SASY Technical Note # 15

SASY Labeling
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December 12, 1997
Version 1.1

1 Introduction

The purpose of this document is to define and explain the labeling conventions used for SASY.

2 Coordinate System

The coordinate system used in describing the placement of detector elements is as follows (see Figure 1): The Z-axis is defined parallel to the beam, with positive Z downstream. The X-axis is in the horizontal plane with positive X to the South (towards the electronics rooms). The Y-axis follows from the right-handed coordinate system to be vertical with positive Y above the target. The polar angle θ is defined as the angle from the Z-axis. The azimuthal angle ϕ is defined as the angle of rotation counter-clockwise of the projection in the X-Y plane, with $0°$ at positive X (and thus $90°$ at positive Y).

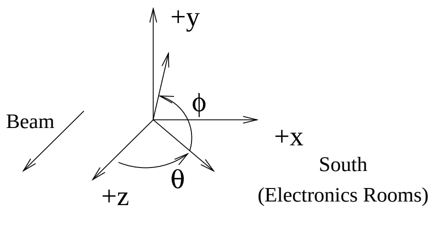

Figure 1: SASY Coordinate system.

The SASY coordinate system is defined with its origin at the center of the XTAL Box. The L10 Coordinate system is defined as a translation of 19.05 cm in the positive Z direction, placing the origin at the center of the shifted target position.

3 Signal and Detector Labeling

Each phototube in the array has an associated signal label. In the case of a single PMT per detector element, the detector label is the same. The exceptions to this include the central PN veto and the XTAL corners.

3.1 XTAL Box

The XTAL box labeling scheme was inhereited from previous experiments. Most of the cables and all of the amplifiers were previously labelled, so we chose to adopt the same labeling scheme.

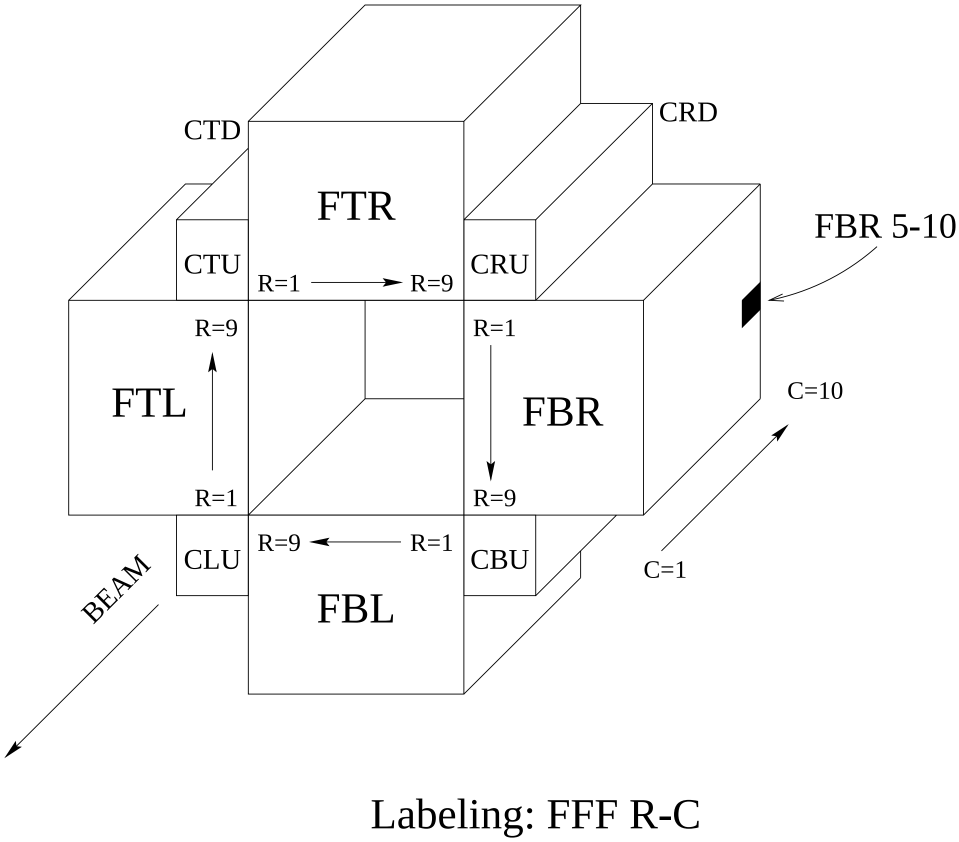

Figure 2: XTAL Box labeling.

This scheme labels each block by a region, row, and column (see Figure 2). A region refers to either one of the faces or corners. The faces are labelled FBR, FBL, FTL, and FTR (abbreviations for Face-Bottom-Right, Face-Bottom-Left, Face-Top-Left, and Face-Top-Right). The corners are labelled CBU, CBD, CLU, CLD, CTU, CTD, CRU and CRD. (Corner-Bottom-Upstream, Corner-Bottom-Downstream, Corner-Left-Upstream, ..., Corner-Top-Upstream, ..., Corner-Right-Upstream, ...). These mnemonics make sense in a setting with the detector reversed in the beam direction and rotated 45° about the beam.

Each face has 9 rows. Looking upstream at the detector they are numbered in a clockwise direction. Each row has 10 columns, increasing from downstream to upstream.

A typical detector labeling would be FBR 5-10 (shown shaded in Figure 2), representing the upstream-most element in the middle of the south face.

(*These next two paragraphs need to be rewritten. Take with a grain of salt - mal, Dec. 11, 1997*)

The corner signals were labelled sequentially 1–9. In this case we opted to number the PMTs from left to right, top to bottom as one would face the corner (see Figure 3). The top left tube is 1, the top right is 3, and the bottom right is 9. Since there is only 1 value, the corners are denoted CCC 0-N (or alternately CCC N), where $N = 1, \ldots, 9$.

N=

1	2	3
4	5	6
7	8	9

CCC N

Figure 3: XTAL Corner numbering: view from downstream.

Unfortunately this scheme does not match values upstream and downstream of the same detector volume. CTU 1 and CTD 3 are on the same crystal. In the down time preceding the January 1997 run it is our intention to swap the left and right columns of the "downstream" (physically, the upstream) corners so that each NaI volume has the same index, N, on each end.

The summed corner signals use a detector label of CC-N, where the upstream-downstream notation is dropped.

In certain situations the regions require a numbering scheme. This is patterned off the ordering of the veto paddle signals as they enter the splitters and FERAs: VBR, VBL, VTL, and VTR (CW (looking upstream at the box) starting with the south face). These are enumerated 1–4. (So far this is only an issue when dealing with NTUPLES). The corner volumes are then enumerated: CBU, CBD, CLU, CLD, CTU, CTD, CRU, CRD.

3.2 PN Bars:

Each phototube in the PN Bar array is labelled by the face, layer, and anode number (see Figure 4). Face simply refers to North(N) or South(S). The layer refers to the position in Z and ranges from 1 through 4. Layer 1 is the set of veto paddles; layers 2 through 4 are the 4 inch bars. The anode number refers to the vertical position, ranging from 1 through 15 bottom to top. Layer 2 ranges from 2 through 14 (1 and 15 are missing). The veto paddle anodes are identified by the rough midpoint of the paddle (anodes 2,5,8,11,14). In this way, the midpoint of the various elements in y can be determined straight from the signal label.

The detector volumes are referenced by the layer and anode (no face notation), except in the case of the central veto paddle, where the two halves are optically isolated. In this case the South PMT is mapped to L1-9.

3.3 PN Bar Fingers

The position calibration scintillators in front of the PN Bars are labelled 1 through 6 from South (electronics rooms) to North.

3.4 Pb Glass:

The Pb Glass numbering is quite straightforward. Each block is identified by a (Column,Row) coordinate. If facing the front of the wall (at target position facing downstream), the columns range from 1 to 15, increasing from left (South) to right (North). The rows increase from bottom to top ranging 1 through 15.

4 Electronics Indexing

The arrangement of the elements in the electronics is a separate issue requiring a mapping from the detector elements to some form of index indicating the location of the signal in the ADCs, TDCs, and discriminators. Each detector is assigned a FERA module and channel number representing their position relative to the beginning of that subsystem's bank (eg., module 3 in the Pb Glass refers to the third Pb Glass FERA. It also refers to the third TFC and the third CFD since the ordering is kept the same from the splitters). In addition, these indices are combined into a FERA index, which is simply $(Module-1)*16+Channel$. All three values: Index, Module and Channel, begin counting at 1.

The ordering of the XTAL Box elements in the FERAs was determined primarily by the

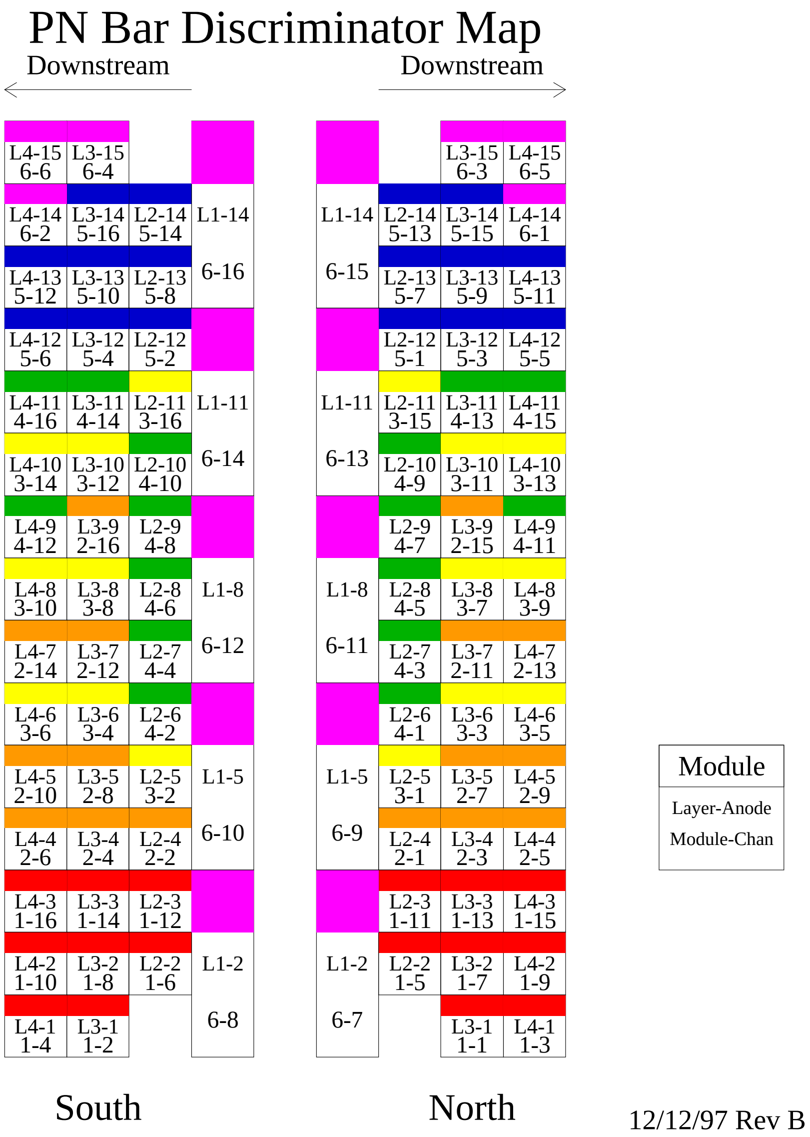

Figure 4: PN Bar labeling and discriminator map.

location of signals in the racks and the patch cable lengths. The order is relatively arbitrary. The only point where the signals need to be tracked is in the bank of FERA ADCs.

The ordering of the PN Bar and Pb Glass signals is driven by potential trigger logic. Grouping horizontal bands of detectors allows one to take summed logic outputs from discriminators representing detectors on the top and on the bottom layers to form a cosmic ray trigger which primarily selects particles passing through the whole array. During the January 1997 setup, we will probably reshuffle the mapping so as to isolate the portion of detectors closest to the beam into a single discriminator. This would allow a limited singles

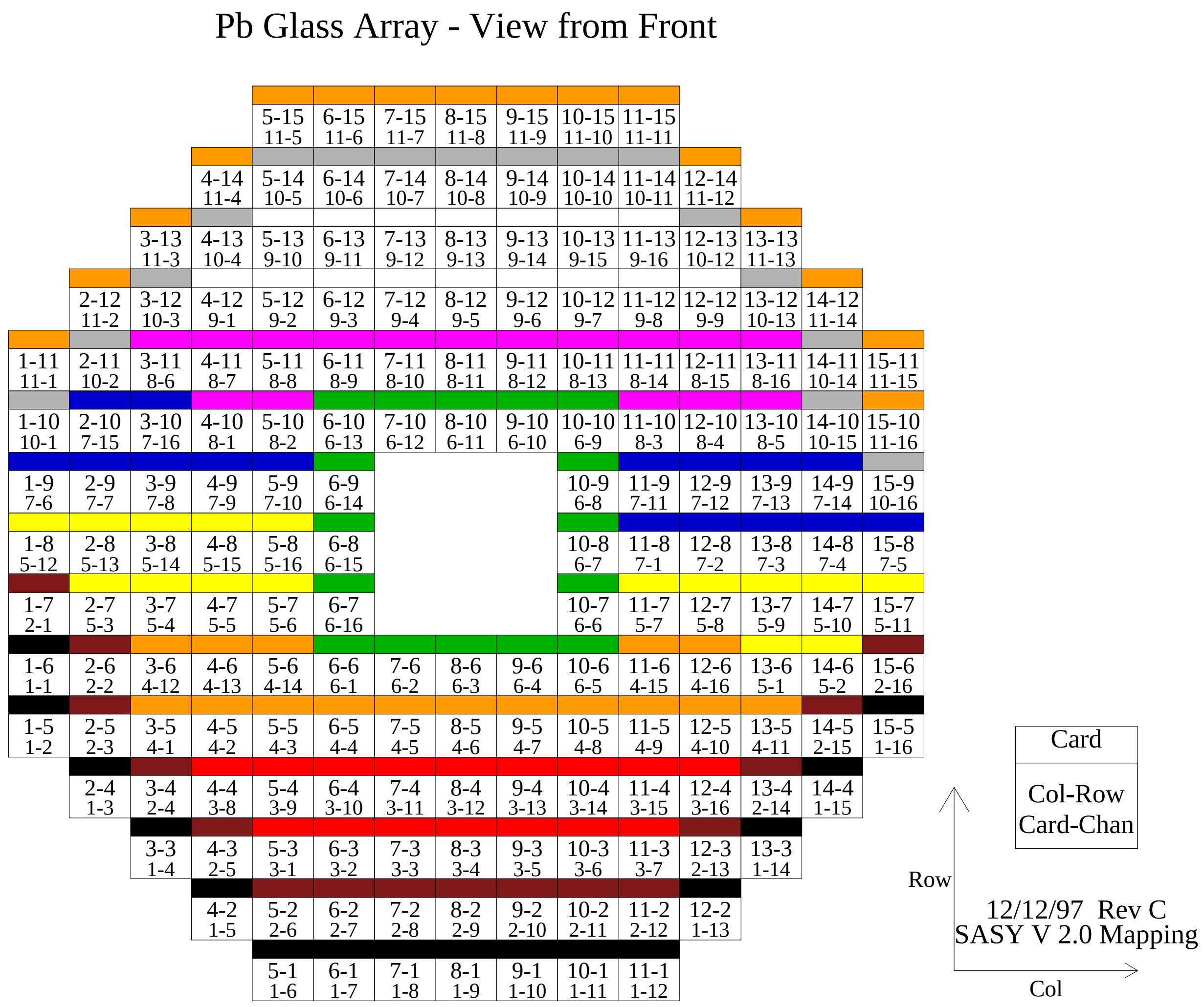

Figure 5: Pb Glass labeling and discriminator map.

trigger from these arrays without necessarily being swamped by events. The mapping for the discriminators also holds for the FERA ADCs and the TDCs.

The FERA mapping for the Pb Glass and PN Bar arrays is shown in Figures 4 and 5.

5 Display Coordinates

A set of crude event display histograms are created online. These represent each detector subsystem as a two-dimensional histogram of hits. The content of each bin represents the pulse height of that detector for a specific event. The current SASY database contains a mapping of detector elements to Display X and Display Y.

6 SASY Database

A crude database has been set up to relate detector elements with FERA indices, Display Coordinates (for event display) and High Voltage locations. The database currently consists of 3 ascii files, a library of subroutines for loading and searching the database, and an include file containing the common blocks defining the database as well as other parameters.

In addition, a utility is provided for command-line access to the database. On the VAX-Cluster this routine can be accessed by typing `SETUP_SASY` to define logicals, and then using the `SASY` command. VMS Help is provided in the LOCAL library.