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ABSTRACT

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On setting the default masks for the fast shutdown system

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1. Each fast shutdown (FSD) module at CEBAF has 16 input channels. Eight of these are wired in through the cross-connect boards, and the other eight are fiber-optic inputs. There is no logical difference in the treatment of these two classes of signals. For most of the modules, the number of channels available exceeds the number of input signals, so that some channels will remain open. At present, we have no ability to apply false input signals to the unused channels. Because of the fail-safe policy that has been applied to the circuit design for the FSD system, this means that the system would be in a perpetual shutdown state if we could not defeat these non-existent signals. In order to be able to run at all, we therefore apply to each module a set of masks that enable it to disregard the internal signals that would otherwise trigger a shutdown.

Perhaps unfortunately, if it is possible to mask out the unused input channels, it is also possible to mask out those that are used, since the absence of a signal is indistinguishable from a fault indication on one of the active channels. In fact, it is often quite helpful to be able to mask off some of the active inputs, as for example in some setup operations, when the beam power is low enough that it is not possible to damage the machine with a missteered beam. It is to be understood that the masks in this category are completely different from those described at first. They are to be used only when beam power (either average or peak) is severely limited, and must be removed when high-power operation is called for. By contrast, the masks for the unused channels must be applied under all beam conditions.

For this reason, we have established two kinds of masks. The operator-defined set is used only when running at low beam power, and can be changed at will. The second set of masks is used at high power, and should not be changed without very careful consideration and review. Because the high-power masks are less restrictive (that is, they are a subset of the others), the control system is set up so that the system defaults to them when no explicit decision to run at low power is enforced. For this reason, they are known as the default masks of the system.

2. The default masks have been found using the FSD system wiring diagrams, CEBAF drawings Y0001D01 through Y0011D01. (Y0011D01 describes a temporary setup at the 135° point in the East Arc; the last numbered drawing for the basic accelerator is Y0010D01.) The actual wiring of the machine is also done from these diagrams, so they can be regarded as the true state of the machine. We have expended no effort to guarantee that the physical wiring agrees with the diagrams, nor have we tested any of the circuits to see that they are working properly. We assume that these tasks have been performed by the people who are in charge of the circuit and wiring installation.

In a few cases, the drawings were found to contain contradictions, usually as the result of typographical errors. In these cases, we attempted to find the correct representation.

Fortunately, in every case so far encountered, we have been able to resolve the discrepancies. We have submitted our proposed solutions to Eric Woodworth for his review, and he has agreed that they are in fact correct; he is in the process of checking the drawings for errors, and our corrections will be included in his master list of changes.

Our method was to prepare a chart showing the 16 inputs of each module, numbering them from 0 to 15. The active inputs, as indicated in the wiring diagrams, are marked in on the chart. When the marking is complete, the unused inputs are left open, showing thereby the default masks.

The default mask for a single FSD module is represented as the binary number that has 0's in the positions of the active inputs, 1's in those of the unused inputs. It is thus an integer in the range 0 to 65535. Converting from binary to decimal representation is made easy by use of a Hewlett-Packard 20S hand calculator.

3. After all masks have been calculated, they are written into a file on the computer **iserver**, with path */users/controls/fsd4geoff.* The file contains instructions to load the masks with the correct addresses into TACL logic, so when it is run (log into */users/controls/* on **iserver** and enter *fsd4geoff*), the loading is done automatically.

The operator can check to be sure that the masks are loaded correctly by inspecting the displays FSDTESTIN, FSDTESTNL, and FSDTESTEA. For each FSD module, a box containing mask and fault information will be found on one of the three displays. The box has three rows of signals, each divided into 16 segments and showing the bit pattern of a signal needed for FSD operation. It also has a smaller box that shows, in reverse video, an integer in the range 0 to 65535. The top row, showing faults, is not relevant to the present discussion. The other two rows are quite significant. The middle row shows the masks in force. A bit in its signal that is set (equal to 1) will cause the associated segment to turn yellow; a reset bit (equal to 0) will cause it to be green. The bottom row, which is the mask requested by the operator, likewise shows yellow for set bits and green for reset.

For operators who can read 16-bit binary numbers without blinking, the middle row is all that is needed. For most of us, however, an additional step can be taken to make the check relatively easy. The operator-requested mask is identical with the number in the small box; when high-power operation is invoked, it is irrelevant, and can be set to whatever value may be convenient. If the operator enters the default mask by buttoning on the small box and typing the correct number, the middle and bottom rows will coincide, that is, show the same pattern of yellow and green segments, iff the masks are set correctly.

user2:[kloeppel.tex]masks.tex

Appendix. Default masks, as of 13 January 1993.

crate	logic name	mask
IN01B08	ISD0I011C	63742
IN01B12	ISD0I013C	28896
IN04B12	ISD0L041C	32704
IN03B06	ISD0L032C	64224
IN02B12	ISD0L021C	32766
IN01A08	ISD0I012C	65534
IN03B12	ISD0L033C	32736
IN03B07	ISD0L032C	65534
NL14B12	ISD1L141C	16638
NL03B12	ISD1L031C	20732
NL01B05	ISD1L011C	65504
NL01B14	ISD1L012C	65534
NL01B15	ISD1L013C	65534
NL02B12	ISD1L021C	32766
NL04B12	ISD1L041C	32766
NL07B12	ISD1L071C	29948
NL05B12	ISD1L051C	32736
NL06B12	ISD1L061C	32766
NL08B12	ISD1L081C	32766
NL11B12	ISD1L111C	29436
NL09B12	ISD1L091C	32736
NL10B12	ISD1L101C	32766
NL12B12	ISD1L121C	32766
NL15B12	ISD1L151C	29948
NL13B11	ISD1L131C	65534
NL13B12	ISD1L132C	32736
NL16B12	ISD1L161C	32766
NL19B12	ISD1L191C	25852
NL17B12	ISD1L171C	32736
NL18B12	ISD1L181C	32766
NL20B12	ISD1L201C	32766
NL21B12	ISD1L211C	32736
NL27B11	ISD1L271C	64736
NL27B13	ISD1L272C	65504
NL27B16	ISD1L273C	65534
E301B05-1	ISD3E012C	57598
E101B05-1	ISD1E012C	63712
E101B02	ISD1E011C	65532
E101B05-2	ISD1E013C	65504
E101B10	ISD1E014C	65534
E201B05-1	ISD2E011C	63712

E201B05-2	ISD2E012C	65504
E201B06	ISD2E013C	65528
E201B10	ISD2E014C	65534
E301B05-2	1SD3E013C	64766
E301B02	ISD3E011C	65534
E301B10	ISD3E014C	65534
E401B05	ISD4E012C	64766
E401B02	ISD4E011C	65534
E401B10	ISD4E013C	65534
E501B05-1	ISD5E012C	61664
E501B02	ISD5E011C	65532
E501B05-2	ISD5E013C	65504
E501B10	ISD5E014C	65534
E501B06	ISD5E015C	65528

The order of this list follows that of the display screens, which in turn follow the tree structure outlined in the wiring diagrams.