

EBIS Software Design Requirements

Software requirements for EBIS can be divided into four main functional categories that specify:

1. Drift tube functions;
2. Triggers;
3. Beam line devices, and
4. Magnets.

All four categories share a common set of requirements that is described separately but apply to all.

COMMON REQUIREMENTS

The following requirements are common to some or all four functional categories described above.

Link Control :

Provide the capability to group and un-group points within and between functions. A change to any point in the group will also apply to all the other points in the same group. The groupings should be easily identifiable.

Nudge :

Selected parameters can be nudged up or down in user selectable increments.

Execution Mode :

Modified parameters can take affect instantly or later at the users discretion.

Execution :

Parameters can be downloaded one at a time or all at once at later users discretion.

File :

Parameter values can be saved and loaded to and from a file.

PPM:

Provide capability to set different PPM user.

Archive:

Provide capability to archive current settings.

Buffer:

Provide a buffer to display historical settings.

DRIFT TUBE FUNCTIONS

Definitions

Provide an interface that will allow for the simultaneous specification and modification of approximately 50 functions that control the EBIS drift tubes. Each function is used to determine voltages, with respect to time, within an EBIS cycle.

For this document, it is assumed that each function will eventually be loaded onto a Front End Computer (FEC) with a Quad Function Generator (QFG). And, it is the responsibility of the FEC to interpolate the given set points and load them onto the QFG, which in turn transmits the values to the connected device.

The synchronization of this transmission amongst the various QFGs needs to be addressed elsewhere. It is currently assumed an event will cause the active and secondary buffers on the QFG to switch functionality, and that possibly, an additional event will cause the QFGs to begin sending data to the power supply interface.

Each function should allow for the specification of at least ten distinct user definable EBIS sub cycles, --which we will refer to as step stones -- along with their corresponding voltage values. Ideally, there should not be any limitations on the number of sub cycles that can be specified.

The interface will provide user selectable interpolation methods that are supported by the FECs containing the QFGs. Currently, only linear interpolation is supported on the FEC.

Loading

Once the functions are defined, the interface will provide a mechanism for the user to load the functions onto all the relevant FECs supporting QFGs for EBIS.

The loading of functions will not interfere with the current active functions.

Once all functions are completely loaded, they can then be activated at the same time on all the QFG's.

It is assumed an event will be used to initiate the activation of the loaded functions.

Read-back

Provide the capability to read-back and display functions from the FEC/QFG.

This includes:

Continuous Measurements:

- 1: Reference values sent to power supply from the Power Supply Interface.
- 2: Actual current values emanating from the power supply.

Discrete Measurements:

- 3: Points sent to the FEC.
- 4: Points interpolated by FEC.

TRIGGER FUNCTIONS

Definitions

The interface will provide the ability to specify named triggers within an EBIS cycle. Capabilities will exist to allow the user to specify the following properties with each trigger...

- ⊗ Active high or low.
- ⊗ Enabled or Disabled.
- ⊗ Start point - a selection from all previously defined Step Stones.
- ⊗ Delay time from the start point
- ⊗ Active high or low.
- ⊗ End point type - by pulse width or relative to end point
 - If pulse width, then width of pulse, and possibly frequency.
 - If end point then specify Step Stone with option to delay.

Some of these parameters, for example high/low are database configurable parameters, and are not subject to change in the application.

Loading

Once the functions are defined, the interface will provide a mechanism for the user to load the functions onto all the relevant FECs supporting QFGs for EBIS.

The loading of functions will not interfere with the current active functions. Once all functions are completely loaded, they can then be activated at the same time on all the QFGs.

It is assumed an event will be used to initiate the activation of the functions just loaded.

BEAM LINE FUNCTIONS

In addition to controlling the drift tubes in EBIS itself, the application also needs to provide the capability to operate external devices in the immediate vicinity in order to control the injection and extraction of beam into and out of EBIS.

Definitions

There will be a software interface to write single injection and extraction values to these devices.

Loading

The loading of functions will not interfere with the current active functions. Once all functions are completely loaded, they can then be activated at the same time on all the QFGs. It is assumed an event will be used to initiate the activation of the functions just loaded.

Read-back

Measurement read-backs and status will also be displayed.

MAGNET FUNCTIONS

Various magnets also exist in EBIS that also need to be controlled.

Definitions

The application will provide an interface to set values to control power supplies connected to various EBIS magnets. Each power supply will have a single control value.

Loading

The loading of functions will not interfere with the current active functions. Once all functions are completely loaded, they can then all be activated at the same time on all the QFGs. It is assumed an event will be used to initiate the activation of the functions just loaded.

Read-back

Measurement read-backs and status will also be displayed.