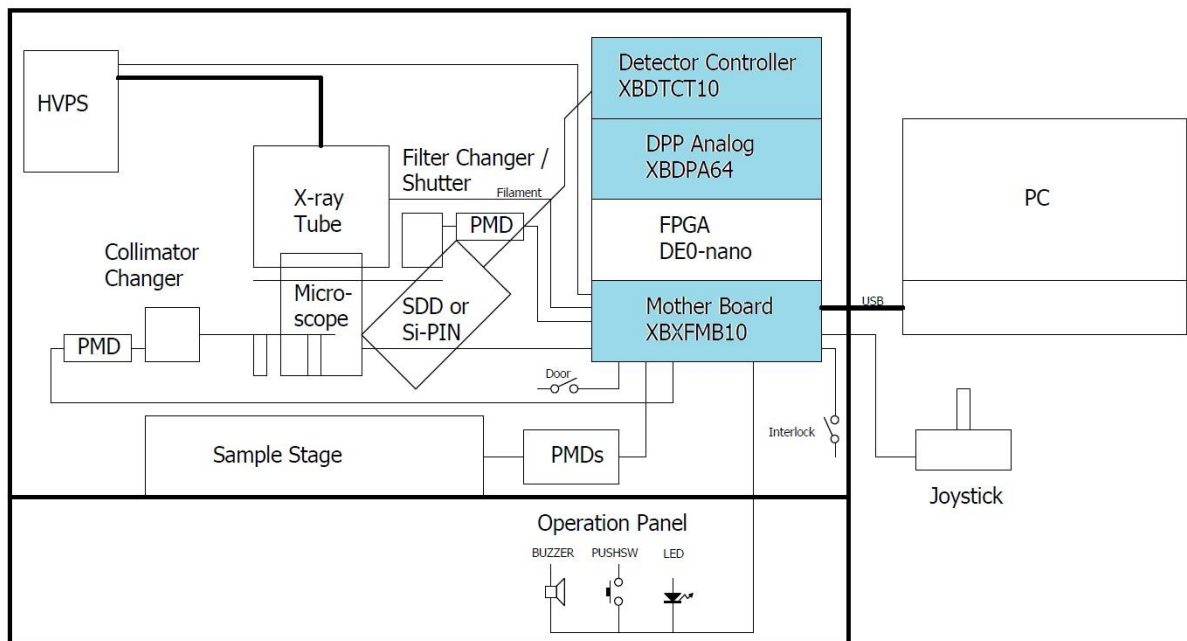|	
HVPS	Designed to be compatible with HVPSs and integrated X-ray sources produced by Spellman, Moxtek, Matsusada and HiTek
Tube Filament	Use of less expensive HVPS is possible
Sample chamber door	
Interlock Switches	
Temperature sensors	For tube protection
Use Interfaces	Lamp, Buzzer, Switch
Solenoid Shutter	
Pulse Motor Controller	Max 5 axis

5. Application Examples

1) Standard EDXRF spectrometer
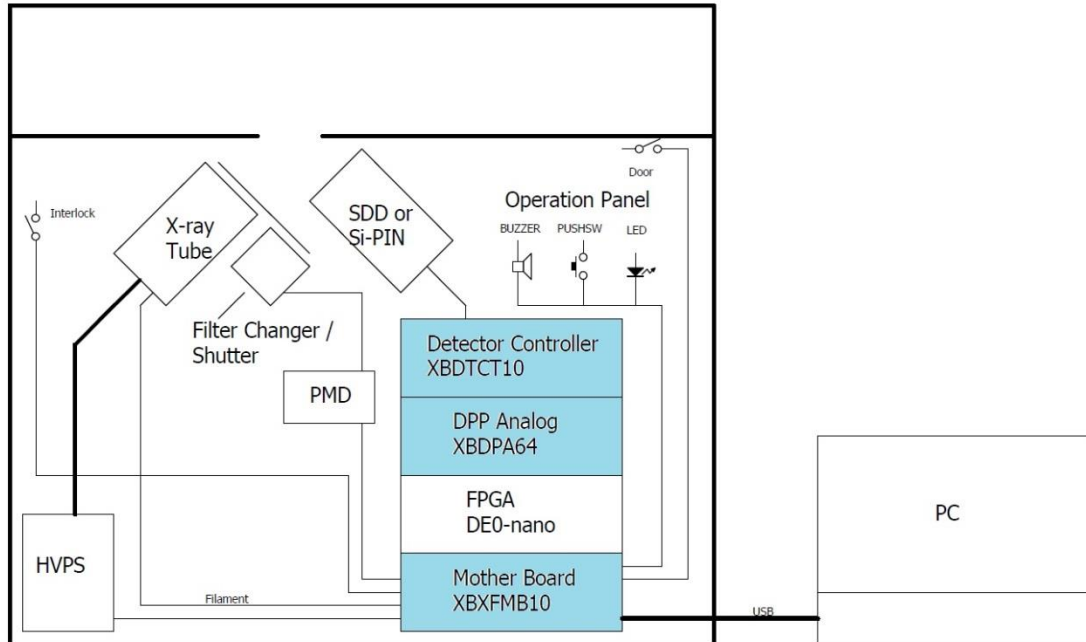
2) SPC based XRF spectrometer
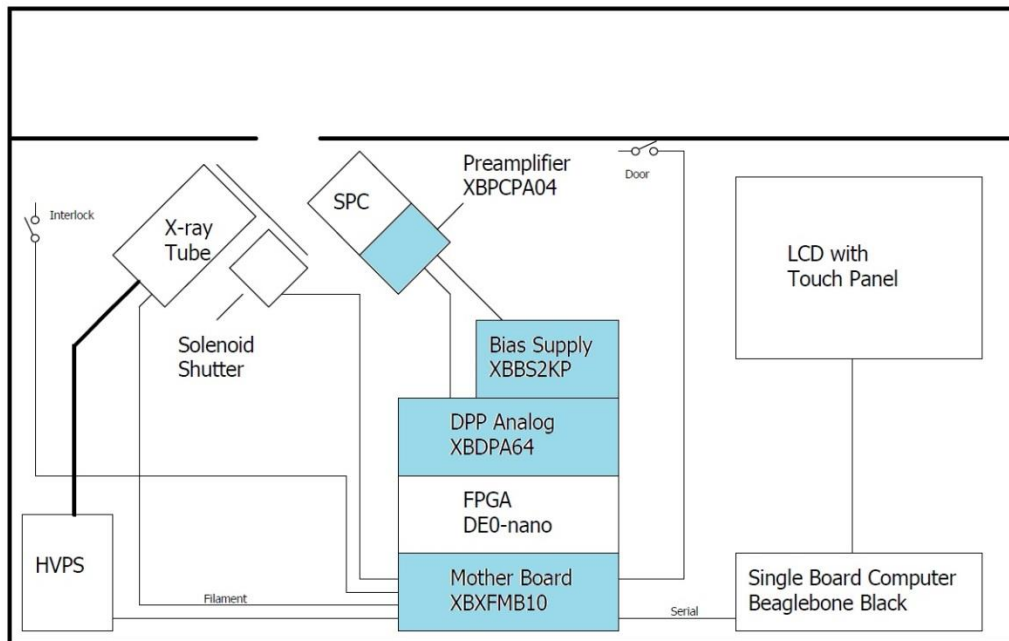
3) Handheld EDXRF spectrometer
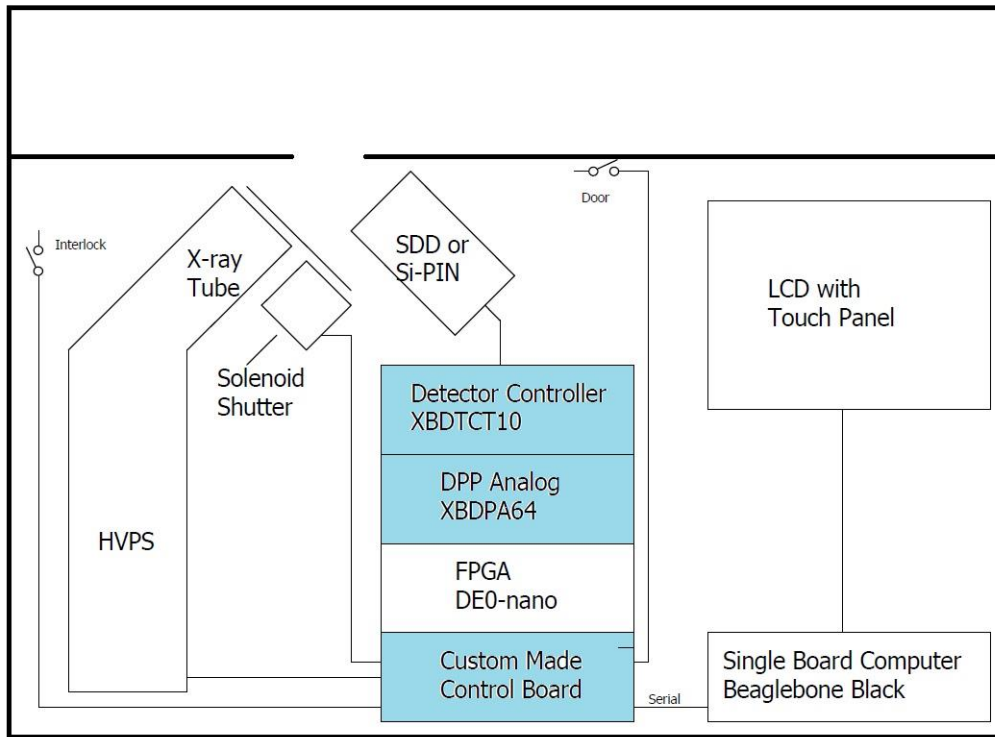
4) XRF coating thickness gauge

5. Powder X-ray Diffractometer