BUNCH IDENTIFICATION MODULE*

J. D. Fox
Stanford Linear Accelerator Center
Stanford University, Stanford, California 94305

General Description

This module provides bunch identification and timing signals for the PEP Interaction areas. Timing information is referenced to the PEP master oscillator, and adjusted in phase as a function of region. Identification signals are generated in a manner that allows observers in all interaction regions to agree on an unambiguous bunch identity.

The module provides bunch identification signals via NIM level logic, upon CAMAC command, and through LED indicators. A front panel "region select" switch allows the same module to be used in all regions.

The module has two modes of operation: a bunch identification mode and a calibration mode. In the identification mode, signals indicate which of the three bunches of electrons and positrons are interacting and timing information about beam crossing is provided. The calibration mode is provided to assist experimenters making time of flight measurements. In the calibration mode, three distinct gating signals are referenced to a selected bunch, allowing three timing systems to be calibrated against a common standard.

Physically, the bunch identifier is constructed as a single width CAMAC module.

Bunch Naming Conventions

The bunch naming scheme I propose identifies each bunch by sign (electron or positron) and flavor (chocolate, vanilla or strawberry). This naming convention allows unambiguous identification of the colliding bunches, and hopefully will simplify exchange of bunch-dependent information between regions. Please recall that due to PEP's geometry, experimenters in different regions see different bunches interacting.

Functional Description

Figure #1 is a block diagram of the identification module. The module accepts two input signals, produces four output signals, and includes a CAMAC interface. The "CLOCK" input accepts the timing signal from the TDIT (PEP #208-503) module. The "STROBE" input is a NIM-level input which latches the current bunch information for later analysis via CAMAC.

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The front panel includes three adjustable potentiometers. The "B Adjust" control provides approximately 204 ns of phase adjustment in the leading edge of the electron flavor outputs. The "X30" and "X3M" controls adjust the phase and pulse width of the X3 revolution signal.

The "X3" output is a NIM level signal at three times the revolution frequency. The phase and width of this signal are independently adjustable via front panel potentiometers, with the phase continuously adjustable from 0 to 120°, and the width adjustable from 50 ns to 24 μ s. It is expected that both adjustments will have associated jitter in the signal of $\pm 1\%$. This signal is not affected by the calibration mode of operation.

The bunch identification outputs are NIM level, and there are two outputs per flavor of electron. Associated with each electron flavor signal output are four LED's. In the normal mode of operation, the NIM level flavor outputs indicate the colliding electron bunch, and one of the three LED's will light, indicating the flavor of the colliding position bunch. The fourth LED, a rate indicator, flashes if the strobe input is activated.

Table I lists the CAMAC commands accepted by the module. The calibration mode is selected by an F(26) A(X) command, where (X) is the encoded number of a particular electron bunch. Each passing of this bunch will be indicated by all of the flavor outputs, while the unselected bunches will not be indicated by any flavor output. Please examine the timing diagram, Figure #2, for clarification.

During the calibration mode, the positron flavor LED's will not light. An F(26) A(3) command has the effect of shutting off the flavor outputs. Executing an F(24) A(0) command returns the module to the identification mode.

The timing of the identification signals is shown in Figure #2. Please note the 204 ns phase adjustment (with $\pm 1\%$ jitter) possible in the leading edge of the identification signals. These signals are intended for use as gating signals, or crude timing signals. Individuals with a need for more precise timing information or CAMAC programmable timing signals should examine the PEP digital delay units (#208-500).

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TABLE 1

CAMAC COMMANDS

		Q	X
F(0) A(0)	Read strobed data	1	1
F(9) A(0)	Reset module	1	1
F(24) A(0)	Disable calibration mode	1	1
F(26) A(0)	Enable calibration mode, Chocolate e ⁻	1	1
F(26) A(1)	" " " Vanilla e ⁻	1	1
F(26) A(2)	" " " Strawberry e ⁻	1	1
F(26) A(3)	Shut off flavor outputs	1	1

Data format for the f(0)A(0) READ are as follows:

R8	R7	R6	R5	R4	R3	R2	R1
Rg3	Rg2	Rg1	Rg0	e+1	e+0	e-1	e-0

e-0, e-1 encoded electron bunch
chocolate = 0, vanilla = 1, strawberry = 2

e+0, e+1 encoded positron bunch

Rg0-Rg3 encoded region number

The module responds to unaddressed Z or C operations with a RESET [F(9)A(0)] sequence.

All other CAMAC commands are ignored, and X=0, Q=0 is returned.

FIGURE CAPTIONS

Fig. 1. Block diagram of the bunch identification module.

Fig. 2. Timing diagram.

2-81
ADP1A3

Fig. 1

Actual bunch crossing is nominally 80 ns from the leading edge, and is adjustable (ϕ adjust) by 200 ns with respect to leading edge. All flavors adjust phase together.

Calibration Mode - Typical Sequence
F(26) A(1) Selected - Vanilla Bunch Timing Standard

Fig. 2