Accelerator Equipment Facts

Accelerator Controls:

550 Front-end computers
108,000 ACNET Devices
303,000 ACNET Properties
320 CAMAC Crates
Over 6000 modules
- 350 Ramp cards to supply reference voltages
- 229 Mutiplexed Analog to Digital Converters with support cards.

Cryogenics:

40 Compressors totaling 27,500 HP
24 Satellite refrigerators
2 Liquefiers
24KW of refrigeration @ 4° K
World's largest and second largest helium liquefiers
4.5-mile liquid helium and liquid nitrogen transfer lines
5000 control and monitoring points
40,000 liquid liters of helium being circulated
100,000 liquid liters of helium storage capacity
15 – 30,000 gallon warm gas storage tanks
83 pieces of rotating equipment operating at a time, 54 w/o installed spares.

EE Support:

TEVATRON

12, Main Power Supplies
- 10, 2.8 MW, 940 volts/3kA
- 2, 4.8 MW, 940 volts/5kA

14, Higher Order Correction PS's (HOPs)
- 600 volts, 50 amp and 150 volts, 50 amp

375, Correction Element Power Supplies

+/- 25 volts, 50 amp

16, Kicker systems:

Abort(10 systems at A0, and 4 systems at B48)

Proton Injection (F17)

1PS, 2Magnets, 800ns RT/FT, 4.4/9.8us PW,
+/-1% reg., 4kA, 50kV, Z=6.25, DS: 1/2.4sec, PFN

PBAR Injection (E48)

395ns RT/FT, 1.6us PW, +/-1% regulation

3.3kA, 21kV, Z=6.25, DS: 1/4sec.

BUCKER: Uses fast FET Pulsed PS and spare magnet

20, Low-Beta Power Supplies

8, 375 kW, 50 volts/7500 amps

12, 10 kW, 10 volts/1000 amps

TEV Quench Protection System

12 Energy Dumps - 40MJ ea.

24 Quench Protection Monitors (QPMs)

250 Heater Firing Units (HFUs)

250 Magnet Voltage Monitors (VFCs)

250 Quench By-pass Switches (QBSs)

Low-Beta Quench Protection System

2 Quench Protection Monitors (QPMs)

50 Magnet Voltage Monitors (VFCs)

12 Heater Firing Units (HFUs)

Tevatron Electron Lens (TEL)

1, 6kV 50kW HV Power Supply

1, 20v 1kamp Power Supply and dump system

4, 20kW PEI's (Gun and collector solenoids)

2, 200 amp PS's and dump system

4, 50 amp PS's and dump system

7, Quench Protection Electronic Systems

8, Correction Element Power Supplies

24, Electrostatic Separator HV Power Supplies

780, **Vacuum Ion Pump Power Supplies**
18, **CIA Vacuum Control Crates**

MAIN Injector

12, Main Dipole Power Supplies:
7MW, 1200volts/5000amps 9500amps peak
6, Main Quad Power Supplies:
2.8 MW, 950volts/3000amps 4000amps peak
1, Computer Regulation System (MECAR)
4-Processor Regulation/Learning System
320, Correction Element Power Supplies
150 volts, 15 amps
2, Sextupole Power Supplies:
+/-700volts, +/-350amps 4-Quadrant Switch-mode
635, Vacuum Ion Pump PS's (70 ma)
27, Vacuum Ion Pump PS's (250 ma)
18, CIA Vacuum Control Crates
7, Kicker Systems
ABORT (2 systems at MI40)
700ns RT, 9.8us FT, +/-10% Regulation
2.7kA, 34kV, Z=12.5, Bpk= .66kG, PFN and Pulse Transformer
8 GEV Proton Injection (3 systems at MI30)
50ns RT, 150ns FT, 1.6us PW, +/-1% Reg., 15 Hz
1.2kA, 30kV, Z=25, Bpk= .136kG, PFL and Res. Charge
8/120/150 GEV Pbar Injection/Proton Extraction (MI52)
1 PS, 2 Magnets, 5 operating modes
Rise Time: 80ns / .5us, FT: .5us/1.9us, PW: 2.1/10.3us
4.4/5.4/ .77 kA, 22/27/4 kV, Bpk= .68kG, PFL/PFN
150 GEV PBAR Extraction (MI62)
1PS, 2Magnets, 9.6us RT, 1.6us PW, +/-1% reg.
5.6kA, 4.8kV, 1/2 sw

MI Beamlines
Includes Abort and MI through F17

14, 500 KW Power Supplies
PEIs
9, 75 KW Power Supplies
Spangs
4, 2.8 MW Power Supplies
Modified Main Ring
Correction Element Power Supplies
Counted in MI above

PBAR

142, Vacuum Ion Pump Power Supplies
8, CIA Vacuum Control Crates

RECYCLER

2, Beamline Power Supplies
240 KW PEI's
269, Correction Element Power Supplies
12 amp / 80 volt – Reused MR Corrector PS's
250, Vacuum Ion Pump Power Supplies
7, CIA Vacuum Control Crates

8 GEV LINE

3, Misc. Power Supplies
19, Transistor Shunts
52, Correction Element Power Supplies
10 amp / 150 volt

BOOSTER

4, Main Power Supplies
1200 volts / 1000 amps

LINAC

8, 30 Megawatt Modulators

3, 500 Kilowatt Modulators

F17 to A0 BEAMLINE (REMNANT)

3, Main Power Supplies
2.8 MW, 950volts/3000amps
13, Correction Element Power Supplies
2, 10 amp/150 volt
11, 20 amp/150 volt

MiniBooNE BEAMLINE

1, Horn Power Supply
10 kv/250 kamp, 150 us ½ sine
7, Bending Power Supplies
3, 240 KW PEIs
4, 20 KW PEIs
2, Transistor Shunts
50 amp
12 Correction Element Power Supplies
7, 50 amp/120 volt and 14, 10 amp/150 volt
1, Pulser Power Supply
500 volt/2000 amps, 16.66ms ½ sine

SWITCHYARD

21, High Power (> 55 kW) power Supplies)
6, 500 KW Transrex's
1, 150 KW PEIs
14, 55 KW Ling/Xrex
12, Medium to low power
11, HP 100/100
1, HP 18/600
3, High Voltage Septa Power Supplies (Glassman)
8, Vacuum Ion Pump Power Supplies (250 ma)
3, CIA Vacuum Control Crates

MISCELLANEOUS

4, 13.8 KV Harmonic Filters

70, 13.8 KV Transformers
Oil Testing, Inspection
MI, TEV, PBAR, Booster, P2 Line, P3 Line,
Booster/MI/TEV RF

EQUIPMENT UNDER CONSTRUCTION:

NuMI BEAMLINE

Not Yet Operational

1, Horn Power Supply
1 kV/200 kamp, 1.5 ms ½ sine
29, Main Power Supplies
7, 500 KW
20, 20 KW
2, 240 KW (for Horn PS)
20, Correction Element Power Supplies
20 amp/150 volt

BOOSTER

2, Pulsers MP01/MP02
3 kv/30 kamp 350 us ½ sine

ELECTRON COOLING (RECYCLER)

2ND TEVATRON ELECTRON LENS

1, 6kV 50kW HV Power Supply
1, 20v 1kamp Power Supply and dump system
2, 20kW PEI's (Gun and collector solenoids)
2, 200 amp PS's and dump system
4, 50 amp PS's and dump system
7, Quench Protection Electronic Systems

RF:

Major Components of High Level RF System

- **Booster**

  18 - Ferrite Bias Supplies 0 – 2500 Amp fast slewing (250,000Amps/Sec)
  18 – 35 Kvolt Series Tube Modulators 0 – 35 Kvolt fast slewing
  18 – RF Cavities with 3 Ferrite loaded tuners per cavity
  18 – 150 Kwatt Power Amplifiers
  18 – 2.5 Kwatt Cascode Driver Amplifiers
  18 – 100 Watt Distributed Amplifers
  128 – Power Supplies to support Cascode and Distributed Amplifiers
  18 – 3 Watt RF amplifiers
  18 – Spark Detector Modules
  18 – Phase Detectors
  18 – -750 Volt Series blocking circuit and control unit for Cascode Cathode supply
  18 – CCIU Station Control Boxes
  18 – Digital Cross-connects
  18 – IRM Control Interface
  18 – IRM's
  2 – 35 Kvolt, 100 Amp Anode Power Supplies with controls

- **Main Injector**

18 - Ferrite Bias Supplies 0 – 2500 Amp fast slewing (250,000Amps/Sec)
18 – 35 Kvolt Series Tube Modulators 0 – 35 Kvolt fast slewing
18 – 53 Mhz RF Cavities with 2 Ferrite loaded tuners per cavity
18 – 200 Kwatt Power Amplifiers
18 – 4 Kwatt Solid State Driver Amplifier with Power Supplies.
18 – Spark Detector Modules
36 – Phase Detectors
18 – Phase Shifters
18 – Cavity Tuning Controllers
18 – Direct RF Feedback Controllers
18 – CCIU Station Control Boxes
18 – Digital Cross-connects
18 – IRM Control Interface
18 – IRM's
3 – 30 Kvolt, 100 Amp Anode Power Supplies with controls

5 – 2.5 Mhz RF Cavities
5 – 2.5 Mhz 5 KWatt Solid State Amplifiers
1 – 5.0 Mhz RF Cavity
1 – 5.0 Mhz 5 Kwatt Solid State Amplifier
5 – 2.5 Mhz Station Controller
1 – 5.0 Mhz Station Controller
4 – Recycler RF Cavities
4 – Recycler 3.5 Kwatt Wide Band Solid State RF Amplifiers
4 – Recycler Station Controllers

1 – 106 Mhz RF Cavity
1 _ 3.0 Kwatt Solid State RF Amplifier

2 – 3000 Gal Closed Loop LCW Water Systems

- **TEV**

8 – 35 Kvolt Series Tube Modulators 0 – 35 Kvolt fast slewing

8 – 53 Mhz RF Cavities with 2 Ferrite loaded tuners per cavity
8 – 200 Kwatt Power Amplifiers
8 – 4 Kwatt Solid State Driver Amplifier with Power Supplies.
8 – Spark Detector Modules
16 – Phase Detectors
8 – Phase Shifters
8 – Cavity Tuning Controllers
8 – High Power Phase Shifters
8 – High Power Phase Shifter Controllers
8 – RFGE Station Control Boxes
18 – Digital Cross-connects
18 – IRM Control Interface
18 – IRM's
1 – 30 Kvolt, 100 Amp Anode Power Supplies with controls

1 – 3000 Gal Closed Loop LCW Water System

Instrumentation:

1000 - Beam Position Monitors
1500 - Beam Loss Monitors
60 - Multiwire readouts
30 - beam intensity torroids and integrators
Special diagnostic devices: SBD, FBI, IPM, IBEAM, Synch Light

Tevatron Collider Run IIA - Store Statistics

Store No.	Start of Store Date	Start of Store Time	End of Store Date	End of Store Time	Init. Lum. (E30)	Store Hours	Store (nb-1)	Integ. Lum. Hour	Lum. per (cm)	b*	Reason for Ending	Comment
651	08/22/01	13:45	08/23/01	04:14	7.10	14.48	290.00	20.02	35		Power glitch	Feeder 47 faulted between MSS & IB1
653	08/23/01	20:00	08/25/01	09:39	6.10	37.65	488.00	12.96	35		Lightning glitch	Dumped during end-of-store studies
656	08/25/01	16:30	08/26/01	06:28	6.18	13.97	224.00	16.04	35		D3 QPM	Bad processor card?
659	08/26/01	17:16	08/28/01	00:03	4.85	30.78	333.40	10.83	35		D0 SMT abort	Bad C335/336 camac module
661	08/28/01	19:45	08/28/01	21:21	6.50	1.60	33.55	20.97	35		D11U quench	No clear reason for quench found
665	08/29/01	11:49	08/30/01	10:47	7.40	22.97	322.50	14.04	35		Intentional	D0Q5 dropped to half value during store
669	08/31/01	20:20	08/31/01	21:46	6.20	1.43	30.10	21.00	35		C2 PS not ready	Changed CPU board for QPM
673	09/01/01	14:50	09/02/01	05:15	5.40	14.42	232.00	16.09	35		A2 PS not ready	Changed scaler card for QPM
675	09/02/01	13:10	09/02/01	16:07	5.90	2.95	66.20	22.44	35		C2 PS not ready	Changed safety coordinator
684	09/04/01	01:20	09/04/01	21:00	5.90	19.67	349.00	17.75	35		A2 PS not ready	Same old QPM problem
686	09/05/01	10:00	09/07/01	10:23	6.90	48.38	717.30	14.83	35		Intentional	
688	09/07/01	17:33	09/08/01	16:05	7.00	22.53	399.00	17.71	35		Quench @ D48L	Reason unknown
691	09/08/01	23:27	09/10/01	07:02	4.26	31.58	310.50	9.83	35		Intentional	
700	09/14/01	12:15	09/16/01	08:00	5.69	43.75	470.87	10.76	35		Intentional	
702	09/16/01	14:56	09/17/01	11:40	5.70	20.73	261.00	12.59	35		Intentional	
704	09/17/01	17:24	09/17/01	20:28	5.20	3.07	50.00	16.30	35		Tevatron abort	5V ps for CAMAC link repeater at B2
706	09/18/01	01:28	09/19/01	06:10	3.00	28.70	188.00	6.55	35		Intentional	
712	09/20/01	16:11	09/21/01	09:47	5.56	17.60	268.00	15.23	35		Quench @ F46L	F4 EVUH opened too far for unk. reason
714	09/21/01	14:50	09/23/01	09:00	7.20	42.17	566.00	13.42	35		Intentional	
716	09/23/01	11:30	09/24/01	08:19	7.50	20.82	366.00	17.58	35		E1 wet engine tripped	Controller failed -- replaced
718	09/24/01	22:23	09/25/01	01:50	7.56	3.45	83.00	24.06	35		B0Q5 tripped	Probably QPM problem
721	09/25/01	13:31	09/26/01	05:00	7.43	15.48	282.00	18.21	35		Intentional	
725	09/27/01	13:59	09/28/01	14:23	5.40	24.40	261.00	10.70	35		Intentional	
727	09/28/01	16:51	09/29/01	04:28	6.40	11.62	195.00	16.79	35		Quench @ B15U	B1 cold compressor tripped off
730	09/29/01	16:16	09/29/01	19:18	6.50	3.03	57.00	18.79	35		Quench @ B15U	B1 cold compressor tripped off
732	09/30/01	08:59	10/01/01	03:20	6.60	18.35	288.70	15.73	35		D0 SMT abort	Bad C335/336 camac module
735	10/01/01	13:10	10/02/01	05:15	6.60	16.08	230.80	14.35	35		Intentional	
745	10/04/01	19:07	10/05/01	13:32	6.80	18.42	280.00	15.20	35		Intentional	
747	10/05/01	18:29	10/06/01	16:02	7.50	21.55	347.00	16.10	35		Intentional	
750	10/06/01	22:50	10/07/01	01:45	5.90	2.92	52.00	17.83	35		Quench @ A15U	A1 cold compressor turned off-unk. why
784	11/28/01	20:00	11/29/01	10:00	3.20	14.00	59.00	4.21	35		Intentional	First store after M&D period
787	11/29/01	19:03	11/29/01	21:04	3.40	2.02	25.83	12.81	35		Quench @ B15U	B1 cold compressor tripped off
793	11/30/01	16:29	12/01/01	11:05	3.40	18.60	112.00	6.02	35		Intentional	

797	12/02/01	05:00	12/02/01	06:47	4.22	1.78	25.90	14.52	35		B2 QPMRebooted itself	
800	12/03/01	07:30	12/04/01	12:21	6.60	28.85	333.30	11.55	35		Intentional	
808	12/06/01	01:12	12/06/01	18:11	3.66	16.98	155.00	9.13	35		Intentional	
810	12/07/01	03:19	12/07/01	15:38	7.69	12.32	246.40	20.01	35		B2 QPMRebooted itself	
811	12/07/01	22:45	12/08/01	15:52	7.00	17.12	311.50	18.20	35		Quench @ F17L	Reason unknown
814	12/09/01	05:19	12/09/01	17:05	6.30	11.77	206.90	17.58	35		Intentional	
816	12/09/01	20:24	12/10/01	14:03	4.90	17.65	225.00	12.75	35		Intentional	36x32;final pbar load fell out
818	12/10/01	17:30	12/11/01	09:51	5.40	16.35	232.00	14.19	35		Intentional	
Total				1516.72	14070.64		9.28					

One year later…

Tevatron Collider Run IIA - Store Statistics

Store No.	Start of Store Date	Time	End of Store Date	Time	Init. Lum. (E30)	Hours	Store (nb-1)	Integ. Lum. Hour	Lum. per (cm)	b*		Reason for Ending	Comment
1654	08/09/02	15:34	08/10/02	07:29	13.38	15.92	447.60	28.12	35		Intentional		
1656	08/10/02	10:22	08/11/02	01:35	13.30	15.22	488.90	32.13	35		A4 lead failure	Replaced 200 mV VFC	
1657	08/11/02	09:24	08/12/02	08:54	18.36	23.50	779.00	33.15	35		Intentional		
1661	08/13/02	22:19	08/14/02	17:30	23.00	19.18	865.00	45.09	35		Intentional		
1663	08/15/02	01:00	08/15/02	02:25	19.90	1.42	94.00	66.35	35		Quench @ BA,BB		Replaced BAD1 100V VFC
1665	08/15/02	17:39	08/16/02	09:38	18.20	15.98	556.70	34.83	35		Intentional		
1667	08/16/02	14:52	08/17/02	09:07	18.30	18.25	607.10	33.27	35		Intentional		
1668	08/17/02	13:55	08/18/02	17:03	23.42	27.13	979.10	36.08	35		Intentional		
1670	08/18/02	22:13	08/19/02	13:29	19.29	15.27	579.40	37.95	35		Intentional		
1672	08/19/02	17:40	08/20/02	06:00	16.82	12.33	453.00	36.73	35		Intentional	36x32	
1679	08/21/02	22:45	08/22/02	03:33	20.20	4.80	244.10	50.85	35		Ramp dump	TECAR failure	
1680	08/22/02	18:59	08/22/02	21:05	15.97	2.10	84.79	40.38	35		TeV RF tripped	Bad gap envelopes on the pbar stations	
1686	08/23/02	17:05	08/24/02	05:39	13.02	12.57	270.30	21.51	35		TeV quench	A4 wet engine flywheel failure	
1687	08/24/02	14:33	08/25/02	09:29	20.60	18.93	785.00	41.46	35		Intentional		
1689	08/25/02	12:08	08/26/02	06:00	20.90	17.87	814.00	45.56	35		Intentional		
1691	08/26/02	09:27	08/26/02	16:15	24.30	6.80	459.10	67.51	35		TeV quench	Replaced BBU2 VFC	
1711	08/30/02	22:14	08/31/02	17:11	23.10	18.95	912.00	48.13	35		Intentional		
1713	08/31/02	20:51	09/01/02	18:00	24.27	21.15	1045.00		49.41	35	Intentional		
1716	09/02/02	00:07	09/02/02	07:17	24.70	7.17	490.30	68.41	35		C:B0Q5 tripped	Jumpered phase imbalance trip relay	
1723	09/02/02	20:00	09/03/02	06:42	23.00	10.70	612.50	57.24	35		C2 wet engine	Broken piston	
1727	09/03/02	22:27	09/04/02	08:22	21.07	9.92	557.40	56.21	35		A0 abort kickers fired		Suspect loose trigger cable
1728	09/04/02	22:55	09/05/02	15:02	18.20	16.12	647.10	40.15	35		Intentional		

1730	09/06/02	03:28	09/06/02	12:04	12.58	8.60	285.20	33.16	35		Intentional		
1735	09/06/02	23:23	09/07/02	23:38	22.90	24.25	900.00	37.11	35		Quench @ E11U		Reason unknown
1737	09/08/02	08:30	09/09/02	05:00	21.65	20.50	873.00	42.59	35		ntentional		
1739	09/09/02	13:00	09/10/02	07:00	19.79	18.00	541.00	30.06	35		Intentional		
1748	09/12/02	03:30	09/12/02	19:45	21.40	16.25	805.00	49.54	35		Intentional		
1750	09/13/02	01:24	09/13/02	19:05	25.67	17.68	1012.00		57.23	35	Intentional		
1752	09/13/02	21:55	09/14/02	13:53	19.25	15.97	694.10	43.47	35		Intentional		
1754	09/14/02	19:24	09/15/02	12:47	19.59	17.38	734.40	42.25	35		Intentional		
1756	09/15/02	15:15	09/16/02	08:00	19.13	16.75	659.90	39.40	35		Intentional		
1758	09/16/02	13:38	09/17/02	08:43	18.89	19.08	740.00	38.78	35		Intentional		
1764	09/17/02	20:15	09/18/02	16:00	19.04	19.75	681.00	34.48	35		Intentional		
1769	09/19/02	02:20	09/19/02	14:04	14.25	11.73	339.00	28.89	35		Intentional		
1770	09/19/02	21:39	09/20/02	21:56	24.05	24.28	1098.00		45.22	35	Quench @ D0	D0 low beta 100 V VFC failure	
1775	09/21/02	09:05	09/21/02	18:51	28.51	9.77	714.00	73.11	35		Quench @ D0	D0 VFC-2 chassis failed	
1779	09/22/02	07:38	09/22/02	23:33	27.59	15.92	976.00	61.32	35		Intentional		
1781	09/23/02	03:30	09/23/02	12:05	28.09	8.58	656.30	76.46	35		E1 wet engine	Replaced controller	
1787	09/24/02	06:39	09/25/02	00:12	30.15	17.55	1104.00		62.91	35	Intentional		
1795	09/26/02	20:36	09/27/02	17:03	23.57	20.45	997.60	48.78	35		Intentional		
1797	09/27/02	22:32	09/28/02	02:09	22.95	3.62	248.60	68.74	35		Quench @ B15U		Feeder 32 faulted, glitching CHL
Total				4287.82		94370.73		22.01					

Downtime Summary
Wed Aug 1 00:00:00 2001 to Tue Oct 8 13:55:51 2002
System and subsystem
with 60 minutes or more of downtime 2710.53 hrs. of DT for Interval of 10405.93 hrs.
3643 entries 0 minutes or more

Number
&
Details
TEVATRON ACCELERATOR SYSTEMS-- TQUEN
Magnet quenches (all causes) 373.98 hrs.
13.80% of total downtime (2710.53 hrs.)
3.59% of Interval (10405.93 hrs.)
146

PRE-ACC AND LINAC -- LRF
Low and High level RF systems 217.95 hrs.
8.04% of total downtime (2710.53 hrs.)
2.09% of Interval (10405.93 hrs.)
853

MAIN INJECTOR -- MIXFER
Beamline failures-> MI8,P1,P2,P3,A1,abort,Numi,etc. 146.57 hrs.
5.41% of total downtime (2710.53 hrs.)
1.41% of Interval (10405.93 hrs.)
48

TEVATRON ACCELERATOR SYSTEMS-- TCRYO
Cryo systems: frigs, compressors, etc. 145.82 hrs.
5.38% of total downtime (2710.53 hrs.)
1.40% of Interval (10405.93 hrs.)
41

MAIN INJECTOR -- MIMAG
Magnet failures,obstacles,over temps,etc. 126.15 hrs.
4.65% of total downtime (2710.53 hrs.)
1.21% of Interval (10405.93 hrs.)
6

TEVATRON ACCELERATOR SYSTEMS-- TPS
Main PS,corr,ramped corr,etc. 123.02 hrs.
4.54% of total downtime (2710.53 hrs.)
1.18% of Interval (10405.93 hrs.)
47

BOOSTER ACCELERATOR -- BMAG
Magnet failures: over temps,shorts,B:400 MeV device,etc. 108.97 hrs.
4.02% of total downtime (2710.53 hrs.)
1.05% of Interval (10405.93 hrs.)
15

ANTIPROTON SOURCE -- PBPS
Power supply failures 99.63 hrs.
3.68% of total downtime (2710.53 hrs.)
0.96% of Interval (10405.93 hrs.)
77

OTHER SYSTEMS -- POWER
Power systems: feeders,Master & Kautz Rd substations 93.27 hrs.
3.44% of total downtime (2710.53 hrs.)
0.90% of Interval (10405.93 hrs.)
18

BOOSTER ACCELERATOR -- BRF
Low & high level RF system, dampers,etc. 86.27 hrs.
3.18% of total downtime (2710.53 hrs.)
0.83% of Interval (10405.93 hrs.)
400

ANTIPROTON SOURCE -- PBVAC
Pbar vacuum 85.12 hrs.
3.14% of total downtime (2710.53 hrs.)
0.82% of Interval (10405.93 hrs.)
5

MAIN INJECTOR -- MIPS
Main PS,corr,ramp corr,harm,pulsed bumps,etc. 77.70 hrs.
2.87% of total downtime (2710.53 hrs.)
0.75% of Interval (10405.93 hrs.)
97

TEVATRON ACCELERATOR SYSTEMS-- TMISC
other misc failures 73.43 hrs.
2.71% of total downtime (2710.53 hrs.)
0.71% of Interval (10405.93 hrs.)
30

BOOSTER ACCELERATOR -- BPS
Power supply failures: GMPS,corr,B:400 MeV devices,etc. 60.47 hrs.
2.23% of total downtime (2710.53 hrs.)
0.58% of Interval (10405.93 hrs.)
154

ANTIPROTON SOURCE -- PBMAG
Pbar magnet failures: over temps,shorts, etc. 60.10 hrs.
 2.22% of total downtime (2710.53 hrs.)
 0.58% of Interval (10405.93 hrs.)
 21

OTHER SYSTEMS -- RADTRIP
Rad trips - ALL machines 57.47 hrs.
 2.12% of total downtime (2710.53 hrs.)
 0.55% of Interval (10405.93 hrs.)
 556

TEVATRON ACCELERATOR SYSTEMS-- TQPM
Quench protection system: heaters, VFC,etc. 52.98 hrs.
 1.95% of total downtime (2710.53 hrs.)
 0.51% of Interval (10405.93 hrs.)
 20

OTHER SYSTEMS -- CHL
Central Helium Liquifier 51.05 hrs.
 1.88% of total downtime (2710.53 hrs.)
 0.49% of Interval (10405.93 hrs.)
 4

CONTROL SYSTEMS -- CMISC
Consoles, frontends, and other misc failures 44.78 hrs.
 1.65% of total downtime (2710.53 hrs.)
 0.43% of Interval (10405.93 hrs.)
 49

ANTIPROTON SOURCE -- PBDIAG
Pbar diagnostics and instrumentation 40.25 hrs.
1.48% of total downtime (2710.53 hrs.)
0.39% of Interval (10405.93 hrs.)
13

PRE-ACC AND LINAC -- PACC
Pre-Acc and 750 KeV transport line,all failures 37.48 hrs.
1.38% of total downtime (2710.53 hrs.)
0.36% of Interval (10405.93 hrs.)
357

OTHER SYSTEMS -- EXPAR
Experimental areas: Fixed target,detectors,Pbar,etc. 35.77 hrs.
1.32% of total downtime (2710.53 hrs.)
0.34% of Interval (10405.93 hrs.)
38

MAIN INJECTOR -- MIDIAG
Diagnostic and instrumentation failures 34.60 hrs.
1.28% of total downtime (2710.53 hrs.)
0.33% of Interval (10405.93 hrs.)
7

TEVATRON ACCELERATOR SYSTEMS-- TRF
Low and high level RF system,dampers,etc. 32.80 hrs.
1.21% of total downtime (2710.53 hrs.)
0.32% of Interval (10405.93 hrs.)
22

TEVATRON ACCELERATOR SYSTEMS-- TVAC
Vacuum systems 32.48 hrs.
 1.20% of total downtime (2710.53 hrs.)
 0.31% of Interval (10405.93 hrs.)
 6

BOOSTER ACCELERATOR -- BMISC
Misc failures 30.30 hrs.
 1.12% of total downtime (2710.53 hrs.)
 0.29% of Interval (10405.93 hrs.)
 60

OTHER SYSTEMS -- MISC
Misc failures not covered elswhere 28.62 hrs.
 1.06% of total downtime (2710.53 hrs.)
 0.28% of Interval (10405.93 hrs.)
 33

BOOSTER ACCELERATOR -- BVAC
Vacuum failures including B:400 MeV devices 27.58 hrs.
 1.02% of total downtime (2710.53 hrs.)
 0.27% of Interval (10405.93 hrs.)
 37

ANTIPROTON SOURCE -- PBRF
Low and high level RF system,dampers,etc. 26.03 hrs.
 0.96% of total downtime (2710.53 hrs.)
 0.25% of Interval (10405.93 hrs.)
 28

MAIN INJECTOR -- MIMISC
Misc failures 23.85 hrs.
 0.88% of total downtime (2710.53 hrs.)
 0.23% of Interval (10405.93 hrs.)
 14

MAIN INJECTOR -- MIRF
Low and high level RF,dampers,etc. 21.87 hrs.
 0.81% of total downtime (2710.53 hrs.)
 0.21% of Interval (10405.93 hrs.)
 83

OTHER SYSTEMS -- WATER
Water systems: CUB,distribution systems,Casey's Pond,etc. 20.85 hrs.
 0.77% of total downtime (2710.53 hrs.)
 0.20% of Interval (10405.93 hrs.)
 14

MAIN INJECTOR -- MIVAC
Vaccum systems 20.37 hrs.
 0.75% of total downtime (2710.53 hrs.)
 0.20% of Interval (10405.93 hrs.)
 48

CONTROL SYSTEMS -- CR&LK
Crates & Links Hardware: repeaters,cards,crate PS,etc. 19.10 hrs.
 0.70% of total downtime (2710.53 hrs.)
 0.18% of Interval (10405.93 hrs.)
 17

ANTIPROTON SOURCE -- PBCOOL
Stochastic cooling systems 19.05 hrs.
 0.70% of total downtime (2710.53 hrs.)
 0.18% of Interval (10405.93 hrs.)
 13

OTHER SYSTEMS -- SAFETY
Safety systems, safety, chipmunks replacement,etc. 17.88 hrs.
 0.66% of total downtime (2710.53 hrs.)
 0.17% of Interval (10405.93 hrs.)
 20

CONTROL SYSTEMS -- CTIME
Timing faults: Tclk,Beam sync,TLG,etc. 17.37 hrs.
 0.64% of total downtime (2710.53 hrs.)
 0.17% of Interval (10405.93 hrs.)
 14

PRE-ACC AND LINAC -- LPS
Power supplies failures: QPS,L:400 MeV devices,etc. 17.12 hrs.
 0.63% of total downtime (2710.53 hrs.)
 0.16% of Interval (10405.93 hrs.)
 55

ANTIPROTON SOURCE -- PBXFER
Beamline failures: AP1,AP2,AP3 & D/A 15.33 hrs.
 0.57% of total downtime (2710.53 hrs.)
 0.15% of Interval (10405.93 hrs.)
 24

TEVATRON ACCELERATOR SYSTEMS-- TMAG
Magnets, leads, header, etc. 14.63 hrs.
0.54% of total downtime (2710.53 hrs.)
0.14% of Interval (10405.93 hrs.)
5

CONTROL SYSTEMS -- CNET
Networking failures: ethernet,token ring,arcnet,etc. 11.97 hrs.
0.44% of total downtime (2710.53 hrs.)
0.11% of Interval (10405.93 hrs.)
10

BOOSTER ACCELERATOR -- BWATR
Water failures: ring & RF,B:400 MeV devices,etc. 11.05 hrs.
0.41% of total downtime (2710.53 hrs.)
0.11% of Interval (10405.93 hrs.)
8

ANTIPROTON SOURCE -- PBTRGT
Pbar target station 10.95 hrs.
0.40% of total downtime (2710.53 hrs.)
0.11% of Interval (10405.93 hrs.)
16

RECYCLER-- RRVAC
Recycler vacuum systems 9.67 hrs.
0.36% of total downtime (2710.53 hrs.)
0.09% of Interval (10405.93 hrs.)
2

PRE-ACC AND LINAC -- LWATR
Water failures: RF & tunnel,L:400 MeV device,95 & 55,etc. 9.62 hrs.
0.35% of total downtime (2710.53 hrs.)
0.09% of Interval (10405.93 hrs.)
37

TEVATRON ACCELERATOR SYSTEMS-- TDIAG
Diagnostic and instrumentation failures 7.53 hrs.
0.28% of total downtime (2710.53 hrs.)
0.07% of Interval (10405.93 hrs.)
11

ANTIPROTON SOURCE -- PBWATR
Water failures: ring & RF 6.18 hrs.
0.23% of total downtime (2710.53 hrs.)
0.06% of Interval (10405.93 hrs.)
6

ANTIPROTON SOURCE -- PBMISC
Pbar miscellaneous failures 5.12 hrs.
0.19% of total downtime (2710.53 hrs.)
0.05% of Interval (10405.93 hrs.)
8

TEVATRON ACCELERATOR SYSTEMS-- TWATR
Water systems: ring & RF 4.72 hrs.
0.17% of total downtime (2710.53 hrs.)
0.05% of Interval (10405.93 hrs.)
5

MAIN INJECTOR -- MIWATR
Water systems: Ring and RF 4.42 hrs.
 0.16% of total downtime (2710.53 hrs.)
 0.04% of Interval (10405.93 hrs.)
 2

PRE-ACC AND LINAC -- NTF
Neutron Therapy Facility failures 3.95 hrs.
 0.15% of total downtime (2710.53 hrs.)
 0.04% of Interval (10405.93 hrs.)
 2

PRE-ACC AND LINAC -- LVAC
Vacuum failures including L:400 MeV devices 2.90 hrs.
 0.11% of total downtime (2710.53 hrs.)
 0.03% of Interval (10405.93 hrs.)
 12

PRE-ACC AND LINAC -- LDIAG
Diagnostic and instrumentation failures 1.43 hrs.
 0.05% of total downtime (2710.53 hrs.)
 0.01% of Interval (10405.93 hrs.)
 10

FIXED TARGET-- FMISC
Misc failures 1.20 hrs.
 0.04% of total downtime (2710.53 hrs.)
 0.01% of Interval (10405.93 hrs.)
 2