This document only covers the operational modes of the MI at the time of writing. Study and future modes are NOT covered in this document.

MI Supported Operating Modes

D. Capista 10/05

8 Gev

Description	Tclock Events	MI State	Injection Beam Sync Trigger	Extraction Beam Sync Trigger(s)	TLG Module
Proton Beam from Booster to Recycler (4 x 2.5 Mhz bunches).	$2D $E2	25	BES	RRBS $A2	171
Proton Beam from Recycler To MI abort.	$2D $E3	25	RRBS $A4	Abort	171
Pbar Beam from Recycler to Recycler.	$2D, $E4, $E0	19	RRBS $A7	RRBS $A0	184
Pbar beam from Accumulator to Recycler.	$91, $2D, $E0	20	MIBS $7A	RRBS $A0	204
Proton Beam from Booster to Accumulator.	$16, $2D, $93	16	BES	MIBS $7E	30
Proton Beam from Booster to Debuncher.	$16, $2D, $85	16	BES	MIBS $7D	10
Proton beam to from Booster MI abort.	$13, $2D	15	BES	Abort	44

120 Gev (Booster Protons)

Description	Tclock Events	MI State	Injection Beam Sync Trigger	Extraction Beam Sync Trigger	TLG Module
Pbar stacking.	$14, $29, $8E, $80	3	BES	MIBS $79	71
Pbar slip stacking.	$14, $29, $8E, $80	28	BES	MIBS $79	61
Pbar stacking cycle to MI abort.	$14, $29	3	BES	Abort	37
NuMi target (0-6 Booster Batches).	$19, $23, $A5	21	BES	MIBS $74	73
Pbar Stacking and NuMi target.	$14, $19, $23, $8D, $8E, $A5	7	BES	MIBS $74 MIBS $79	72
Slip Stacking and NuMi target.	$14, $19, $23, $8D, $8E, $A5	5	BES	MIBS $74 MIBS $79	68
NuMi target cycle to MI abort.	$19, $23	8	BES	Abort	55
SY120.	$13, $21, $30	24	BES	MIBS $75	196
Stacking and SY120.	$14, $13, $21, $80, $30	17	BES	MIBS $79	58
Slip Stacking and SY120.	$14, $13, $21, $80, $30	14	BES	MIBS $79	67

150 Gev

Description	Tclock Events	MI State	Injection Beam Sync Trigger	Extraction Beam Sync Trigger	TLG Module
Protons to Tevatron.	$15, $2B, $4D	4	BES	MIBS $7C	193
Protons from Tevatron.	$2E, $2A, $5D	12	BES	MIBS $D8	63
Tevatron proton cycle to MI abort.	$15, $2B	4	BES	Abort	203
Pbars from Accumulator to Tevatron.	$91, $2E, $2A, $40	23	MIBS $7A	MIBS $7B	62
Pbars from Recycler to	$2E, $2A, $40, $E4	11	RRBS $A0	MIBS $7B	180

Tevatron.					
Tevatron pbar cycle to MI abort using protons.	$2E, $1C, $2A	30	BES	Abort	219

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Command Definitions

Closed Orbit: Sets the BPM system into the narrow bandwidth mode

Datum1: Enables or disables the command

- Enable
- Disable

Datum2: NA
Datum3: NA
Datum4: NA

Flash: Sets the BPM system into the wide bandwidth mode for injection and extraction flash turn measurements

Datum1: Enables or disables the command

- Enable
- Disable

Datum2: Transfer event

- BES (Booster Extraction sync)
- MIBS $TBT, $7A, $D6, $D8, $A1, $A6, $74, $75, $76, $7B, $7C, $7D, $7E
- RRBS $A0, $A1, $A2,$A3, $A6, $A7

Datum3: Turns delay from event

- Integer number

Datum4: Sample Bucket

- 0-587

Filter: Sets the particle type(protons or Pbars) , the RF structure (2.5 or 53 Mhz), and the detctor signal attenuator

Datum1: Particle type

- Proton
- Pbar

Datum2: RF structure (MHz)

- 2.5
- 53

Datum3: Attenuator Setting (Db in 6Db steps)

- 0 to -48

Datum4: NA

TBT(turn by Turn): Sets the BPM system into the wide bandwidth mode

Datum1: Enables or disables the command

- Enable
- Disable

Datum2: *I:device* used for arming or disabling the command(0=disable, otherwise the value is the arm time)

- Displays the value of this device. Not setable from this page

Datum3: Turns delay from event

- Integer number

Datum4: Sample Bucket

- 0-587

MI BPM State Definitions

120 Gev Pbar Production (State 3)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	*I:device*	0(Turns)	40 (Bucket)
3	0	Flash	Enable	BES		
4	.055	Closed Orbit	Enable			
5	.93	Flash	Enable	MIBS $79	17 (Turns)	40 (Bucket)

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150 Gev Collider Proton to Tevatron (state 4)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	0 (Bucket)
3	0	Flash	Enable	BES		
4	.055	Closed Orbit	Enable			
5	2.6.	Flash	Enable	MIBS $7C	24 (Turns)	0 (Bucket)

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Slip Stacking + NuMi Multi Batch (state 5)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	TBT	*I:device*	0 (Turns)
3	0	Flash	Enable	BES		
4	.055	Closed Orbit	Disable			

5	.43	Closed Orbit	Enable			
6	1.2	Flash	Enable	MIBS $79	17 (Turns)	40 (Bucket)
7	1.2	Flash	Disable	MIBS $74	15 (Turns)	160 (Bucket)

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Pbar Stacking + NuMi Multi Batch (state 7)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	40 (Bucket)
3	0	Flash	Enable	BES		
4	.13	Closed Orbit	Disable			
5	.43	Closed Orbit	Enable			
6	1.2	Flash	Enable	MIBS $79	17 (Turns)	40 (Bucket)
7	1.2	Flash	Disable	MIBS $74	15 (Turns)	160 (Bucket)

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NuMi Target cycle to MI Abort (state 8)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	40 (Bucket)
3	0	Flash	Enable	BES		
4	.055	Closed Orbit	Disable			
5	.37	Closed Orbit	Enable			

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Pbars From Recycler to Tevatron (state 11)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Pbar	2.5	0 Db	
2	0	TBT	Enable	*I:device*	0(Turns)	20 (Bucket)
3	0	Flash	Enable	RRBS $A7	30(Turns)	20 (Bucket)

4	1.1	Closed Orbit	Enable			
5	2.6	Filter	Pbar	53	0 Db	
6	6.9	Flash	Enable	MIBS $7B	45(Turns)	20 (Bucket)

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Reverse Injection Tuneup from Tevatron with Protons (state 12)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-24 Db	
2	0	Flash	Enable	MIBS $D8	46 (Turns)	0 (Bucket)

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Slip Stacking and Switchyard Slow Extraction (State 14)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	40 (Bucket)
3	0	Flash	Enable	BES		
4	.055	Closed Orbit	Disable			
5	.22	Closed Orbit	Enable			
6	.96	Flash	Enable	MIBS $79	17 (Turns)	40 (Bucket)

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8 Gev Protons to MI Abort (State 15)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	40 (Bucket)
3	0	Flash	Enable	BES		
4	.055	Closed Orbit	Enable			

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8 Gev Protons to Accumulator or Debuncher (state 16)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	40 (Bucket)
3	0	Flash	Enable	BES		
4	.055	Closed Orbit	Enable			
5	2.47	Flash	Disable	MIBS $7D	17 (Turns)	40 (Bucket)
6	2.47	Flash	Enable	MIBS $7E	17 (Turns)	40 (Bucket)

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Stacking ans SY120 (state 17)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	40 (Bucket)
3	0	Flash	Enable	BES		
4	.055	Closed Orbit	Disable			
5	.17	Closed Orbit	Enable			
6	.96	Flash	Enable	MIBS $79	17 (Turns)	40 (Bucket)

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Pbar Beam From Recycler to Recycler (state 19)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Pbar	2.5	0 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	40 (Bucket)
3	0	Flash	Enable	RRBS $A7	31 (Turns)	40 (Bucket)
4	3.65	Closed Orbit	Enable			
5	4.55	Flash	Enable	RRBS $A0	30 (Turns)	40 (Bucket)

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Pbar Beam from Accumulator to Recycler (state 20)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Pbar	2.5	-10 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	40(Bucket)
3	0	Flash	Enable	MIBS $7A	17 (Turns)	40(Bucket)
4	1.7	Closed Orbit	Enable			
5	4.55	Flash	Enable	RRBS $A0	30 (Turns)	40 (Bucket)

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NuMi Multi Batch (state 21)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	40 (Bucket)
3	0	Flash	Enable	BES		
4	.13	Closed Orbit	Disable			
5	.43	Closed Orbit	Enable			
6	1.2	Flash	Enable	MIBS $74	17 (Turns)	40 (Bucket)

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Pbars from Accumulator to Tevatron (state 23)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Pbar	2.5	0 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	20 (Bucket)
3	0	Flash	Enable	MIBS $7A	17 (Turns)	20 (Bucket)
4	1.65	Closed Orbit	Enable			
5	2.6	Filter	Pbar	53	0 Db	
6	6.9	Flash	Enable	MIBS $7B	45 (Turns)	20 (Bucket)

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Switchyard 120 Gev (state 24)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	40 (Bucket)
3	0	Flash	Enable	BES		
4	.055	Closed Orbit	Disable			
5	.4	Closed Orbit	Enable			
6	.96	Flash	Disable	MIBS $75	17 (Turns)	40 (Bucket)

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Proton Beam to Recycler and/or from Recycler to MI Abort (state 25)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-10 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	40 (Bucket)
3	0	Flash	Enable	BES		
4	.055	Closed Orbit	Disable			
5	.07	Filter	Proton	2.5	0 Db	
6	3.35	Flash	Enable	RRBS $A2	30 (Turns)	40 (Bucket)
7	4.2	Flash	Enable	RRBS $A3	30 (Turns)	40 (Bucket)
8	4.4	Closed Orbit	Enable			

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Slip Stacking 120 Gev Pbar Production (state 28)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-48 Db	
2	0	TBT	Enable	*I:device*	0(Turns)	40 (Bucket)
3	0	Flash	Enable	BES		
4	.14	Closed Orbit	Enable			

5	.93	Flash	Enable	MIBS $79	17 (Turns)	40 (Bucket)

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Pbar Acceleration cycle to MI Abort Using Protons (state 30)

ROW	DELAY	COMMAND	DATUM1	DATUM2	DATUM3	DATUM4
1	0	Filter	Proton	53	-20 Db	
2	0	TBT	Enable	*I:device*	0 (Turns)	0 (Bucket)
3	0	Flash	Enable	BES		
4	.055	Closed Orbit	Enable			

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