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SLC Control Program

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New Device All Beam Display

September 12, 1994

Author: *Daniel Van Olst* **Subsystem:** *Timing* **User Impact:** *Small*

Panel Changes: *Few* **Documents:** *No* **Help File:** *Yes*

Have you ever wanted to find out if, when, or how often a timing device was *really* triggering? Answering this question has been tricky since the inception of regional beam codes for the SLC timing system.

The old `Device All Beam` display has been junked and a new display has been released that 'understands' regional beam codes.

The new `Device All Beam` display shows all the information provided by the old display. Like the old `Device All Beam` display, the new display only shows information for each beam code on which the selected timing device is activated.

In addition, the new `Device All Beam` display incorporates much of the information shown by the [Disply Conditions] display on the `DUPCD Expressions` panel, such as conditional expressions, timing value sum expressions, and substitute beam codes.

Furthermore, the new `Device All Beam` display offers several features not available elsewhere, such as the evaluated values of timing value sums, device trigger rates, and graphical representations of the timing values used on each fiducial.

While this display 'understands' regional beam codes, it is subject to several minor limitations at the present time. See **Restrictions and Limitations** at the end of this article.

Display Summary

The `Device All Beam` display shows the following information:

- All conditions (if any) for the device.

The display omits this section if the selected device cannot have or does not have conditional expressions. See 'Beamcode-sensitive devices' below for more information.

- Timing value(s) from the TMATRIX for the device.

  The display may show more than one value, depending on the type of timing device selected.

- A 'Device Pattern' for the device.

  A Device Pattern (DPAT for short) represents when and how a timing device triggers. One character represents each fiducial (360th of a second).

- The period of the device pattern.

  The display shows this in seconds or in 360ths of a second, depending on what seems most reasonable.

- The rate of the device pattern.

  This is the number of fiducials per second on which the device triggers.

  The display may mark the rate as *averaged* or *approximate* (or both).

  A tilde (~) precedes all *averaged* rates. An averaged rate means that the period of the device pattern exceeds 360 fiducials or does not divide evenly into 360 fiducials, and thus the device triggers a different number of times each one-second interval.

  A question mark (?) follows all *approximate* rates. An approximate rate means that the period of the device pattern exceeds the number of fiducials that the display can simulate. In this case the display shows a rate computed from the number of fiducials actually simulated.

The 'Device All Beam Display' Panel

The period of the pattern for a timing device can easily be many seconds long, due to the interaction of beamcode and modifier patterns.

The `Device All Beam` display buttons on most of the SCP panels provide 'default' settings. These buttons simulate no more than 2 seconds (720 fiducials) when attempting to compute the device's triggering rate.

If a more exact rate computation is needed, the new `Device All Beam Display` panel may be used. This panel is available from the `Timing Diagnostics` Panel and it provides buttons to force the display to simulate as many fiducials as required to exactly compute triggering rates.

The `Device All Beam Display` Panel also has buttons that shift the device patterns on the display left or right.

Beamcode-sensitive Devices

If the selected device is a beamcode-sensitive device (DUPCD, TGAS, VDU), the display shows the information listed above (conditions, TMATRIX value, pattern, rate, and period) for each beam code on which the device is activated.

In addition, the display shows this information for a beamcode if the device/beamcode has a conditional expression whose timing value sum evaluates to an 'activated' timing value. In this situation, a device can trigger via the conditional expression, even though deactivated on the beamcode.

For a specific device/beamcode, the display shows the following information for each condition:

- Conditional expression string.
- Timing value sum expression string.
- Substitute PPs corresponding to the timing value sum.
- 'Evaluated' value (or values) of the timing value sum expression string. The evaluated timing value sum is generally computed using current tmatrix and TMVA values.
- A symbol used to represent this timing value sum in the device pattern(s).

For a specific device/beamcode, if the device has conditions AND the MPG is issuing the beamcode, the display shows the rate, period and device pattern for each possible ratelimiting type.

For a specific device/beamcode, if the device has no conditions OR the MPG is not issuing the beamcode, the display shows only one rate, period, and device pattern. (Under these conditions, the rate, period, and device pattern are the same under all ratelimiting types).

For beamcode-sensitive devices, the following characters can appear in a device pattern:

- '-': Beamcode not present.
- '*': Beamcode present; device using activated TMATRIX value.
- '+': Beamcode present; device using deactivated TMATRIX value.
- 'A'-'Z': Beamcode present; device using activated timing sum.
- 'a'-'z': Beamcode present; device using deactivated timing sum.

Beamcode-insensitive Devices

At present, TRBRs are the only kind of timing device not affected by beamcodes.

If the selected device is a TRBR, the display shows information listed above in **Display Summary** only once. TRBRs do not have conditions. Only one value is displayed for rate, period, and device pattern.

For TRBRs, the following characters can appear in a device pattern:

- '-': TRBR's TMSK is 'low'
- '*': TRBR's TMSK is 'high' and TRBR is activated.
- '+': TRBR's TMSK is 'high' and TRBR is deactivated.

Restrictions and Limitations

At the present time, this display has the following restrictions and limitations:

- The display treats suspended beamcodes and modifiers as unsuspended.
- The display does not understand the modifiers flags 'Ratelim deadtime' and 'Oneshot' and will not take them into account, if set.
- If a timing value sum uses a micro-controlled TMVA such as PSK time, then the evaluated timing value sum will not reflect the latest value of the TMVA. In this case the display shows a warning that the sum includes a micro-controlled TMVA, and may not be up-to-date.
- The display does not check evaluated timing value sums to determine if the sums violate the upper or lower bounds for their timing device type. The micro does perform a check, so one must check the error log if this is of concern.

New Alarms/Warnings & BSOIC Panels

Sept 1,1994

Author: *Mary Byrne* **Subsystem:** *SCP* **User Impact:** *Small*
Panel Changes: *Yes* **Documents:** *No* **Help File:** *No*

A new Alarms and Warnings panel and a series of BSOIC panels give easier access to Alarm information and BSOIC resets and status.

A new button [ALARMS & WARNGS] on the Main Index panel selects the new Alarms and Warnings panel which displays 3 boxes: Alarms, Warnings, and VAX Only Warnings. This panel is an improvement upon the older Primary Annunciator Panel which displayed Alarms and all Warnings. On the new panel, Warnings refers to warnings that are hardwired and VAX Only Warnings are those that are not. In addition, the new panel provides analog status information associated with alarms and warnings.

From the Alarms & Warnings panel, a new BSOIC panel can be selected. This allows the user to view digital status of all BSOICs and to confirm the proper operation of the PPS. BSOICs and related devices are displayed by region.

The new BSOIC panel also gives access to new BSOIC reset panels and a new BSOIC Analog Status panel which are all organized by region. This improves upon the previous method, where the BSOIC resets and analogs were not arranged by region and were difficult to find.

Scanning Electron and Positron Beams with one Wire Scan

September 13, 1994

Author: *Lee Ann Yasukawa* **Subsystem:** *Wires* **User Impact:** *Small*
Panel Changes: *Few* **Documents:** *Yes* **Help File:** *None*

A few of the linac wires can now be used to scan both electron and positron beams with one wire scan. The wires which can use this functionality are those where the beams are close enough together so that one reasonable scan range covers both beams. It is expected that the LI02, LI11 and LI28 wires will use this capability which will result in reducing the time needed to scan these sectors of the linac.

Currently, the only wires setup to utilize this capability are the LI28 wires (as seen by the '0100'x bit set in the WIRE HDSC). For each of these wires, there is at least one GADC channel which is timed to read the positron beam when the electron beam is being scanned. The data from the timed GADC channel is fit with the gaussian or asymmetric gaussian fit just like the electron beam. The results of the fit are stored both in the positron database, and the file which is written in conjunction with the DSPLY LATEST SCAN function, and can be used with emittance and skew scans. When a regular positron scan is performed, there is no additional data available than what is currently provided (i.e. no electron beam data is collected).

When scanning multiple wires to calculate emittance or skew, the electron data is used to calculate emittance and skew for the electron beam and the positron beam results are used to calculate emittance and skew for the positron beam. The positron beam results is not automatically displayed but the results are automatically put into the database. The results can be seen by switching the [SELECT BPM DEFN] button from ELECTRON to POSITRON and selecting the [RECALC EMIT] or [RECALC SKEW] buttons.

So far, there are no BPMs which are timed for the positron beam in LI28 so the positron GADC data collected is not normalized and wire position is not jitter corrected. Once a BPM is setup for the positron beam, normalization and jitter correction can occur. This does not impact the electron beam scans where there are BPMS timed to acquire electron data so normalization and jitter correction are provided when selected from the Scan Options Panel. Also, if normalization and jitter correction are desired for the positron beam, a regular positron beam wire scan can be performed.

The software which allows users to change the selected GADC index from the Scan Options Panel, has also been modified to account for the timing of the various GADCs used for each wire. When the wire is setup to scan both electrons and positrons beams, there is a bit mask in the database which corresponds to the WIRE's GADC list and is used to determine which GADCs can be selected for the primary beam and which can be selected for the secondary beam.

When selecting the [DISPLY GADC READOUT] button, the user is prompted for the unit number of the wire of interest and also whether the user wants to see the selected GADC index for the primary or secondary beam. The primary beam GADC is always used for the particle listed on $\boxed{\text{SELECT BPM DEFN}}$.

The secondary beam GADC index is only used for the positron beam when scanning electrons.

When changing the selected GADC index using the $\boxed{\text{SELECT GADC READOUT}}$ button, the software checks to ensure the newly selected GADC can be used for the selected beam type: primary or secondary. If the user is changing the primary beam index but selects a GADC channel that is timed for the secondary beam, a message is written to the LOCAL MESSAGE window saying the GADC is for the other beam.

There is a document which describes the changes made to implement the software for the secondary beam calculations in DOC$SPEC:WIRE_2BEAM_SCANS.TXT. This document also describes the database changes necessary to convert a wire from a one beam wire scanner to a two beam wire scanner.