

# Paraphase Curve Module Quick Reference

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A new VXI module has been developed and installed to provide the paraphase curve that programs the phase between the A and B RF cavities during the Booster acceleration cycle. This module replaces a CAMAC 071 card that provided the curve, and a NIM module call the Sum Box which inserted fixed offsets into the curve at specific TCLK offsets.

The new paraphase curve module provides 500 points spaced at 1.2 us intervals. This provides for a 600 us curve. The final value of the curve is held for the duration of the cycle. There are two offsets that can be applied to the main curve at programmable offsets from the start of the curve. Once the offsets are applied they are in for the remainder of the cycle. There is also an auxiliary curve of 500 points that can be summed into the main curve beginning at a programmable offset from the start of the curve. The nominal spacing of the points in the auxiliary curve is 1.2 us, however there is a programmable clock divisor that can increase the spacing of the points. Finally, an externally generated curve can be summed with the paraphase curve by applying the external curve through ADC0 of the module and enabling the external offset feature.

Table 1 lists the programmable parameters of the module and the associated scale factors. Listing 1 is a screen shot from the ACNET parameter page.

The main paraphase curve and the auxiliary curve points are created and edited using page B26. The device names are B:PARAT and B:PAUXT, respectively. See Figure 1 and Figure 2

The curve is triggered with a TTL signal through the front panel. This signal is ACNET trigger B:VXTPPP. This is generated by a CAMAC 377 module in Crate \$92, Slot 16, Channel 5. See Figure 3.

In addition to the curve trigger, there are front panel digital input connections that enable (or not) the PBR bunch rotation offset, the playing of the auxiliary curve, and enable the application of an external curve. If these inputs see a rising edge then the particular function is enabled for the remainder of the current Booster cycle. Figure 4 illustrates the logic involved. The final gate for each function is the sum of the front panel enables and the internally timed triggers for each function. The internally timed triggers are controlled by the Acnet parameters PBRcnt, PAUXct and PEXTEN. So in order to set the occurrence of the bunch rotation offset or the start of the auxiliary curve one can either send the front panel enable pulse at the beginning of the booster cycle and time the occurrence of the function with the Acnet count parameter, or they can set the Acnet

count parameter to zero and use CAMAC TCLK trigger delay parameters to time the occurrence of the front panel enable.

The best way to experiment with creating curves is to use the spare module in one of the two test stands available in booster gallery lab area. Contact Craig Drennan at X2160 or email address [cdrennan@fnal.gov](mailto:cdrennan@fnal.gov) if you would like to try this module out.

Table 1 List of parameters that can be Read or Written by ACNET.

Index	Acnet Name	Units	Scale Factor	Parameter Description
0	PARANM	--	--	Number of values in the base paraphase curve.
1	PC1OFF	Counts	1.221 milli-Volts per Count	C1 Offset: Baseline offset for the paraphase curve.
2	PC2OFF	Counts	1.221 milli Volts per Count	C2 Offset: Post-Transition offset for the paraphase curve.
3	PBROFF	Counts	1.221 milli Volts per Count	BR Offset: Beam Rotation offset for the paraphase curve.
4	PC2CNT	Clocks	1.200 micro-Sec per Clock	C2 Count: Apply Offset C2 at this number of 1.2us clocks from start.
5	PBRCNT	Clocks	1.200 micro-Sec per Clock	BR Count: Apply Offset BR at this number of 1.2us clocks from start.
6	--			Curve 1: The Paraphase Curve.
7	--			Curve 2: The Aux Offset Curve.
8	PAUXNM			Number of values in the Auxiliary Offset curve.
9	PAUXCT	Clocks	1.200 micro-Sec per Clock	Aux Curve Count: Apply Aux Offset Curve at this number of 1.2us clocks from the start.
10	PAUXDV			Aux Curve Clock Divisor, m. Clock Period = 1.2us*m.
11	PEXTEN			The External Analog Offset enable ( enabled = 1 ).

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B9      GMPS VOLTAGES                SET      D/A   A/D   Com-U ♦PTools♦
-<FTP>+ *SA♦ X-A/D X=TIME            Y=R:IP619A,R:IP620A,R:IG620 ,R E4IG06
COMMAND ---- Log   I= 0             I= 1.0E-11, 1.0E-11, 1.0E-11, 1.0E-11
-< 1>+ One+ AUTO   F= 600           F= 5.0E-09, 5.0E-09, 1.0E-09, 1.0E-09
bpm_400 .GMPS.. rad_mon irms        tunmetr dampers bpm-400 .montr.

-B:PC10FF      Bseline offset paraph 64          64
-B:PC20FF      Post Trans off paraph 52          52
-B:PBROFF      Beam Rot off paraphas 0           0
-B:PC2CNT      Strt cnt Post Trans o 14217       14217
-B:PBRCNT      Strt cnt Beam Rot off 6            6
-B:PAUXCT      Start count aux curve 1000         1000
-B:PAUXDV      Aux curve clock divis 1            1
-B:PEXTEN      Ext offset enable 0              0
-B:PHCF00      Phase Ctrl Flt Param 0            1

-B:PARATV      Boo Paraphase Tbl Val 0            9.9023436 Vlts
-B:PARATT      Boo Paraphase Tbl Tim 0            0 uSec
-B:PARATC      Boo Paraphase Table C 0            496
B:PARATD      DSP Module Digital Cntrl

-B:PAUXTV      Boo Aux Off Tbl Value 0            0 Vlts
-B:PAUXTT      Boo Aux Off Tbl Times 0            0 uSec
-B:PAUXTC      Boo Aux Off Table Ctr 0            151
B:PAUXTD      DSP Module Digital Cntrl

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Listing 1 ACNET parameter page of VXI Paraphase Module parameters

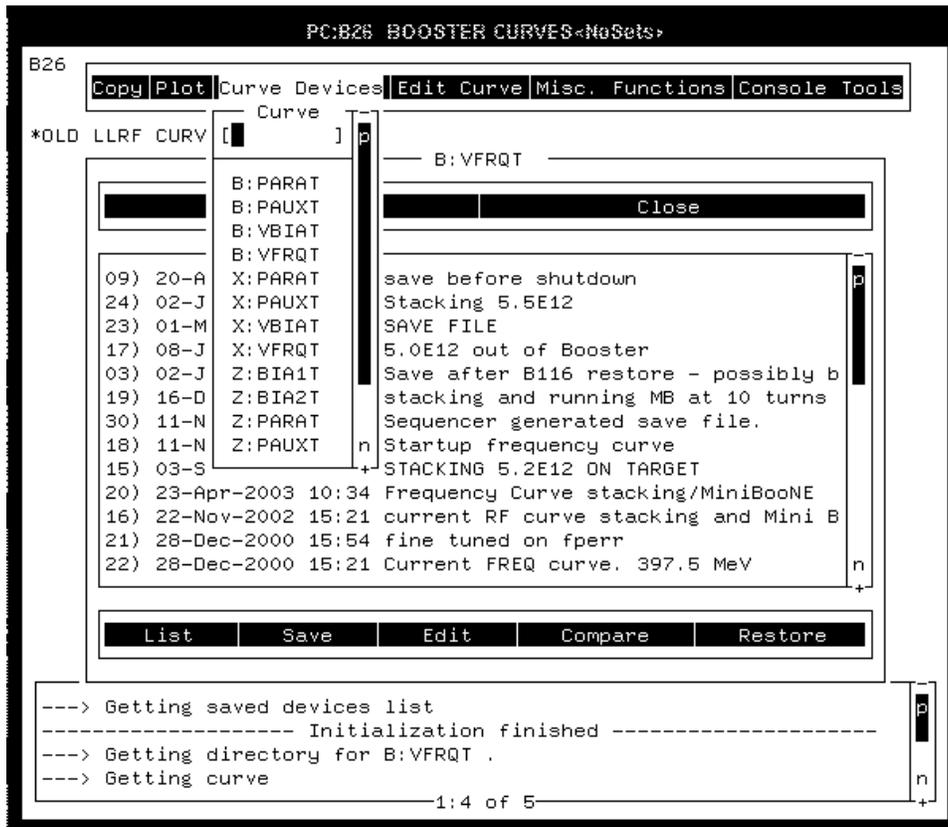


Figure 1 Screen shot of the B26 Booster Curves control page.



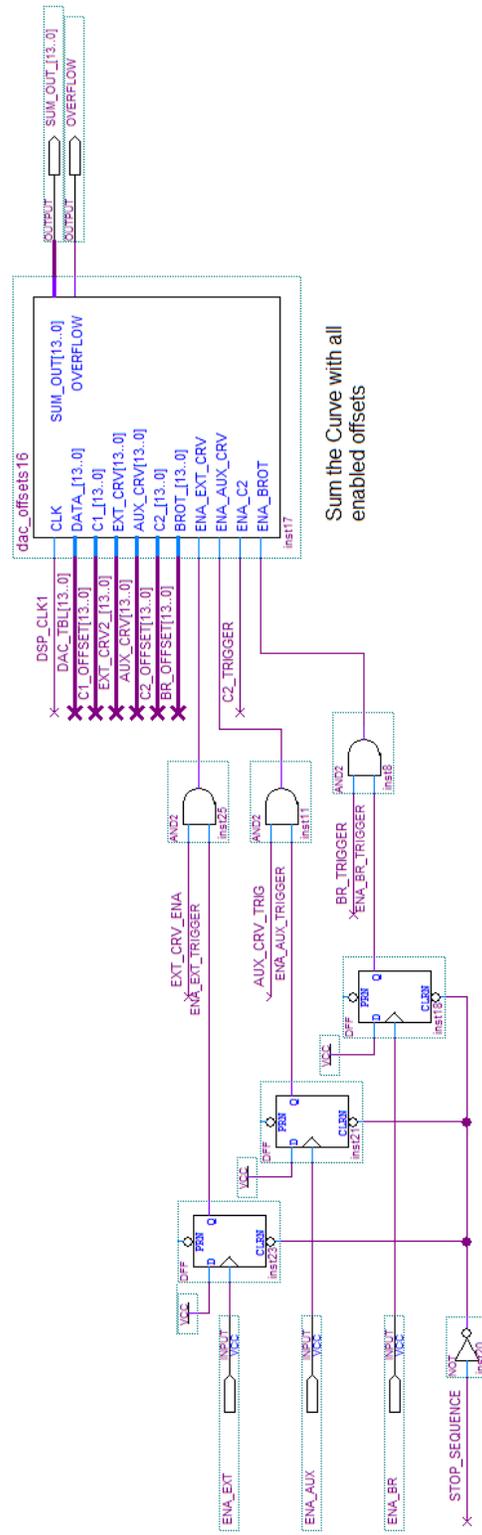


Figure 4 Logic for enabling and gating additional paraphrase curve offset.

