Intensity Data in SDA

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The following table lists the proton intensity devices, their meanings, and the Cases in which they are recorded.

Meaning	Name	Case
MI DC intensity @ extraction during proton tuneup	I:IBEAMM	Proton Injection Tuneup
Tev DC intensity @ injection during proton tuneup	T:IBEAM	Proton Injection Tuneup
coalescing status (1=off, 2=on) during proton tuneup	V:COALP	Proton Injection Tuneup
MI narrow gate intensity @ 150 GeV injection during rev. proton tuneup	I:P1ING	Eject Protons
MI wide gate intensity @ 150 GeV injection during rev. proton tuneup	I:P1IWG	Eject Protons
MI DC intensity @ 150 GeV injection during rev. proton tuneup	I:IBEAMM	Eject Protons
A150 intensity at Tor 914 during rev. proton tuneup	I:TOR914	Eject Protons
A150 intensity at Tor 902 during rev. proton tuneup	I:TOR902	Eject Protons
Tev narrow gate intensity @ extraction during rev. proton tuneup	C:FBIPNG[1]	Eject Protons
Tev wide gate intensity @ extraction during rev. proton tuneup	C:FBIPWG[1]	Eject Protons
Tev DC intensity @ extraction during rev. proton tuneup	T:IBEAM	Eject Protons
coalescing status (1=off, 2=on) during rev. proton tuneup	V:COALP	Eject Protons
# Booster turns for proton injection	G:TURN15	Inject Protons: Booster to MI
# Booster bunches extracted to MI	G:BNCH15	Inject Protons: Booster to MI
Booster intensity at extraction	B:CHGB15	Inject Protons: Booster to MI
MI narrow gate intensity @ injection	I:P1ING	Inject Protons: Booster to MI
MI wide gate intensity @ injection	I:P1IWG	Inject Protons: Booster to MI
MI DC intensity @ injection	I:IBEAMM	Inject Protons: Booster to MI
MI SBD bunch intensities @ injection (central bunch is array element 40)	I:SBD01I[35-47]	Inject Protons: Booster to MI
MI narrow gate intensity @ start of flattop	I:P1ING	Accelerate Protons in MI
MI wide gate intensity @ start of flattop	I:P1IWG	Accelerate Protons in MI
MI DC intensity @ start of flattop	I:IBEAMM	Accelerate Protons in MI
MI SBD bunch intensities @ 150 GeV before coalescing (central bunch is array element 40)	I:SBD02I[35-47]	Coalesce Protons
MI SBD bunch intensities @ 150 GeV after coalescing (central bunch is array element 40)	I:SBD03I[35-44]	Coalesce Protons
MI FBI proton qualifier narrow gate intensity	T:PQNPI1	Inject Protons
MI FBI proton qualifier wide gate intensity	T:PQWPI1	Inject Protons
MI FBI proton qualifier lower limit	T:PQULL	Inject Protons
MI FBI proton qualifier upper limit	T:PQUUL	Inject Protons
MI FBI proton qualifier NG/WG lower limit	T:PQURAT	Inject Protons
MI narrow gate intensity @ extraction	I:P1ING	Inject Protons
MI wide gate intensity @ extraction	I:P1IWG	Inject Protons
MI DC intensity @ injection	I:IBEAM5	Inject protons
MI DC intensity @ extraction	I:IBEAM7	Inject Protons
MI SBD bunch intensities @ 150 GeV before transfer (central bunch is array element 40)	I:SBD04I[35-44]	Inject Protons
Tev narrow gate intensity during proton injection	C:FBIPNG[0-36]	Inject Protons
Tev wide gate intensity during proton injection	C:FBIPWG[0-36]	Inject Protons

Tev DC intensity during proton injection	T:IBEAM	Inject Protons
Tev DC intensity during proton injection (>1E13)	T:IBEAMB	Inject Protons
Tev SBD bunch intensities @ injection	T:SBDPIS[0-36]	Inject Protons
Tev narrow gate intensity before opening helix	C:FBIPNG[0-36]	Proton Injection Porch
Tev wide gate intensity before opening helix	C:FBIPWG[0-36]	Proton Injection Porch
Tev DC intensity before opening helix	T:IBEAM	Proton Injection Porch
Tev DC intensity before opening helix (>1E13)	T:IBEAMB	Proton Injection Porch
Tev SBD bunch intensities before opening helix	T:SBDPIS[0-36]	Proton Injection Porch
Tev narrow gate intensity after opening helix	C:FBIPNG[0-36]	Pbar Injection Porch
Tev wide gate intensity after opening helix	C:FBIPWG[0-36]	Pbar Injection Porch
Tev DC intensity after opening helix	T:IBEAM	Pbar Injection Porch
Tev DC intensity after opening helix (>1E13)	T:IBEAMB	Pbar Injection Porch
Tev SBD bunch intensities after opening helix	T:SBDPIS[0-36]	Pbar Injection Porch
Tev narrow gate intensity during pbar injection	C:FBIPNG[0-36]	Inject Pbars
Tev wide gate intensity during pbar injection	C:FBIPWG[0-36]	Inject Pbars
Tev DC intensity during pbar injection (includes pbars)	T:IBEAM	Inject Pbars
Tev DC intensity during pbar injection (>1E13) (includes pbars)	T:IBEAMB	Inject Pbars
Tev SBD bunch intensities during pbar injection	T:SBDPIS[0-36]	Inject Pbars
Tev narrow gate intensity after pbar injection	C:FBIPNG[0-36]	Before Ramp
Tev wide gate intensity after pbar injection	C:FBIPWG[0-36]	Before Ramp
Tev DC intensity after pbar injection (includes pbars)	T:IBEAM	Before Ramp
Tev DC intensity after pbar injection (>1E13) (includes pbars)	T:IBEAMB	Before Ramp
Tev SBD bunch intensities before start of ramp	T:SBDPIS[0-36]	Before Ramp
Tev narrow gate intensity at start of acceleration	C:PNGSUM[0-36]	Pbar Injection Porch
Tev narrow gate intensity @ 160 GeV	C:FBIPNG[0-36]	Acceleration
Tev wide gate intensity @ 160 GeV	C:FBIPWG[0-36]	Acceleration
Tev DC intensity @ 160 GeV (includes pbars)	T:IBEAM	Acceleration
Tev DC intensity @ 160 GeV (>1E13) (includes pbars)	T:IBEAMB	Acceleration
Tev SBD bunch intensities @ ~200 GeV	T:SBDPIS[0-36]	Acceleration
Tev narrow gate intensity @ start of flattop	C:FBIPNG[0-36]	Flattop
Tev wide gate intensity @ start of flattop	C:FBIPWG[0-36]	Flattop
Tev DC intensity @ start of flattop (includes pbars)	T:IBEAM	Flattop
Tev DC intensity @ start of flattop (>1E13) (includes pbars)	T:IBEAMB	Flattop
Tev SBD bunch intensities @ start of flattop	T:SBDPIS[0-36]	Flattop
Tev narrow gate intensity @ start of squeeze	C:PNGSUM[0-36]	Squeeze
Tev narrow gate intensity @ end of squeeze	C:FBIPNG[0-36]	Squeeze
Tev wide gate intensity @ end of squeeze	C:FBIPWG[0-36]	Squeeze
Tev DC intensity @ end of squeeze (includes pbars)	T:IBEAM	Squeeze
Tev DC intensity @ end of squeeze (>1E13) (includes pbars)	T:IBEAMB	Squeeze
Tev SBD bunch intensities @ end of squeeze	T:SBDPIS[0-36]	Squeeze
Tev narrow gate intensity before initiating collisions	C:PNGSUM[0-36]	Initiate Collisions
Tev narrow gate intensity after initiating collisions	C:FBIPNG[0-36]	Initiate Collisions
Tev wide gate intensity after initiating collisions	C:FBIPWG[0-36]	Initiate Collisions
Tev DC intensity after initiating collisions (includes pbars)	T:IBEAM	Initiate Collisions
Tev DC intensity after initiating collisions (>1E13) (includes pbars)	T:IBEAMB	Initiate Collisions
Tev SBD bunch intensities after initiating collisions	T:SBDPIS[0-36]	Initiate Collisions
Tev narrow gate intensity after scraping	C:FBIPNG[0-36]	Remove Halo
Tev wide gate intensity after scraping	C:FBIPWG[0-36]	Remove Halo
Tev DC intensity after scraping (includes pbars)	T:IBEAM	Remove Halo
Tev DC intensity after scraping (>1E13) (includes pbars)	T:IBEAMB	Remove Halo

Tev SBD bunch intensities after scraping	T:SBDPIS[0-36]	Remove Halo
Tev narrow gate intensity during HEP	C:FBIPNG[0-36]	HEP
Tev wide gate intensity during HEP	C:FBIPWG[0-36]	HEP
Tev DC intensity during HEP (includes pbars)	T:IBEAM	HEP
Tev DC intensity during HEP (>1E13) (includes pbars)	T:IBEAMB	HEP
Tev SBD bunch intensities during HEP	T:SBDPIS[0-36]	HEP
Tev narrow gate intensity when HEP paused	C:FBIPNG[0-36]	Pause HEP
Tev wide gate intensity when HEP paused	C:FBIPWG[0-36]	Pause HEP
Tev DC intensity when HEP paused (includes pbars)	T:IBEAM	Pause HEP
Tev DC intensity when HEP paused (>1E13) (includes pbars)	T:IBEAMB	Pause HEP
Tev SBD bunch intensities when HEP paused	T:SBDPIS[0-36]	Pause HEP

The following tables list how to calculate some selected proton efficiencies. Units of all devices are E9.

Meaning	"Generic" Formula: Device[Case]
MI accel. efficiency	I:P1IWG[Acc. P. in MI] / I:P1IWG[Inj. P.: B. to MI]; I:SBD02I[coal. P.]/I:SBD01I[Inj. P.: B-MI]
coalescing efficiency	I:P1ING[Inj. P.] / I:P1IWG[Acc. P. in MI]; I:SBD04I[Inj. P]/I:IBEAM7[Inj. P.]
MI → Tev xfer efficiency	C:FBIPNG[Inj. P.] / I:P1ING[Inj. P.]; T:SBDPIS[Inj. P.]/I:SBD04I[Inj. P.]
Tev efficiency @ 150 GeV on C.O.	C:FBIPNG[P. Inj. Porch] / C:FBIPNG[P. Inj.]; T:SBDPIS[P. Inj. Porch]/T:SBDPIS[P. Inj.]
Tev efficiency opening helix	C:FBIPNG[Pbar Inj. Porch] / C:FBIPNG[P. Inj. Porch]; T:SBDPIS[Pbar Inj. Porch]/T:SBDPIS[P. Inj. Porch]
Tev efficiency @ 150 GeV on helix	C:PNGSUM[Pbar Inj. Porch] / C:FBIPNG[Pbar Inj. Porch]; T:SBDPIS[Before Ramp]/T:SBDPIS[Pbar Inj. Porch]
Tev acceleration efficiency	C:FBIPNG[Flattop] / C:PNGSUM[Pbar Inj. Porch]; T:SBDPIS[Flattop]/T:SBDPIS[Before Ramp]
Tev efficiency at flattop	C:PNGSUM[Squeeze] / C:FBIPNG[Flattop]
Tev efficiency in squeeze	C:FBIPNG[Squeeze] / C:PNGSUM[Squeeze]
Tev efficiency in flattop and squeeze	T:SBDPIS[Squeeze]/T:SBDPIS[Flattop]
Tev efficiency initiating collisions	C:FBIPNG[Init. Coll.] / C:PNGSUM[Init. Coll.]; T:SBDPIS[Init. Coll.]/T:SBDPIS[Squeeze]
Tev efficiency in remove halo	C:FBIPNG[Remove Halo] / C:FBIPNG[Init. Coll.]; T:SBDPIS[Remove Halo]/T :SBDPIS[Init. Coll.]

Sums over *i* are from 1 to 36. "NG" means "narrow gate."

Meaning	Specific Formula: Device[element][Case][Set]
total # protons injected into MI	SUM_i{I:P1IWG[Acc. P. in MI][i]}; SUM_i{I:IBEAMM[Inj. P.: B-MI][i]}; SUM_i{I:IBEAM5[Inj. P.][i]}; SUM_i{I:SBD01I[sum(36-44)][Inj. P.: B. to MI][i]}
MI accel. efficiency for proton bunch i	I:P1IWG[Acc. P. in MI][i] / I:P1IWG[Inj. P.: B. to MI][i]; I:IBEAMM[Acc. P. in MI][i]/I:IBEAM5[Inj. P.][i]; I:IBEAMM[Acc. P. in MI][i]/I:IBEAMM[Inj. P.: B-MI][i]; I:SBD02I[sum(36-44)][Coal. P.][i]/ I:SBD01I[sum(36-44)][Inj. P.: B-MI][i]
average MI accel. efficiency for protons	SUM_i{I:P1IWG[Acc. P. in MI][i]}/ SUM_i{I:P1IWG[Inj. P.: B. to MI][i]}; SUM_i{ I:IBEAMM[Acc. P. in MI][i]}/ SUM_i{I:IBEAM5[Inj. P.][i]}; SUM_i{I:IBEAMM[Acc. P. in MI][i]}/ SUM_i{I:IBEAMM[Inj. P.: B-MI][i]}; SUM_i{ I:SBD02I[sum(36-44)][Coal. P.][i]}/ SUM_i{I:SBD01I[sum(36-44)][Inj. P.: B-MI][i]}
total # protons accelerated to 150 GeV	SUM_i{I:P1IWG[Acc. P. in MI][i]}; SUM_i{I:IBEAMM[Acc. P. in MI][i]}; SUM_i{I:SBD02I[sum(36-44)][Coal. P.][i]}
coalescing efficiency for proton bunch i	I:P1ING[Inj. P.][i] / I:P1IWG[Acc. P. in MI][i]; I:SBD04I[40][Inj. P.][i]/I:IBEAM7[Inj. P.][i]; I:SBD04I[40][Inj. P.][i]/I:IBEAMM[Acc. P. in MI][i]; I:SBD04I[40][Inj. P.][i]/I:SBD04I[sum36-44)][Inj. P.][i]
average coalescing efficiency	SUM_i{I:P1ING[Inj. P.][i]} / SUM_i{ I:P1IWG[Acc. P. in MI][i]}; SUM_i{ I:SBD04I[40][Inj. P.][i]}/ SUM_i{I:IBEAM7[Inj. P.][i]}; SUM_i{ I:SBD04I[40][Inj. P.][i]}/ SUM_i{I:IBEAMM[Acc. P. in MI][i]}; SUM_i{I:SBD04I[40][Inj. P.][i]}/ SUM_i{I:SBD04I[sum(36-44)][Inj. P.][i]}
total # protons coalesced in MI	SUM_i{I:P1ING[Inj. P.][i]}; SUM_i{I:SBD04I[40][Inj. P.][i]}
MI → Tev xfer efficiency for proton bunch i	C:FBIPNG[i][Inj. P.][i] / I:P1ING[Inj. P.][i]; T:SBDPIS[i][Inj. P.][i]/ I:SBD04I[40][Inj. P.][i]
average MI → Tev xfer efficiency	SUM_i{C:FBIPNG[i][Inj. P.][i]} / SUM_i{ I:P1ING[Inj. P.][i]}; SUM_i{T:SBDPIS[i][Inj. P.][i]}/ SUM_i{ I:SBD04I[40][Inj. P.][i]}
total # NG protons injected into Tevatron	SUM_i{C:FBIPNG[i][Inj. P.][i]}; SUM_i{T:SBDPIS[i][Inj. P.][i]}
Tev efficiency @ 150 GeV on	C:FBIPNG[i][P. Inj. Porch] / C:FBIPNG[i][P. Inj.][i];

C.O. for proton bunch i	T:SBDPIS[i][P. Inj. Porch]/T:SBDPIS[i][Inj. P.][i]
average Tev efficiency @ 150 GeV on C.O.	C:FBIPNG[0][P. Inj. Porch]/ SUM$_i${C:FBIPNG[i][Inj. P.][i]}; T:SBDPIS[0][P. Inj. Porch]/ SUM$_i${T:SBDPIS[i][Inj. P.][i]}
total # NG protons before opening helix	C:FBIPNG[0][P. Inj. Porch]; T:SBDPIS[0][P. Inj. Porch]
Tev efficiency opening helix for proton bunch i	C:FBIPNG[i][Pbar Inj. Porch] / C:FBIPNG[i][P. Inj. Porch]; T:SBDPIS[i][Pbar. Inj. Porch]/T:SBDPIS[i][P. Inj. Porch]
average efficiency opening helix	C:FBIPNG[0][Pbar Inj. Porch] / C:FBIPNG[0][P. Inj. Porch]; T:SBDPIS[0][Pbar. Inj. Porch]/T:SBDPIS[0][P. Inj. Porch]
total # NG protons after opening helix	C:FBIPNG[0][Pbar Inj. Porch] ; T:SBDPIS[0][Pbar Inj. Porch]
Tev efficiency @ 150 GeV on helix for proton bunch i	C:PNGSUM[i][Pbar Inj. Porch] / C:FBIPNG[i][Pbar Inj. Porch]; T:SBDPIS[i][Before Ramp]/T :SBDPIS[i][Pbar Inj. Porch]
average efficiency @ 150 GeV on helix	C:PNGSUM[0][Pbar Inj. Porch] / C:FBIPNG[0][Pbar Inj. Porch]; T:SBDPIS[0][Before Ramp]/T :SBDPIS[0][Pbar Inj. Porch]
total # NG protons after injecting pbars	C:PNGSUM[0][Pbar Inj. Porch]; T:SBDPIS[0][Before Ramp]
Tev acceleration efficiency for proton bunch i	C:FBIPNG[i][Flattop] / C:PNGSUM[i][Pbar Inj. Porch]; T:SBDPIS[i][Flattop]/T:SBDPIS[i][Before Ramp]
average acceleration efficiency	C:FBIPNG[0][Flattop] / C:PNGSUM[0][Pbar Inj. Porch]; T:SBDPIS[0][Flattop]/T:SBDPIS[0][Before Ramp]
total # NG protons at start of flattop	C:FBIPNG[0][Flattop]; T:SBDPIS[0][Flattop]
Tev efficiency at flattop for proton bunch i	C:PNGSUM[i][Squeeze] / C:FBIPNG[i][Flattop]
average efficiency at flattop	C:PNGSUM[0][Squeeze] / C:FBIPNG[0][Flattop]
total # NG protons at start of squeeze	C:PNGSUM[0][Squeeze]
Tev efficiency in squeeze for proton bunch i	C:FBIPNG[i] [Squeeze] / C:PNGSUM[i] [Squeeze]
average efficiency in squeeze	C:FBIPNG[0] [Squeeze] / C:PNGSUM[0] [Squeeze]
Tev efficiency on flattop and squeeze for proton bunch i	T:SBDPIS[i][Squeeze]/T:SBDPIS[i][Flattop]
average efficiency on flattop and squeeze	T:SBDPIS[0][Squeeze]/T:SBDPIS[0][Flattop]
total # NG protons at end of squeeze	C:FBIPNG[0] [Squeeze]; T:SBDPIS[0][Squeeze]
Tev efficiency initiating collisions for proton bunch i	C:FBIPNG[i] [Init. Coll.] / C:PNGSUM[i] [Init. Coll.]; T:SBDPIS[i][Init. Coll.]/T:SBDPIS[i][Squeeze]
average efficiency initiating collisions	C:FBIPNG[0] [Init. Coll.] / C:PNGSUM[0] [Init. Coll.]; T:SBDPIS[0][Init. Coll.]/T:SBDPIS[0][Squeeze]
total # NG protons after initiating collisions	C:FBIPNG[0] [Init. Coll.]; T:SBDPIS[0][Init. Coll.]
Tev efficiency in remove halo for proton bunch i	C:FBIPNG[i] [Remove Halo][1] / C:FBIPNG[i] [Init. Coll.]; T:SBDPIS[i][Remove Halo]/T:SBDPIS[i][Init. Coll.]
average efficiency removing halo	C:FBIPNG[0] [Remove Halo][1] / C:FBIPNG[0] [Init. Coll.]; T:SBDPIS[0][Remove Halo]/T:SBDPIS[0][Init. Coll.]
total # NG protons after remove halo	C:FBIPNG[0] [Remove Halo][1]; T:SBDPIS[0][Remove Halo]

The following table lists the antiproton intensity devices, their meanings, and the Cases in which they are read.

Meaning	Name	Case
Accumulator intensity just before unstacking	A:IBEAMB	Unstack Pbars
Requested unstacking fraction	A:BMFRAC	Unstack Pbars
Accumulator intensity just before extraction	A:IBEAMB	Transfer Pbars from Accum to MI
Accumulator intensity just before extraction	A:IBEAM1	Transfer Pbars from Accum to MI
Accumulator intensity just after extraction (S/H)	A:IBEAM2	Transfer Pbars from Accum to MI
Requested unstacking fraction	A:BMFRAC	Transfer Pbars from Accum to MI
AP1 wall monitor total intensity	A:BUNBM	Transfer Pbars from Accum to MI
AP1 wall monitor intensity for bunch 1	A:BUNBM1	Transfer Pbars from Accum to MI
AP1 wall monitor intensity for bunch 2	A:BUNBM2	Transfer Pbars from Accum to MI
AP1 wall monitor intensity for bunch 3	A:BUNBM3	Transfer Pbars from Accum to MI
AP1 wall monitor intensity for bunch 4	A:BUNBM4	Transfer Pbars from Accum to MI
Calculated extracted beam intensity from VSA	A:VSAEXI	Transfer Pbars from Accum to MI
Intensity in AP3 line	D:TOR910	Transfer Pbars from Accum to MI
Intensity in AP1 line	M:TOR105	Transfer Pbars from Accum to MI
Intensity in P2 line	I:TORF1S	Transfer Pbars from Accum to MI
Intensity in P1 line	I:TR714S	Transfer Pbars from Accum to MI
Intensity in P1 line	I:TR702S	Transfer Pbars from Accum to MI
Intensity in MI injection channel	I:TR521S	Transfer Pbars from Accum to MI
MI DC intensity @ injection	I:IBEAMS	Transfer Pbars from Accum to MI
MI batch 1 narrow gate intensity @ injection	I:A1ING	Transfer Pbars from Accum to MI
MI batch 2 narrow gate intensity @ injection	I:A2ING	Transfer Pbars from Accum to MI
MI batch 3 narrow gate intensity @ injection	I:A3ING	Transfer Pbars from Accum to MI
MI batch 4 narrow gate intensity @ injection	I:A4ING	Transfer Pbars from Accum to MI
MI sum narrow gate intensity @ injection	I:ANGSUM	Transfer Pbars from Accum to MI
MI batch 1 wide gate intensity @ injection	I:A1IWG	Transfer Pbars from Accum to MI
MI batch 2 wide gate intensity @ injection	I:A2IWG	Transfer Pbars from Accum to MI
MI batch 3 wide gate intensity @ injection	I:A3IWG	Transfer Pbars from Accum to MI
MI batch 4 wide gate intensity @ injection	I:A4IWG	Transfer Pbars from Accum to MI
MI sum wide gate intensity @ injection	I:AWGSUM	Transfer Pbars from Accum to MI
MI DC intensity @ start of flattop	I:IBEAMS	Accelerate Pbars in the MI
MI batch 1 narrow gate intensity @ start of flattop	I:A1ING	Accelerate Pbars in the MI
MI batch 2 narrow gate intensity @ start of flattop	I:A2ING	Accelerate Pbars in the MI
MI batch 3 narrow gate intensity @ start of flattop	I:A3ING	Accelerate Pbars in the MI
MI batch 4 narrow gate intensity @ start of flattop	I:A4ING	Accelerate Pbars in the MI
MI sum narrow gate intensity @ start of flattop	I:ANGSUM	Accelerate Pbars in the MI
MI batch 1 wide gate intensity @ start of flattop	I:A1IWG	Accelerate Pbars in the MI
MI batch 2 wide gate intensity @ start of flattop	I:A2IWG	Accelerate Pbars in the MI
MI batch 3 wide gate intensity @ start of flattop	I:A3IWG	Accelerate Pbars in the MI
MI batch 4 wide gate intensity @ start of flattop	I:A4IWG	Accelerate Pbars in the MI
MI sum wide gate intensity @ start of flattop	I:AWGSUM	Accelerate Pbars in the MI
Accumulator intensity just before extraction	A:IBEAMB	Inject Pbars
Accumulator intensity just after extraction (S/H)	A:IBEAM2	Inject Pbars
MI batch 1 narrow gate intensity before extraction	I:A1ING	Inject Pbars
MI batch 2 narrow gate intensity before extraction	I:A2ING	Inject Pbars
MI batch 3 narrow gate intensity before extraction	I:A3ING	Inject Pbars
MI batch 4 narrow gate intensity before extraction	I:A4ING	Inject Pbars
MI sum narrow gate intensity before extraction	I:ANGSUM	Inject Pbars
MI batch 1 wide gate intensity before extraction	I:A1IWG	Inject Pbars
MI batch 2 wide gate intensity before extraction	I:A2IWG	Inject Pbars
MI batch 3 wide gate intensity before extraction	I:A3IWG	Inject Pbars

MI batch 4 wide gate intensity before extraction	I:A4IWG	Inject Pbars
MI sum wide gate intensity before extraction	I:AWGSUM	Inject Pbars
MI DC beam intensity at injection	I:IBEAM3	Inject Pbars
MI DC beam intensity at FT	I:IBEAM6	Inject Pbars
MI DC beam intensity before extraction	I:IBEAMS	Inject Pbars
MI SBD bunch intensities @ injection (array element 0 is sum; central bunches are 14, 35, 56, 77)	I:ISBD01I[0-89]	Inject Pbars
MI SBD bunch intensities @ 150 GeV before coalescing (array element 0 is sum; central bunches are 14, 35, 56, 77)	I:ISBD02I[0-89]	Inject Pbars
MI SBD bunch intensities @ 150 GeV after coalescing (array element 0 is sum; central bunches are 14, 35, 56, 77)	I:ISBD03I[0-89]	Inject Pbars
MI SBD bunch intensities @ 150 GeV before transfer (array element 0 is sum; central bunches are 14, 35, 56, 77)	I:ISBD04I[0-89]	Inject Pbars
Pbar intensity in A150 line	I:TOR902	Inject Pbars
Pbar intensity in A150 line	I:TOR914	Inject Pbars
Tev narrow gate intensity before injection (for background check)	C:ANGSUM[0-36]	Inject Pbars
Tev narrow gate intensity @ injection	C:FBIANG[0-36]	Inject Pbars
Tev wide gate intensity @ injection	C:FBIAWG[0-36]	Inject Pbars
Tev SBD bunch intensities @ injection	T:SBDAIS[0-36]	Inject Pbars
Tev narrow gate intensity before ramp	C:FBIANG[0-36]	Before Ramp
Tev wide gate intensity before ramp	C:FBIAWG[0-36]	Before Ramp
Tev SBD bunch intensities before start of ramp	T:SBDAIS[0-36]	Before Ramp
Tev narrow gate intensity @ start of ramp	C:FBIANG[0-36]	Pbar Injection Porch
Tev wide gate intensity @ start of ramp	C:FBIAWG[0-36]	Pbar Injection Porch
Tev SBD bunch intensities @ start of ramp	T:SBDAIS[0-36]	Pbar Injection Porch
Tev narrow gate intensity @ 160 GeV	C:FBIANG[0-36]	Acceleration
Tev wide gate intensity @ 160 GeV	C:FBIAWG[0-36]	Acceleration
Tev SBD bunch intensities @ ~200 GeV	T:SBDAIS[0-36]	Acceleration
Tev narrow gate intensity @ start of flattop	C:FBIANG[0-36]	Flattop
Tev wide gate intensity @ start of flattop	C:FBIAWG[0-36]	Flattop
Tev SBD bunch intensities @ start of flattop	T:SBDAIS[0-36]	Flattop
Tev narrow gate intensity @ start of squeeze	C:ANGSUM[0-36]	Squeeze
Tev narrow gate intensity @ end of squeeze	C:FBIANG[0-36]	Squeeze
Tev wide gate intensity @ end of squeeze	C:FBIAWG[0-36]	Squeeze
Tev SBD bunch intensities @ end of squeeze	T:SBDAIS[0-36]	Squeeze
Tev narrow gate intensity before initiating collisions	C:ANGSUM[0-36]	Initiate Collisions
Tev narrow gate intensity after initiating collisions	C:FBIANG[0-36]	Initiate Collisions
Tev wide gate intensity after initiating collisions	C:FBIAWG[0-36]	Initiate Collisions
Tev SBD bunch intensities after initiating collisions	T:SBDAIS[0-36]	Initiate Collisions
Tev narrow gate intensity after removing halo	C:FBIANG[0-36]	Remove Halo
Tev wide gate intensity after removing halo	C:FBIAWG[0-36]	Remove Halo
Tev SBD bunch intensities after removing halo	T:SBDAIS[0-36]	Remove Halo
Tev narrow gate intensity during HEP	C:FBIANG[0-36]	HEP
Tev wide gate intensity during HEP	C:FBIAWG[0-36]	HEP
Tev SBD bunch intensities during HEP	T:SBDAIS[0-36]	HEP
Tev narrow gate intensity when HEP paused	C:FBIANG[0-36]	Pause HEP
Tev wide gate intensity when HEP paused	C:FBIAWG[0-36]	Pause HEP
Tev SBD bunch intensities when HEP paused	T:SBDAIS[0-36]	Pause HEP

The following tables list how to calculate some selected antiproton efficiencies and losses. A:IBEAMB, A:IBEAM1, A:IBEAM2, toroids, and I:IBEAMS have units E10. I:IBEAMS was rescaled by a factor of 10 after store 2285. All other devices have units E9.

Meaning	"Generic" Formula: Device[Case]
Accumulator unstacking efficiency	A:IBEAMB[Tr. pbars Accum. to MI] / A:IBEAMB[Unstack Pbars]
Accumulator → MI xfer efficiency	I:AWGSUM[Tr. Pbar: Acc-MI] / (A:IBEAMB[Tr. Pbar: Acc-MI] - A:IBEAM2[Tr. Pbar: Acc-MI]); I:IBEAM3[Inj. Pbar] / (A:IBEAMB[Tr. Pbar: Acc-MI] - A:IBEAM2[Tr. Pbar: Acc-MI]); I:IBEAMS[Tr. Pbar: Acc-MI] / (A:IBEAMB[Tr. Pbar: Acc-MI] - A:IBEAM2[Tr. Pbar: Acc-MI]); I:SBD01I[Inj. Pbar] / (A:IBEAMB[Tr. Pbar: Acc-MI] - A:IBEAM2[Tr. Pbar: Acc-MI])
MI accel. efficiency	I:AiIWG[Acc. Pbar in MI] / I:AiIWG[Tr. Pbar: Acc-MI]; I:SBD02[Inj. Pbar]/I:SBD01I[Inj. Pbar]; I:IBEAM6[Inj. Pbar]/I:IBEAM3[Inj. Pbar]; I:IBEAMS[Acc. Pbar in MI]/I:IBEAMS[Tr. Pbar: Acc-MI]
coalescing efficiency	I:AiING[Inj. Pbar] / I:AiIWG[Acc. Pbars in MI]; I:AiING[Inj. Pbar]/I:IBEAMS[Acc. Pbar in MI]; I:SBD04I[Inj. Pbar]/SBD02I[Inj. Pbar]
MI → Tev xfer efficiency	C:FBIANG[Inj. Pbar] / I:AiING[Inj. Pbar]; T:SBDAIS[Inj. Pbar]/I:SBD04I[Inj. Pbar]
Tev efficiency @ 150 GeV on helix	C:FBIANG[Pbar Inj. Porch] / C:FBIANG[Inj. Pbars]; T:SBDAIS[Pbar Inj. Porch]/T:SBDAIS[Inj. Pbar]
Tev acceleration efficiency	C:FBIANG[Flattop] / C:FBIANG[Pbar Inj. Porch]; T:SBDAIS[Flattop]/T:SBDAIS[Pbar Inj. Porch]
Tev efficiency at flattop	C:ANGSUM[Squeeze] / C:FBIANG[Flattop]
Tev efficiency in squeeze	C:FBIANG[Squeeze] / C:ANGSUM[Squeeze]
Tev efficiency on flattop and squeeze	T:SBDAIS[Squeeze]/T:SBDAIS[Flattop]
Tev efficiency initiating collisions	C:FBIANG[Init. Coll.] / C:ANGSUM[Init. Coll.]; T:SBDAIS[Init. Coll.]/T:SBDAIS[Squeeze]
Tev efficiency in remove halo	C:FBIANG[Remove Halo] / C:FBIANG[Init. Coll.]; T:SBDAIS[Remove Halo]/T:SBDAIS[Init. Coll.]

Sums over *j* are from 1 to 9. Sums over *i* are from 1 to 36. *k* index (pbar batch in MI) goes from 1 to 4. MI pbar widegate FBI signals (I:AWGSUM, I:AkIWG) may be too noisy for accurate calculations.

Meaning	Specific Formula: Device[element][Case][Set]
total # pbars extracted from Accumulator	A:IBEAMB[Unstack Pbars][1] - A:IBEAM2[Tr. Pbar: Acc- MI][9]; SUMj{A:IBEAMB[Tr. Pbar: Acc-MI][j]-A:IBEAM2[Tr. Pbar: Acc-MI][j]}
# pbars extracted from Acc. on shot j	A:IBEAMB[Tr. Pbar: Acc-MI][j]-A:IBEAM2[Tr. Pbar: Acc-MI][j]
Accumulator unstacking efficiency for shot j	A:IBEAMB[Tr. Pbar: Acc-MI][j] / A:IBEAMB[Unstack Pbars][j]
average Accumulator unstacking efficiency	SUMj{A:IBEAMB[Tr. Pbar: Acc-MI][j]}/ SUMj{A:IBEAMB[Unstack Pbars][j]]}
Accumulator → MI xfer efficiency for shot j	I:AWGSUM[Tr. Pbar: Acc-MI][j] / (A:IBEAMB[Tr. Pbar: Acc-MI][j] - A:IBEAM2[Tr. Pbar: Acc-MI][j]); I:IBEAMS[Tr. Pbar: Acc-MI][j] / (A:IBEAMB[Tr. Pbar: Acc-MI][j] - A:IBEAM2[Tr. Pbar: Acc-MI][j]); I:IBEAM3[Inj. Pbar][j] / (A:IBEAMB[Tr. Pbar: Acc-MI][j] - A:IBEAM2[Tr. Pbar: Acc-MI][j]); I:SBD01I[sum(21*k-13,21*k-1)][Inj. Pbar][j] / (A:IBEAMB[Tr. Pbar: Acc-MI][j] - A:IBEAM2[Tr. Pbar: Acc-MI][j])

average Accumulator → MI xfer efficiency	SUMj{I:AWGSUM[Tr. Pbar: Acc-MI][j]}/ SUMj{(A:IBEAMB[Tr. Pbar: Acc-MI][j] - A:IBEAM2[Tr. Pbar: Acc-MI][j])}; SUMj{I:IBEAMS[Tr. Pbar: Acc-MI][j]} / SUMj{ (A:IBEAMB[Tr. Pbar: Acc-MI][j] - A:IBEAM2[Tr. Pbar: Acc-MI][j])}; SUMj{I:IBEAM3[Inj. Pbar][j]} / SUMj{ (A:IBEAMB[Tr. Pbar: Acc-MI][j] - A:IBEAM2[Tr. Pbar: Acc-MI][j])}; SUMj,k{I:SBD01I[sum(21*k-13,21*k-1)][Inj. Pbar][j]} / SUMj{ (A:IBEAMB[Tr. Pbar: Acc-MI][j] - A:IBEAM2[Tr. Pbar: Acc-MI][j])}
total # pbars injected into MI	SUMj{I:IBEAMS[Tr. Pbar: Acc-MI][j]}; SUMj{I:IBEAM3[Inj. Pbar][j]}; SUMj,k{SBD0I1[sum(21*k-13,21*k-1)][Inj. Pbar][j]}
MI accel. efficiency for pbar batch k, shot j	I:AkIWG[Acc. Pbars in MI][j] / I:AkIWG[Tr. Pbar: Acc-MI][j]; I:SBD02I[sum(21*k-13,21*k-1)][Inj. Pbar][j]/ I:SBD01I[sum(21*k-13,21*k-1)][Inj. Pbar][j]; I:IBEAM6[Inj. Pbar][j]/I:IBEAM3[Inj. Pbar][j]
average MI accel. efficiency	SUMj{I:AWGSUM[Acc. Pbars in MI][j]}/SUMj{I:AWGSUM[Tr. Pbar: Acc-MI][j]}; SUMj,k{I:SBD02I[sum(21*k-13,21*k-1)][Inj. Pbar][j]}/ SUMj,k{ I:SBD01I[sum(21*k-13,21*k-1)][Inj. Pbar][j]}; SUMj{I:IBEAM6[Inj. Pbar][j]}/ SUMj{I:IBEAM3[inj. Pbar][j]}
total # pbars accelerated in MI	SUMj{I:AWGSUM[Acc. Pbars in MI][j]}; SUMj,k{I:SBD02I[sum(21*k-13,21*k-1)][Inj. Pbar][j]}; SUMj{I:IBEAM6[Inj. Pbar][j]}
coalescing efficiency for pbar batch k, shot j	I:AkING[Inj. Pbar][j] / I:AkIWG[Acc. Pbars in MI][j]; I:SBD04I[21*k-7][Inj. Pbar][j]/I:SBD02I[sum(21*k-13,21*k-1)][Inj. Pbar][j]; I:SBD04I[21*k-7][Inj. Pbar][j]/I:IBEAM6[Inj. Pbar][j]
average MI coalescing efficiency	SUMj{I:ANGSUM[Inj. Pbar][j]}/ SUMj{I:AWGSUM[Acc. Pbars in MI][j]}; SUMj,k{I:SBD04I[21*k-7][Inj. Pbar][j]}/ SUMj,k{I:SBD02I[sum(21*k-13,21*k-1)][Inj. Pbar][j]}; SUMj,k{I:SBD04I[21*k-7][Inj. Pbar][j]}/ SUMj{I:IBEAM6[Inj. Pbar][j]}
total # pbars coalesced in MI	SUMj{I:ANGSUM[Inj. Pbar][j]}; SUMj,k{I:SBD04I[21*k-7][Inj. Pbar][j]}
MI → Tev xfer eff. for pbar bunch i (shot j, batch k)	C:FBIANG[i][Inj. Pbar][j] / I:AkING[Inj. Pbar][j]; T:SBDAIS[i][Inj. Pbar][j]/I :SBD04I[21*k-7]Inj. Pbar][j]
average MI → Tev xfer efficiency	SUMi{C:FBIANG[i][Inj. Pbar][j(i)]}/ SUMj{I:AWGSUM[Acc. Pbars in MI][j]}; SUMi{T:SBDAIS[i][Inj. Pbar][j]}/ SUMj,k{I :SBD04I[21*k-7]Inj. Pbar][j]}
total # NG pbars injected into Tevatron	SUMi{C:FBIANG[i][Inj. Pbar][j(i)]}; SUMi{T:SBDAIS[i][Inj. Pbar][j]}
Tev efficiency @ 150 GeV on helix for pbar bunch i	C:FBIANG[i][Pbar Inj. Porch] / C:FBIANG[i][Inj. Pbars][j(i)]; T:SBDAIS[i][Pbar Inj. Porch]/T :SBDAIS[i][Inj. Pbar][j]
average Tev efficiency @ 150 GeV on helix	C:FBIANG[0][Pbar Inj. Porch] / SUMi{C:FBIANG[i][Inj. Pbars][j(i)]}; T:SBDAIS[0][Pbar Inj. Porch]/ SUMi{T :SBDAIS[i][Inj. Pbar][j]}
total # NG pbars at start of acceleration	C:FBIANG[0][Pbar Inj. Porch]; SUMi{T:SBDAIS[i][Pbar Inj. Porch]}
Tev acceleration efficiency for pbar	C:FBIANG[i][Flattop] / C:FBIANG[i][Pbar Inj. Porch];

bunch i	T:SBDAIS[i][Flattop]/T:SBDAIS[i][Pbar Inj. Porch]
average Tev acceleration efficiency	C:FBIANG[0][Flattop] / C:FBIANG[0][Pbar Inj. Porch]; T:SBDAIS[0][Flattop]/T:SBDAIS[0][Pbar Inj. Porch]
total # NG pbars at start of flattop	C:FBIANG[0][Flattop]; T:SBDAIS[0][Flattop]
Tev efficiency at flattop for pbar bunch i	C:ANGSUM[i][Squeeze] / C:FBIANG[i][Flattop]
average Tev efficiency at flattop	C:ANGSUM[0][Squeeze] / C:FBIANG[0][Flattop]
total # NG pbars at start of squeeze	C:ANGSUM[0][Squeeze]
Tev efficiency in squeeze for pbar bunch i	C:FBIANG[i][Squeeze] / C:ANGSUM[i][Squeeze]
average Tev efficiency in squeeze	C:FBIANG[0][Squeeze] / C:ANGSUM[0][Squeeze]
total # NG pbars at end of squeeze	C:FBIANG[0][Squeeze]; T:SBDAIS[0][Squeeze]
Tev efficiency on flattop and squeeze for pbar bunch i	T:SBDAIS[i][Squeeze] / T:SBDAIS[i][Flattop]
average Tev efficiency on flattop and squeeze	T:SBDAIS[0][Squeeze] / T:SBDAIS[0][Flattop]
Tev efficiency initiating collisions for pbar bunch i	C:FBIANG[i][Init. Coll.] / C:ANGSUM[i][Init. Coll.]; T:SBDAIS[i][Init. Coll.] / T:SBDAIS[i][Squeeze]
average Tev efficiency initiating collisions	C:FBIANG[0][Init. Coll.] / C:ANGSUM[0][Init. Coll.]; T:SBDAIS[0][Init. Coll.] / T:SBDAIS[0][Squeeze]
total # NG pbars after initiating collisions	C:FBIANG[0][Init. Coll.]; T:SBDAIS[0][Init Coll.]
Tev efficiency in remove halo for pbar bunch i	C:FBIANG[i][Remove Halo][1] / C:FBIANG[i][Init. Coll.]; T:SBDAIS[i][Remove Halo] / T:SBDAIS[i][Init. Coll.]
average Tev efficience in removing halo	C:FBIANG[0][Remove Halo][1] / C:FBIANG[0][Init. Coll.]; T:SBDAIS[0][Remove Halo] / T:SBDAIS[0][Init. Coll.]
total # NG pbars after removing halo	C:FBIANG[0][Remove Halo][1]; T:SBDAIS[0][Remove Halo]

The indices, i = pbar bunch # in the Tevatron (1-36), j = pbar shot # (1-9), and k = pbar batch # in the MI (1-4), are related in the following way:

i	j	k
1	1	1
2	1	2
3	1	3
4	1	4
5	4	1
6	4	2
7	4	3
8	4	4
9	7	1
10	7	2
11	7	3
12	7	4
13	2	1
14	2	2
15	2	3
16	2	4
17	5	1
18	5	2
19	5	3
20	5	4
21	8	1
22	8	2
23	8	3
24	8	4
25	3	1
26	3	2
27	3	3
28	3	4
29	6	1
30	6	2
31	6	3
32	6	4
33	9	1
34	9	2
35	9	3
36	9	4