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WIDAR Binary Lag Set Format Specification

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Revision history

Revision	Date	Description	Name
0.1	4 Jan 2008	Initial draft version	mpp

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1 Introduction

The WIDAR binary lag set format is an intermediate output format for files produced by the WIDAR correlator backend. The format is designed primarily for WIDAR system diagnostics, and is not appropriate for science purposes. Files produced in the format are intended to provide a record of the lag sets assembled by the backend from lag frames received from the WIDAR baseline boards, without loss of any information carried by the lag frames. Nearly all of the fields in the lag frames comprising a lag set are recorded in the binary lag set format; the only exceptions being those fields that that are constant in all (valid) LTA output data frames. Several additional fields are present in the binary lag set format for completeness.

The format described in this document is intentionally very similar to the LTA output data frame format, and no attempt is made herein to describe in much detail those fields appearing in both formats. Please refer to the *LTA Controller FPGA* RFS document[1] for further information on the LTA output data frame format.

2 Format

2.1 Output products

The assembly of lag sets by the correlator backend is determined by the backend configuration. Each lag set belongs to a correlator output product defined by the backend configuration, and the binary lag set files produced by the backend are organized by output product. Within any such file, the lag sets are ordered by time, and lag sets appear in a sequence without any extra padding between adjacent lag sets.

Aside from the requirement that all lag sets in a file in the binary lag set format belong to the same output product, no other requirement is imposed on the files. In particular, a file may contain any number of lag sets, and the naming of files is left unspecified.

2.2 Lag sets

A schematic representation of a lag set in the binary lag set format is given in **Table 1**.

Any frames of a lag set that were not received by the correlator backend (within some timeout interval) are, nevertheless, present in the lag set as recorded in the binary lag set format. All of the fields in the lag set associated with the missing lag frames are set to zero. Thus, the size of a lag set is fixed for a given output product, and all of the records in a sequence of lag sets in an output product have the same size.

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[1] WIDAR document number A25091N0000, available at `http://www.drao-ofr.hia-iha.nrc-cnrc.gc.ca/science/widar/private/BaselineBoard/A25091N0000_LTACntrlRFS_V1.4_Aug23-07.pdf`.

<table>
<tr><th rowspan="2">block</th><th rowspan="2">word offset</th><th colspan="32">data word</th></tr>
<tr><th colspan="4">28</th><th colspan="4">24</th><th colspan="4">20</th><th colspan="4">16</th><th colspan="4">12</th><th colspan="4">8</th><th colspan="4">4</th><th colspan="4">0</th></tr>
<tr><td rowspan="3">Lag set headers</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>1</td><td colspan="3">BBID-Y</td><td colspan="5">SBID-Y</td><td colspan="8">SID-Y</td><td colspan="3">BBID-X</td><td colspan="5">SBID-X</td><td colspan="8">SID-X</td></tr>
<tr><td>2</td><td colspan="32">Num_Frames (= $M + 1$)</td></tr>
<tr><td rowspan="8">Lag frame 0 headers</td><td>3</td><td colspan="8">Start_BlockY</td><td colspan="8">NBlocks</td><td colspan="3">nlags</td><td colspan="6">ChipID</td><td colspan="4">CCC#</td><td colspan="3">CS-Valid</td></tr>
<tr><td>4</td><td colspan="7">STATUS_BITS</td><td colspan="9">FRAME_COUNT</td><td colspan="8">RECIRC_BLK-Y</td><td colspan="8">RECIRC_BLK-X</td></tr>
<tr><td>5</td><td colspan="32">TIMESTAMP-0</td></tr>
<tr><td>6</td><td colspan="32">TIMESTAMP-1</td></tr>
<tr><td>7</td><td colspan="32">DVCOUNT-Center</td></tr>
<tr><td>8</td><td colspan="32">DVCOUNT-Edge</td></tr>
<tr><td>9</td><td colspan="16">Board S/N</td><td colspan="16">LTA Bin #</td></tr>
<tr><td>10</td><td colspan="32">Checksum</td></tr>
<tr><td>Lag frame 1 headers</td><td>11 . . . 18</td><td colspan="32">. . .</td></tr>
<tr><td>⋮</td><td>⋮</td><td colspan="32">⋮</td></tr>
<tr><td>Lag frame M headers</td><td>$(3 + 8M) \ldots (10 + 8M)$</td><td colspan="32">. . .</td></tr>
<tr><td rowspan="8">Lags</td><td>$11 + 8M$</td><td colspan="32">Num_Lags (= $N + 1$)</td></tr>
<tr><td>$12 + 8M$</td><td colspan="32">Lag 0-In_phase</td></tr>
<tr><td>$13 + 8M$</td><td colspan="32">Lag0-Quadrature</td></tr>
<tr><td>$14 + 8M$</td><td colspan="32">Lag1-In_phase</td></tr>
<tr><td>$15 + 8M$</td><td colspan="32">Lag1-Quadrature</td></tr>
<tr><td>⋮</td><td colspan="32">⋮</td></tr>
<tr><td>$12 + 8M + 2N$</td><td colspan="32">LagN-In_phase</td></tr>
<tr><td>$13 + 8M + 2N$</td><td colspan="32">LagN-Quadrature</td></tr>
</table>

Table 1 Binary lag set

2.2.1 Fields

Comments on some of the fields of the binary lag set format are provided below. Any field in the format that is not associated with the comments below is unchanged from the homonymous field in the LTA output data frame format. Note, however, that the endianness of the words in the binary lag set format is left unspecified (in contrast to the LTA data frame format).

Word 0

Synchronization word; also useful for determining the endianness of the binary data words.

Num_Frames

Number of frames comprising the lag set.

CS-Valid

Boolean value representing the validity of the frame checksum. If the frame checksum is invalid (as determined by the correlator backend), the value of this field is zero; otherwise, the value is non-zero. This field exists only for convenience; the original LTA output frame could always be reconstructed, and the checksum validated by the reader of a lag set.

Num_Lags

Number of complex lags in the lag set.

Lags

The lags are ordered as determined by the output product specification (given as part of the correlator backend configuration).