Auxiliary ROI Outputs on the Saturn Digital X-ray Processor

The optional regions of interest (ROI) outputs on the Saturn digital x-ray processor (DXP) provide real time outputs for up to 16 ROI's. When an x-ray that is in a defined ROI is processed, a high-true digital TTL pulse is produced on the connector line corresponding to that ROI. The ROI's are individually programmable, and can overlap. The outputs are brought out to the back panel of the Saturn via a 26-pin dual-row connector.

Auxiliary Connector

The auxiliary connector on the back panel is a 26-pin, 0.100" spacing dual row connector, 3M part number 4626-6000 or equivalent. The mating connector is a standard 26-pin IDC (insulation displacement connector) socket, such as 3M part number 89126-0101 (most 0.100" spacing mass termination socket connectors will work here).

The pinout of the auxiliary connector is given below. Pin 1 is identified by a little triangle mark on the connector, and is in the upper right hand corner of the connector looking at it from the back of the Saturn box. Pin 2 is right below pin 1, etc:

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25  23  21  19  17  15  13  11  9   7   5   3   1
26  24  22  20  18  16  14  12  10  8   6   4   2
```

Auxiliary Connector Pinout			
Pin Number	Connection	Pin Number	Connection
1	Ground	2	No Connection (NC)
3	ROI 0	4	ROI 1
5	ROI 2	6	ROI 3
7	ROI 4	8	Ground
9	Ground	10	NC
11	ROI 5	12	ROI 7
13	ROI 6	14	ROI 8
15	ROI 9	16	Ground
17	NC	18	NC
19	Ground	20	ROI 11
21	ROI 10	22	ROI 13
23	ROI 12	24	NC
25	ROI 14	26	ROI 15

The TTL pulses on the ROI outputs are driven high for 500 ns when an event in the corresponding region of interest is processed. Three volt logic is used in the DXP, so the high level voltage output is around 3 volts, which is fully compatible with standard 5 volt TTL inputs.

Region of Interest Definition:

The regions of interest are defined using 33 DSP parameters; for historical reasons, the names of the parameters are based on single channel analyzer (SCA) regions. The parameter NUMSCA specifies the number of active ROI's (or SCA's). The ROI limits are specified in terms of MCA channel numbers:

SCAnLO == Low channel limit for ROI n (n = 0 to 15)
SCAnHI == Upper channel limit for ROI n (n = 0 to 15)

These parameters must be defined prior to starting a run; if the values are changed during a run, there will be no effect until the next run is started. As part of the begin run processing, a map array is built, where for each channel in the MCA, the corresponding word in the map array has a bit set corresponding to each ROI that includes that channel. By precomputing this array, the event processing is not slowed down by the determination of which ROI's are hit by each event.

Currently, each parameter must be set individually. Using the XiaDemo program, this is accomplished by choosing the 'Parameters' option from the 'View' drop-down menu, then selecting each parameter in turn in the drop-down list, typing the value into the box, and pressing 'Download' (note that you must press 'Download'; if you press 'OK' to close the window, the edit is not automatically performed). Using the XIA support libraries, you must make appropriate calls to the XiaSetParameter routine. We will be adding higher level support to the XIA libraries for ROI definition in the near future.

DSP Code:

To use the auxiliary ROI outputs, you must use the correct DSP code. The ROI-enabled DSP code has a filename of the form X10PROI_vvvv.hex or SATROI_vvvv.hex, where vvvv is a version number (currently 0106 at the time of this writing). Note that the DXP-X10P is an earlier version of the Saturn processor.

By default, the ROI outputs are not enabled, even if NUMSCA is set to a nonzero value and the ROI regions are defined. To turn on the ROI outputs, the special task bit (bit 11) of the parameter RUNTASKS must be set (each bit of RUNTASKS controls a specific task; see the Saturn manual for more information).

Summary:

Use the following steps to set up the ROI outputs:

- Write the number of ROI's to the parameter NUMSCA
- For each ROI (or SCA), set the limits using the DSP parameters SCAnLO and SCAnHI where n is the ROI number (0 to 15)
- Set bit 11 in the DSP parameter RUNTASKS to enable the ROI outputs.
- Start the run.