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Global Ultraviolet Imager
Critical Design Review



Detector Processor Software

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Changes Since PDR

DPU Software

- **Faster event processing**
 - **Several logic functions moved to H/W**
 - **Possible use of RTX2010 barrel shifter**
- **H/W counters function moved to DPU board**
 - **New cmds/code to control counters; Input, Valid, and Actual Integration time**
 - **Allows complete stand-alone testing of FPE**



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DPU Commands

PROM Based Commands:

- Download from CPU to DPU RAM
- Upload DPU memory to CPU
- Run PROM test
- Run RAM test
- Execute Program in Memory

RAM Based Commands:

- Initialize DPU
- Process Detector Data
- Transfer Data - Imaging Mode
- Transfer Data - Spectrograph Mode
- Transfer Data - Individual Pixel Mode
- Transfer Detector raw W, S, I values
- Transfer Forced ADC data
- Transfer Counter Data



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DPU Commands (Test Port Only)

- **PROM Based Commands:**
 - **Run Forth Environment**
 - **Download Code - Intel-Hex**
 - **Dump Memory**
 - **Alter Memory**
 - **Dump Registers**
 - **Print Stack**
 - **Push data onto Stack**
 - **Go to program**
 - **Emit data to test ports**



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Task Level Descriptions

Download Code

- Inputs: Starting address location followed by sequential code or data. May require page argument.
- Outputs: None.
- Function: This PROM based routine reads data from the TPU via the communications bus and stores the data into DPU RAM. The first data element is used as a starting address in DPU RAM space. Subsequent code or data elements are stored in sequential memory locations. The routine will wait indefinitely for the next element until the CPU issues a DPU reset.



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Task Level Descriptions (cont.)

Upload Code

- Inputs: Specified DPU address. May require page arg.
- Outputs: Contents of specified DPU address.
- Function: This PROM based routine reads a single specified address from the TPU and returns the contents of that address (code or data) to the TPU. The DPU will then wait for either a new address or a reset.



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Task Level Descriptions (cont.)

DPU PROM Checksum Test

- Inputs: None.
- Outputs: Completion code.
- Function: This PROM based routine performs a simple checksum test on the DPU PROM. An error or completion code is returned. The DPU then returns to the main monitor loop.



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Task Level Descriptions (cont.)

DPU RAM Test

- Inputs: None.
- Outputs: Completion code.
- Function: This PROM based routine checks every memory location in DPU RAM. The test does not preserve previously stored data. The DPU returns an error or completion code before returning to the main monitor loop.



Task Level Descriptions (cont.)

Initialize DPU

- Inputs: FPE Configuration values.
- Outputs: Completion code.
- Function: This task readies the DPU for Detector data processing. The task is comprised of the following subtasks. Write all hardware configuration values to the appropriate hardware control registers. Initialize all variables and arrays. Build the lookup tables for the position computation algorithm.



Task Level Descriptions (cont.)

Process Detector Data

- Inputs: None.
- Outputs: 2-D Image Accumulation (via transfer commands)
 - Data Structure: 13-bit index : 5-bit spatial position ; 8-bit spectral bin location
- Function: Core dedicated function of the DPU. Poll A/D Board for event. When new event present, read W, S, and I values. Reject event if any of the three values are above upper limit. Compute sum. Reject event if sum below lower limit. Compute x-y position. Bounds check result. Increment pixel value. Return to A/D polling loop. Continue until reset.



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Task Level Descriptions (cont.)

Transfer data - Imaging Mode

- Inputs: Color Table, 2-D Image accumulation.
- Outputs: For each spatial position, outputs the co-added value for each of the five colors as defined by the color table.
- Function: For each spatial position, sum spectral bins as defined in color table for each color. Color table contains length of color followed by absolute addresses. Return to main monitor loop.



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Task Level Descriptions (cont.)

Transfer data - Spectrograph Mode

- Inputs: Focal Plane Segment Selection, 2-D Image accumulation.
- Outputs: For each spatial position within chosen focal plane segment, outputs all 160 spectral bin values.
- Function: Begin at segment start position. Transfer 160 spectral bin values. Repeat for each spatial index within segment. Segment definitions TBD. Return to main monitor loop.



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Task Level Descriptions (cont.)

Transfer data - Pixel Mode

- Inputs: Pixel address, 2-D Image accumulation.
- Outputs: Individual pixel values.
- Function: Read specified absolute address from TLM processor. Transfer pixel value. Wait for new address or reset.



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Task Level Descriptions (cont.)

Transfer data - W, S, I values

- Inputs: None.
- Outputs: W, S, I values.
- Function: This task collects and transfers raw Wedge, Strip, and Intermediate anode values to the TLM processor. Poll the A/D Board. When new event present, read in three A/D values and transfer data to TLM processor. Return to A/D polling loop. Continue until reset.



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Task Level Descriptions (cont.)

Transfer data - Forced ADC data

- Inputs: None.
- Outputs: W, S, and I A/D converter values.
- Function: This task collects and transfers raw A/D converter samples to the TLM processor independent of detector activity. Issues a forced conversion command to the A/D Board. Polls for conversion complete. Reads in three A/D values and transfers data to TLM processor. Repeat until reset.