To: MTB Distribution

FROM: George T. Williams

Date: May 31, 1978

Subject: Multics Performance Test Results as of System 33.7

The attached are the performance test results through system 33.7 (MR 6.0). Things have improved slightly since the last performance report. The main trouble is, still, pagefaults. The current slope of the curve (see the attached chart of pagefaults from MSS 28.0 - MSS 33.7) is promising. However, pagefault history since MSS 30.0 (the low point on the chart) can be described best by one word: 'Excelsior'. Pagefaults have increased by 25% since MSS 30.0 and by 4% since MSS 32.0; they have decreased by 2% since the last reporting period (MSS 32.4). On the plus side, virtual cpu time has decreased by over 17% since MSS 30.0 while total cpu and elapsed time have stayed about the same.

The real question, which has gome unanswered for over a year, is why the dramatic increase in pagefaults and what real effect is it having on performance?

	Current Status (MSS 33.7)		
	33.7	32.4	% change
Elapsed Time:	59.6	61.7	-3.40356
Virtual CPU:	1671	1689	-1.06571
Total CPU:	3124	3180	-1.76100
Page Faults:	586707	599288	-2.09932
Memory Units:	45211	45913	-1.52897

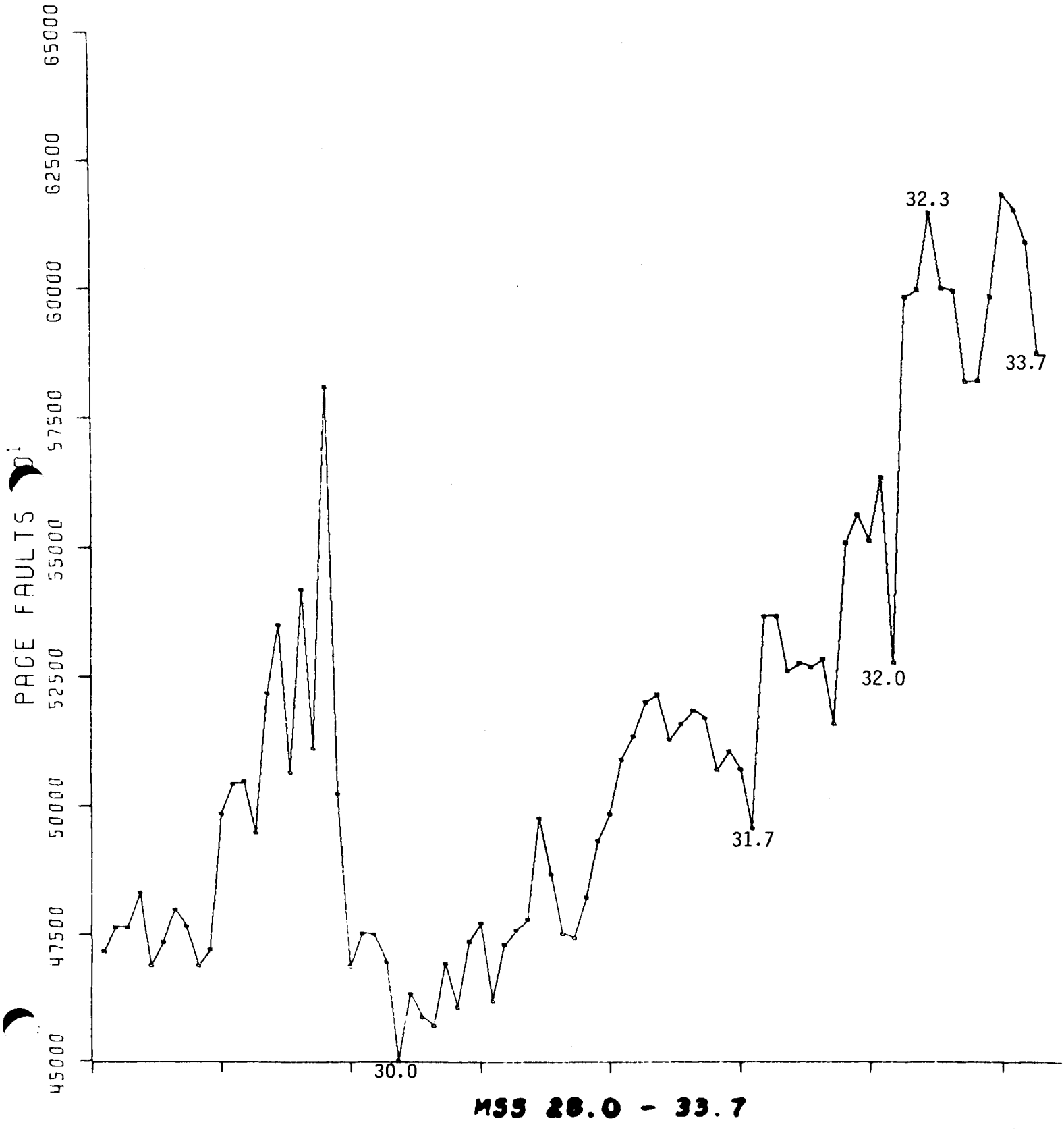
MTB-
Current Status (MSS 33.7)

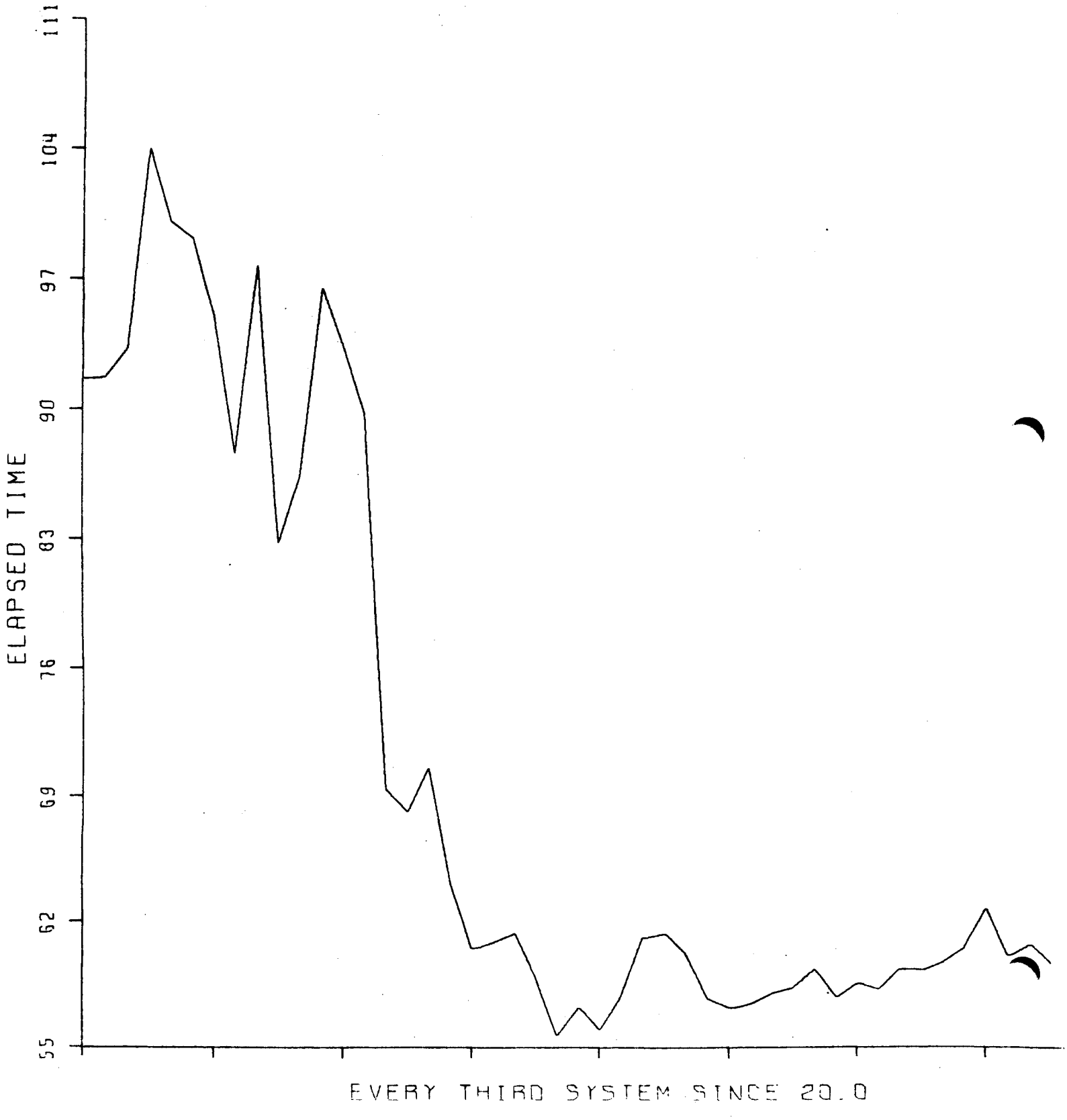
	33.7	30.0	% change
Elapsed Time:	59.6	58.0	2.75862
Virtual CPU:	1671	2020	-17.27722
Total CPU:	3124	3128	-0.12787
Page Faults:	586707	469677	24.91712
Memory Units:	45211	34779	29.99511

	33.7	30.10	% change
Elapsed Time:	59.6	57.1	4.37828
Virtual CPU:	1671	1963	-14.87519
Total CPU:	3124	3088	1.16580
Page Faults:	586707	482276	21.65378
Memory Units:	45211	35956	25.73979

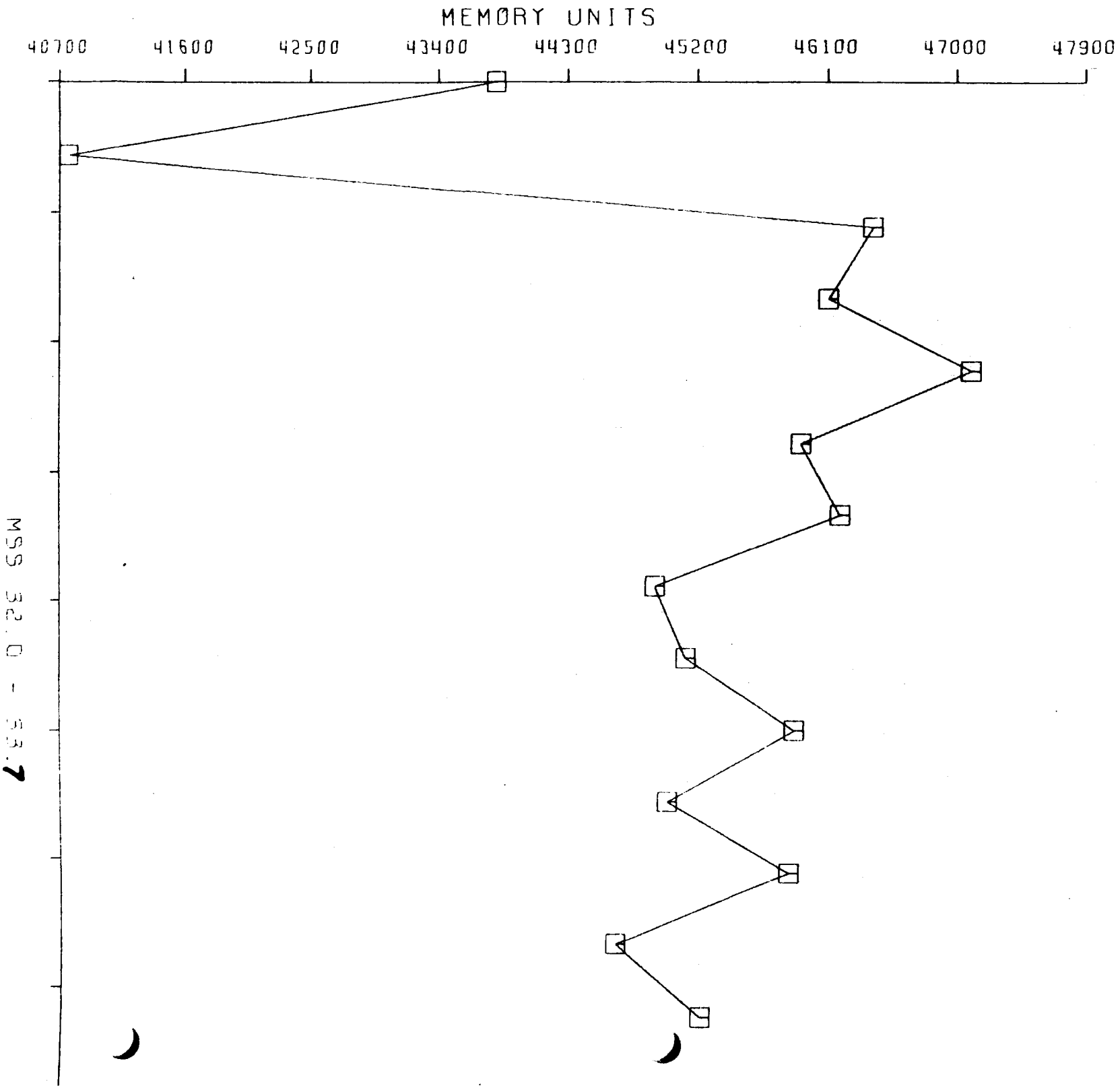
	33.7	32.0	% change
Elapsed Time:	59.6	59.8	-0.33444
Virtual CPU:	1671	1742	-4.07577
Total CPU:	3124	3167	-1.35775
Page Faults:	586707	563275	4.15995
Memory Units:	45211	43797	3.22853

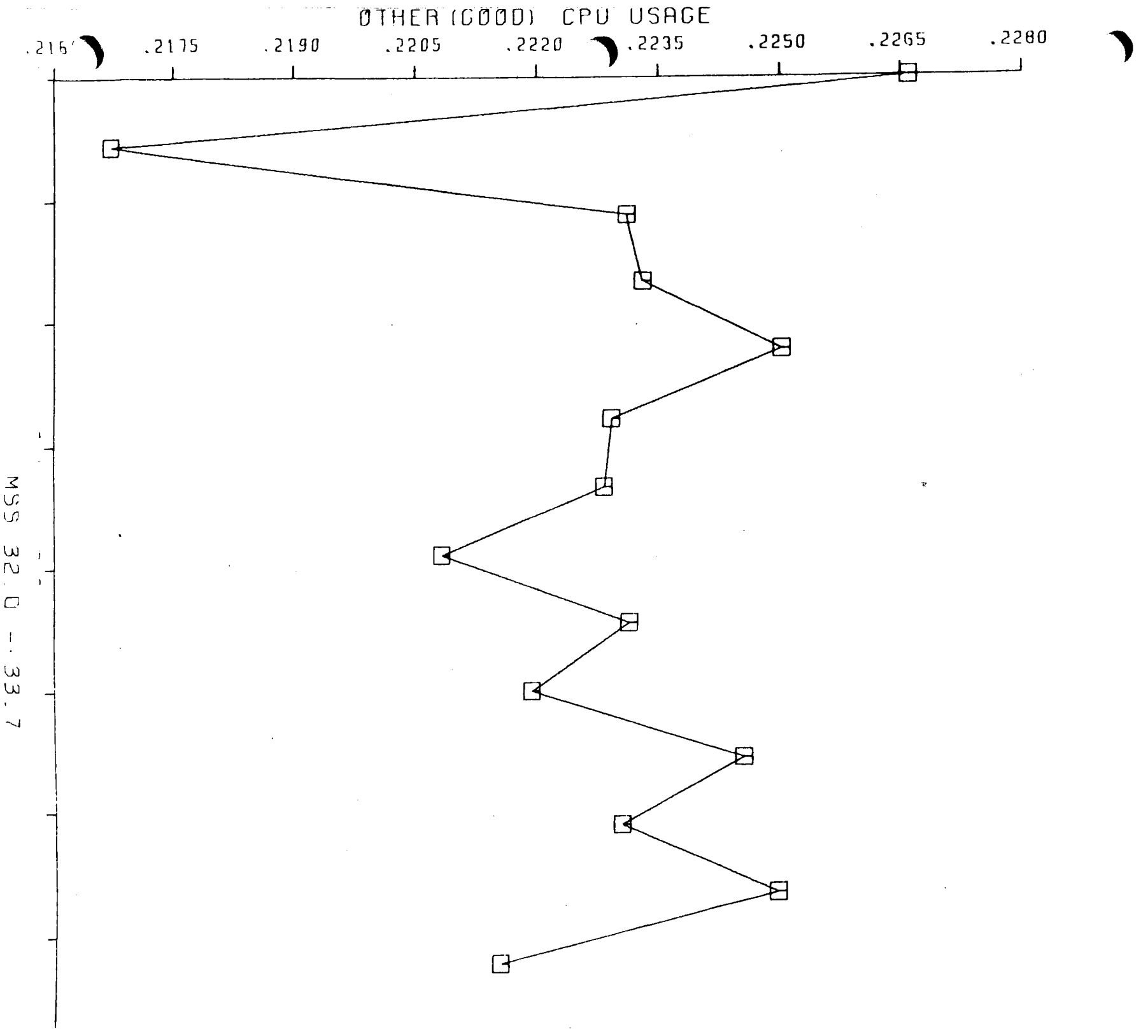
related MTB's:
MTB-126 Revision of Multics Performance Tests
MTB-087 Multics Performance Goals for 1974
MTB-344 Multics Performance Test Results as of System 31.4
MTB-348 Multics Performance Test Results as of System 32.4

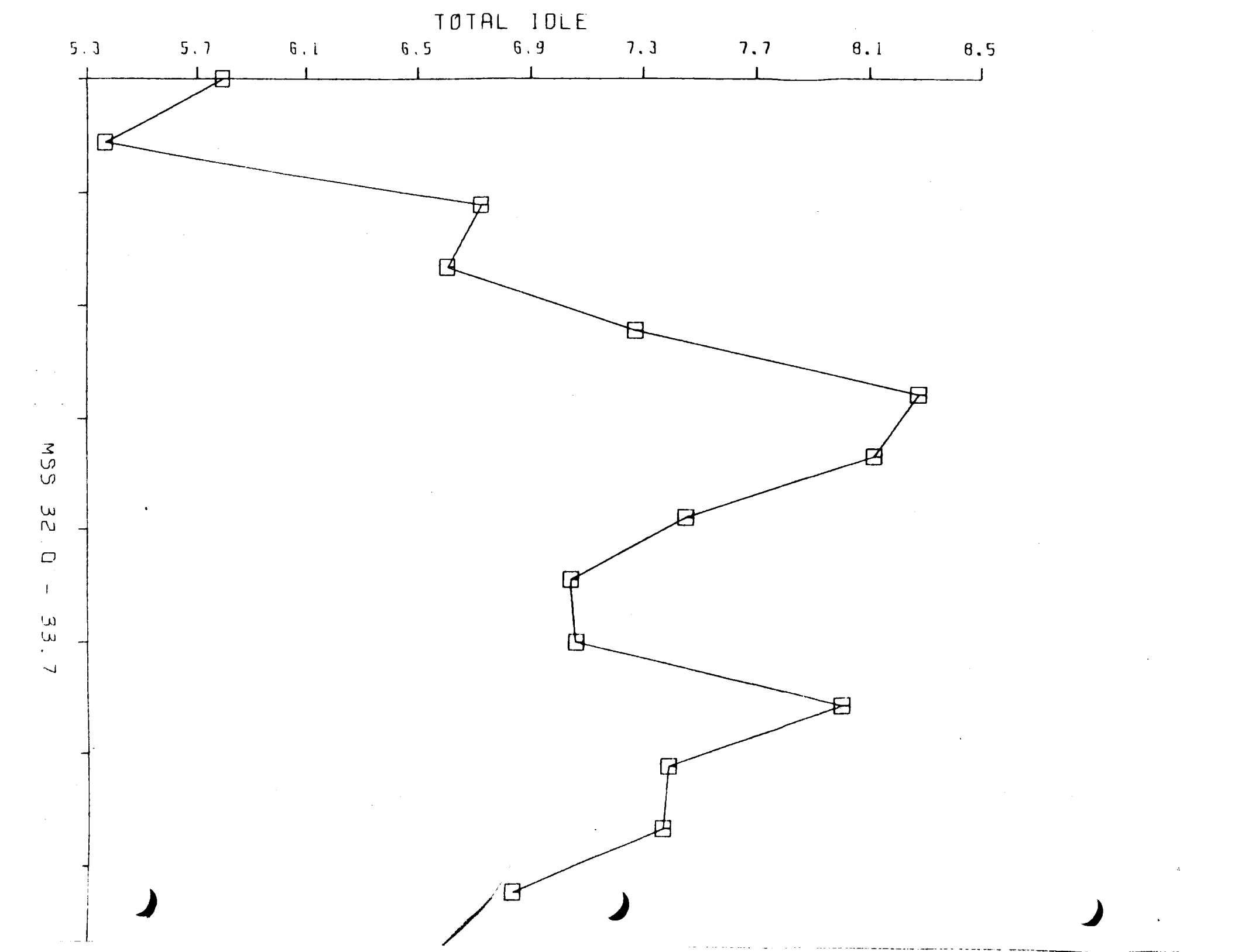

PAGE FAULTS
65000
62500
60000
57500
55000
52500
50000
47500
45000
32.3
33.7
32.0
31.7
30.0
MSS 28.0 - 33.7

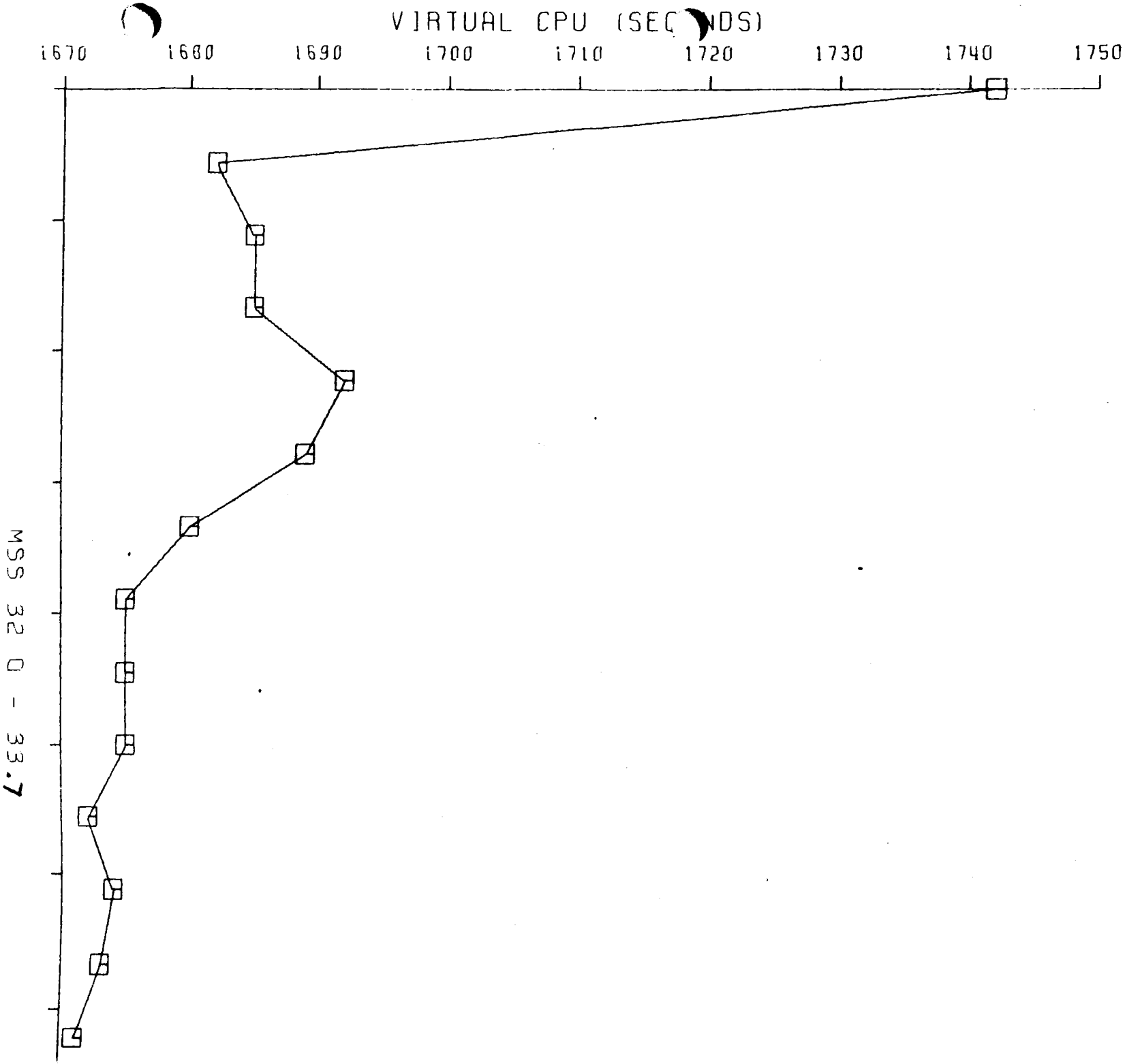

ELAPSED TIME
55
62
69
76
83
90
97
104
111
EVERY THIRD SYSTEM SINCE 20.0

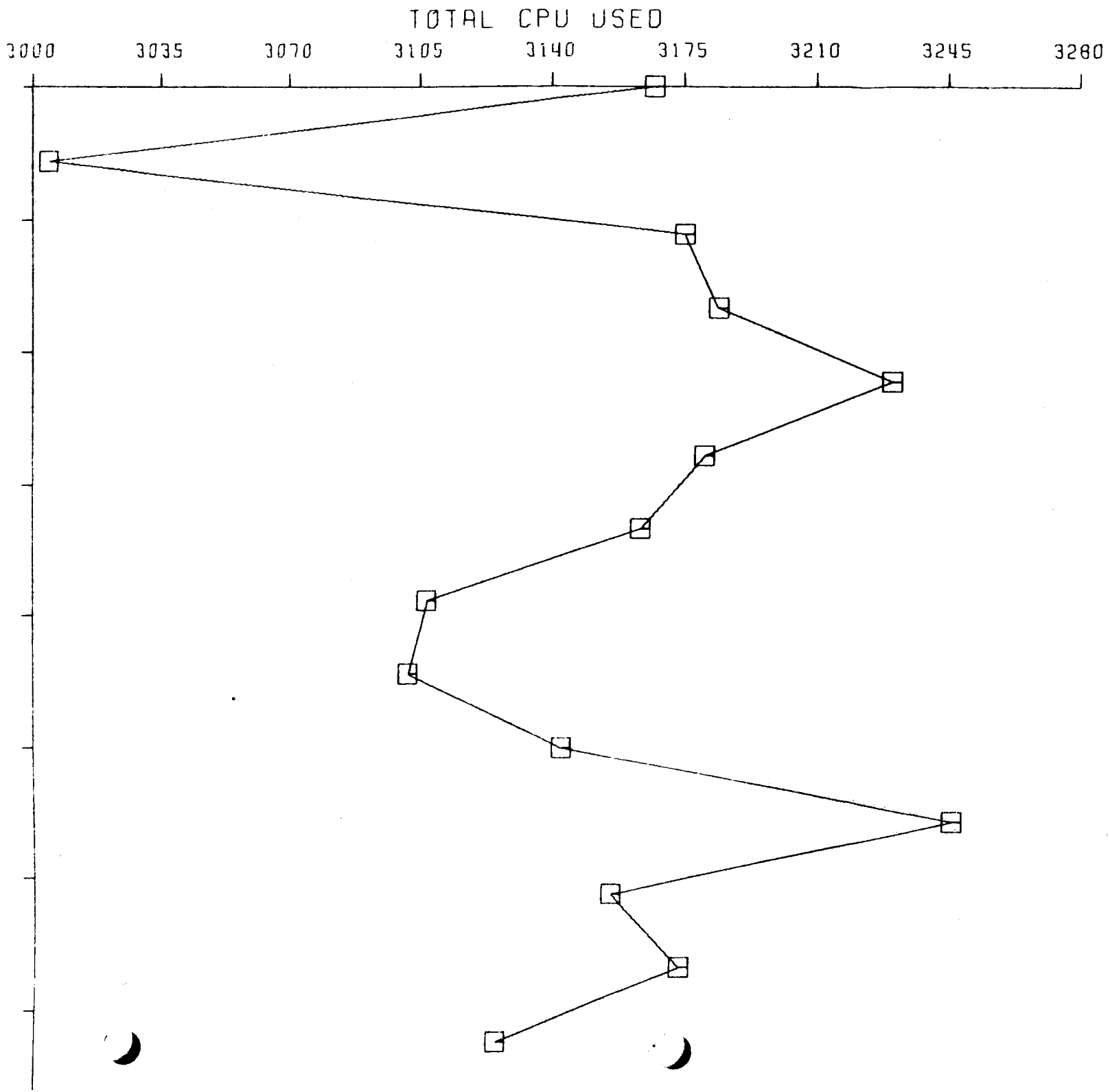
62400
61100
59800
58500
57200
55900
54600
53300
52000
MSS 32.0 - 33.7

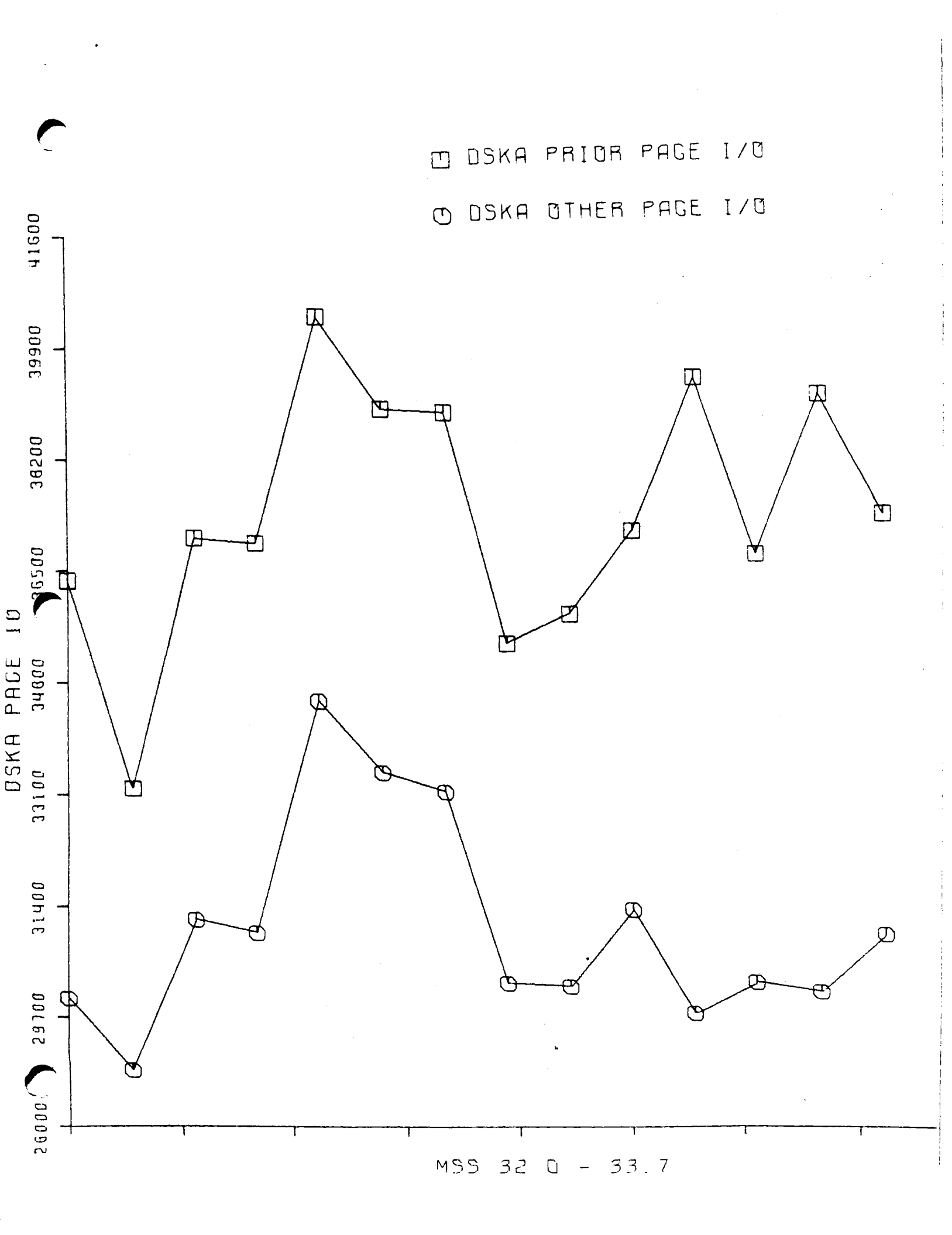

MEMORY UNITS
40700
41600
42500
43400
44300
45200
46100
47000
47900
MSS 32.0 - 33.7

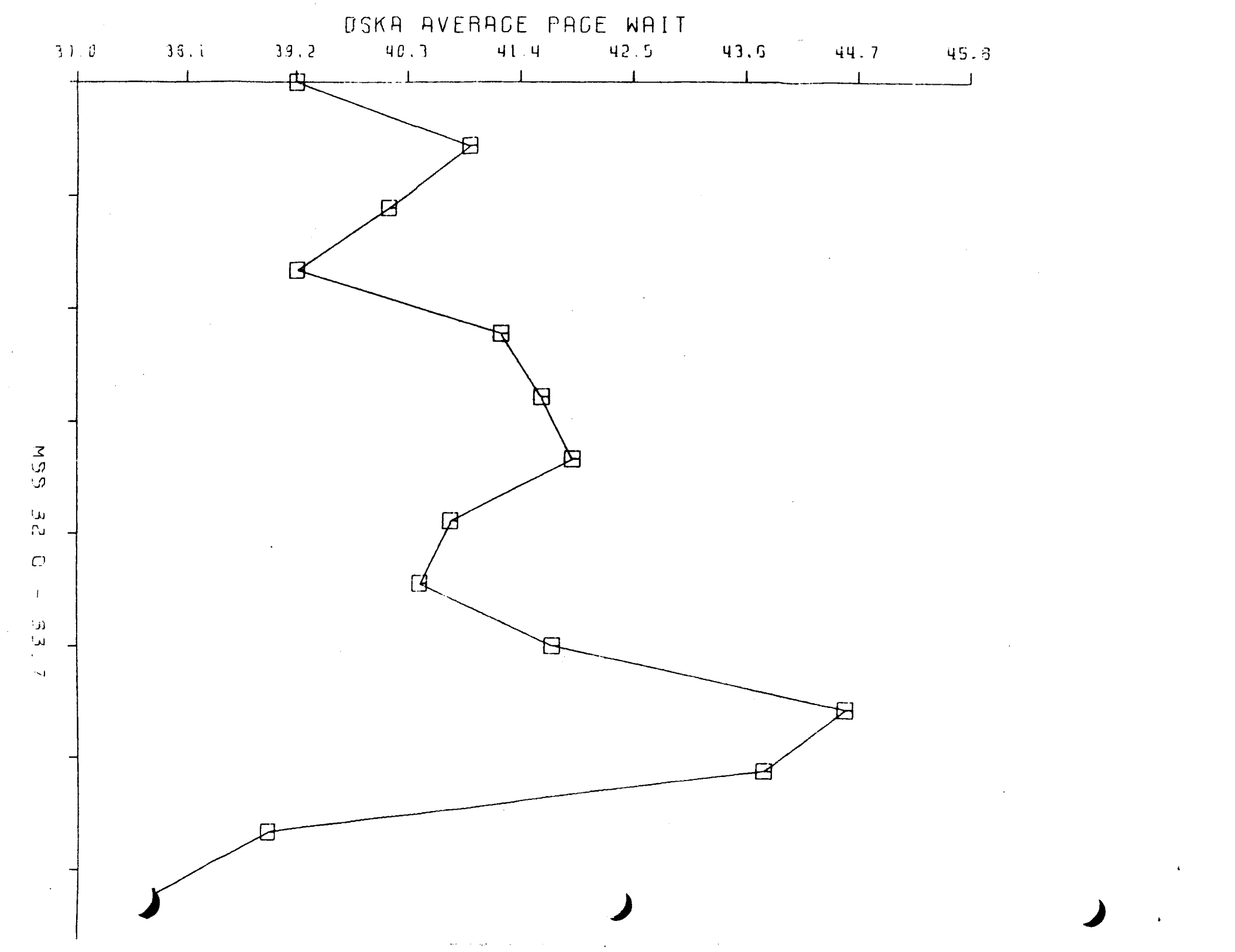

OTHER (GOOD) CPU USAGE
.216
.2175
.2190
.2205
.2220
.2235
.2250
.2265
.2280
MSS 32.0 - 33.7

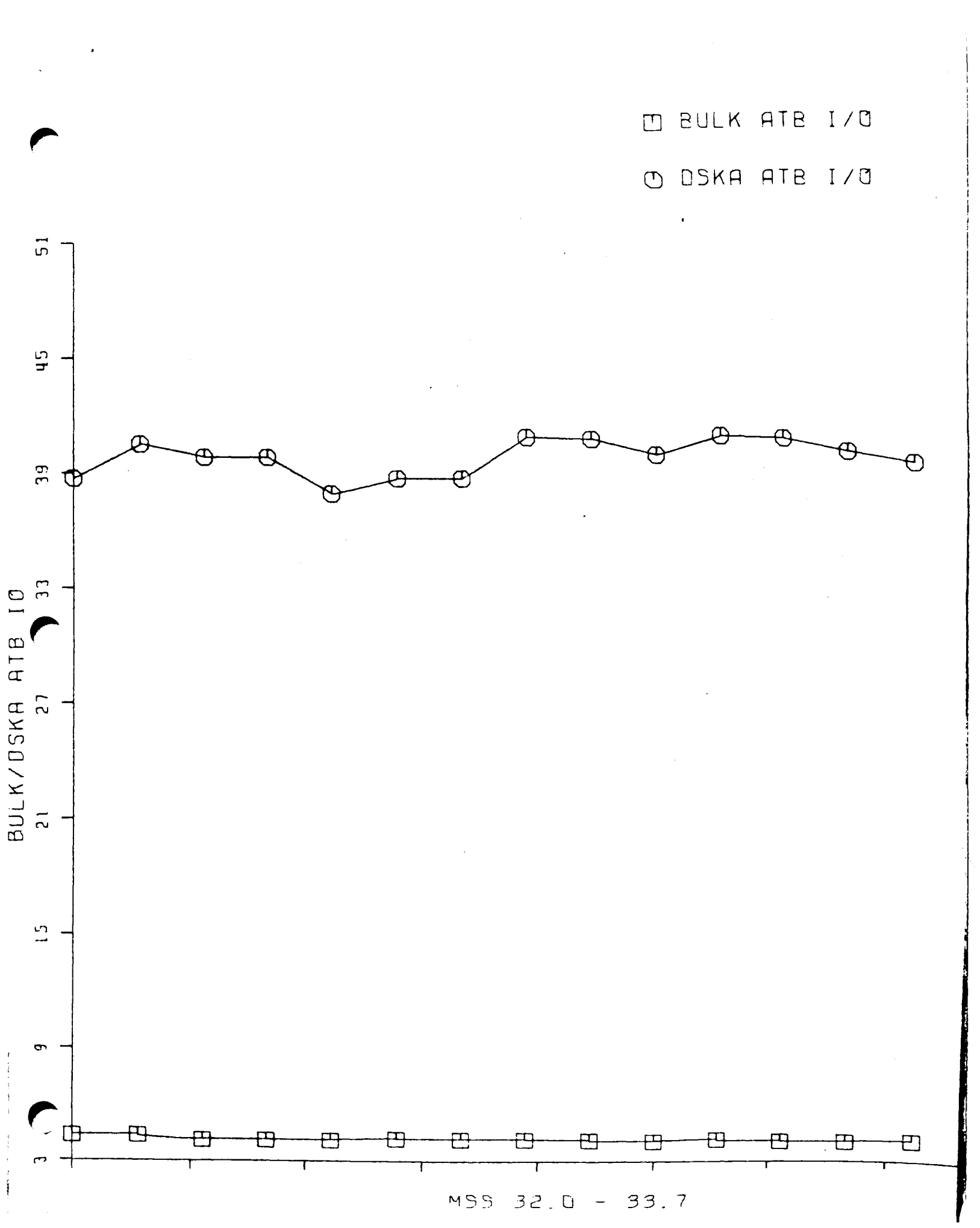

TOTAL IDLE
5.3
5.7
6.1
6.5
6.9
7.3
7.7
8.1
8.5
MSS 32.0 - 33.7


VIRTUAL CPU (SECONDS)
1670
1680
1690
1700
1710
1720
1730
1740
1750
MSS 32 0 - 33.7


TOTAL CPU USED
3000
3035
3070
3105
3140
3175
3210
3245
3280
MSS 32 0 - 33.7


DSKA PRIOR PAGE I/O
DSKA OTHER PAGE I/O
DSKA PAGE IO
41600
39900
38200
36500
34800
33100
31400
29700
26000
MSS 32 0 - 33.7

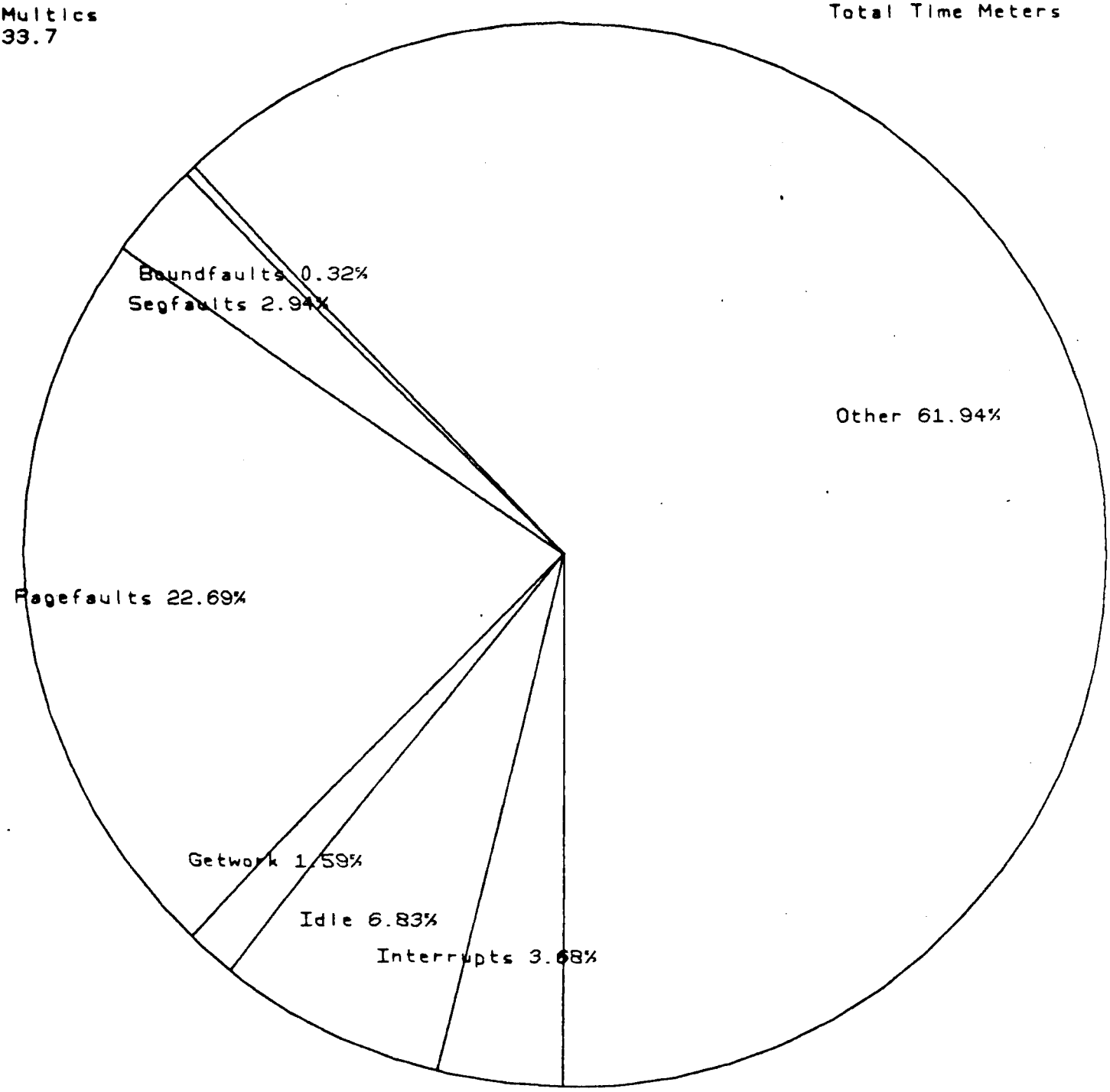

OSKA AVERAGE PAGE WAIT
37.0
38.1
39.2
40.3
41.4
42.5
43.6
44.7
45.8
MSS 32 0 - 33.7 SSW


BULK ATB I/O
OSKA ATB I/O
BULK/OSKA ATB IO
51
45
39
33
27
21
15
9
3
MSS 32.0 - 33.7

BULK PRIOR PAGE I/O
BULK OTHER PAGE I/O
BULK PAGE IO 10¹
25000
31000
37000
43000
49000
55000
61000
67000
73000
MSS 32 0 -33.7"

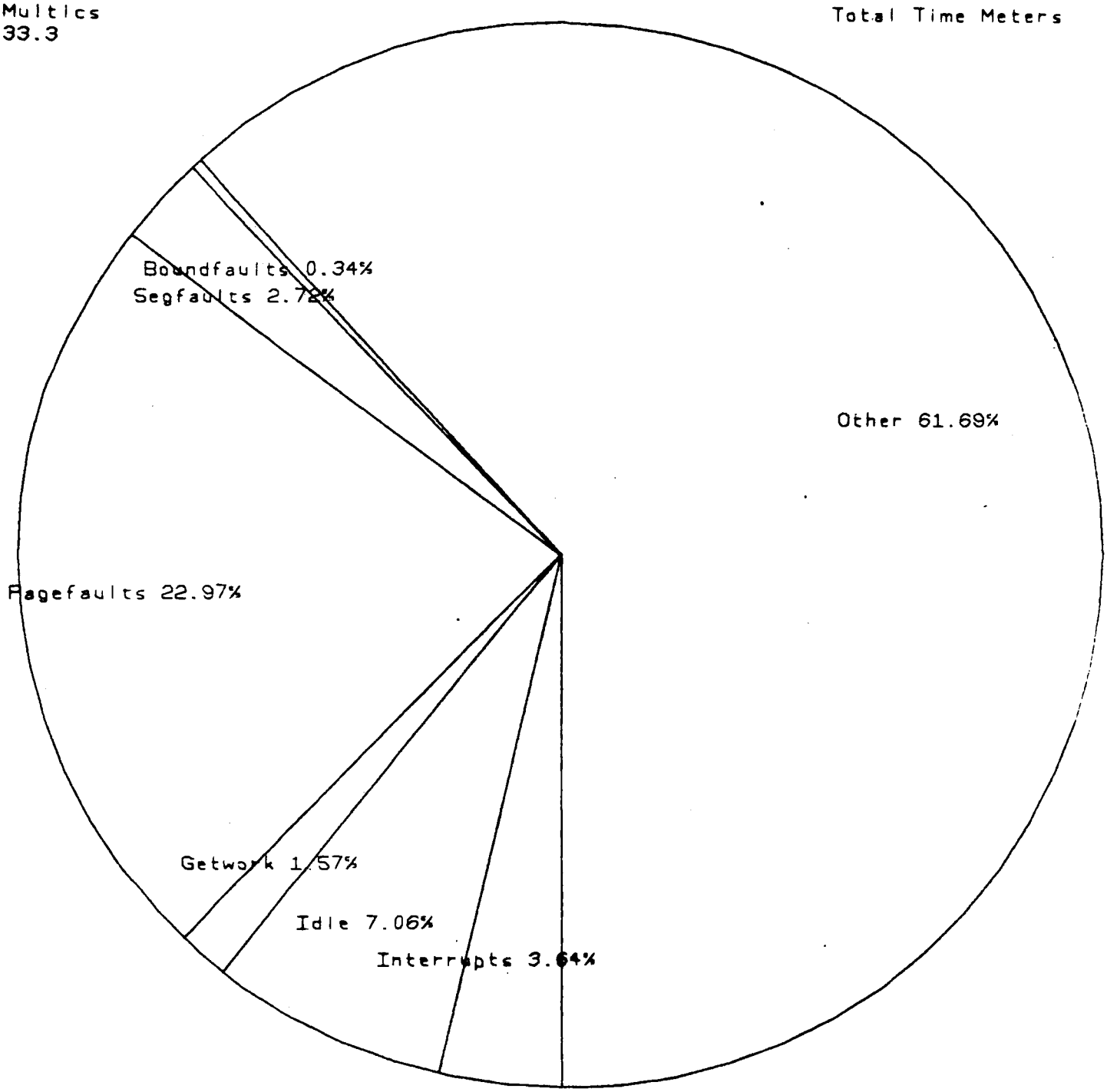
Multics
33.7

Total Time Meters



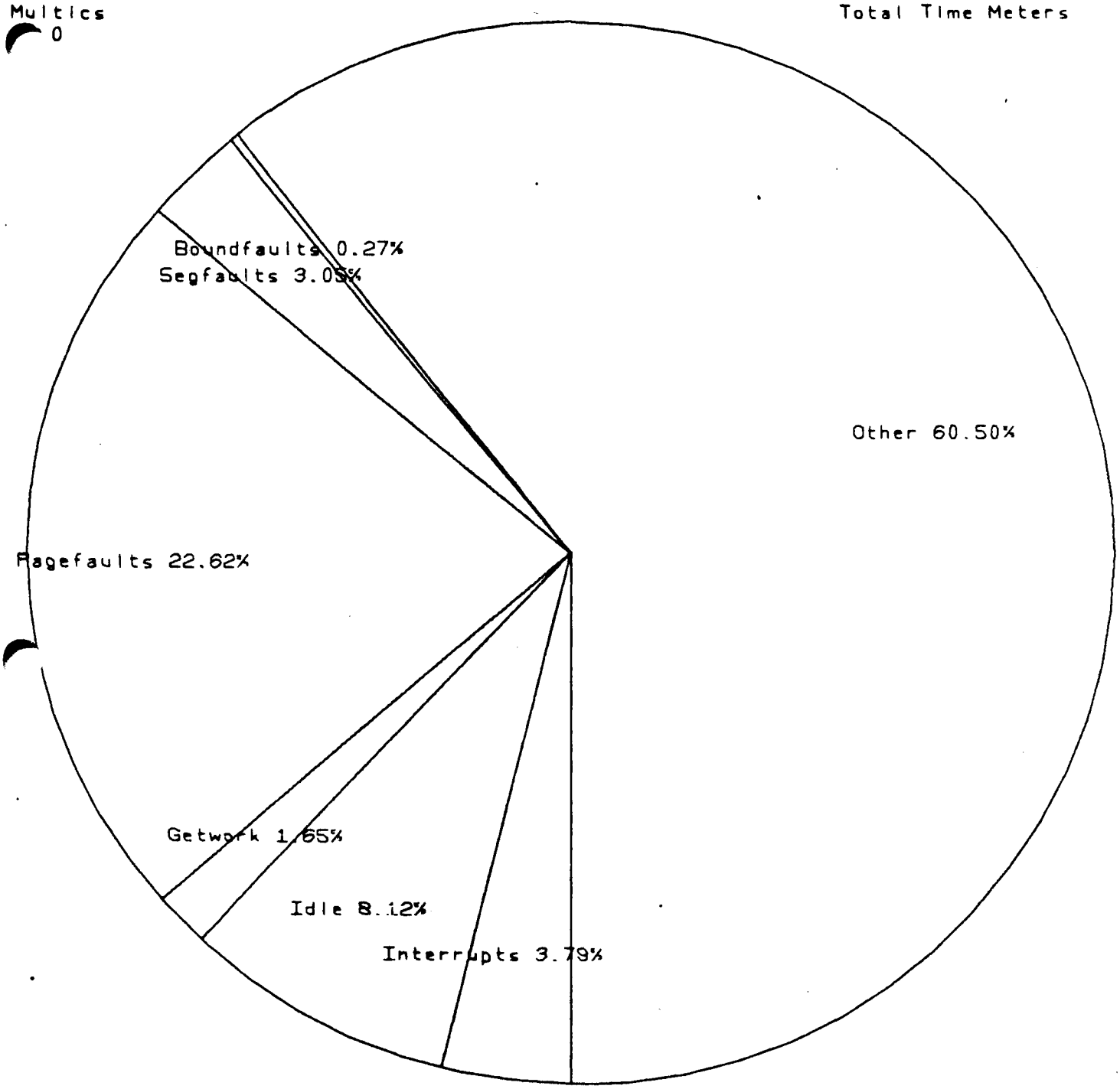
Multics
33.3

Total Time Meters



Multics
0

Total Time Meters



Metering Comparisons for 32.0, 32.0a, 32.1, 32.2, 32.3, 32.4, 33.0, 33.1, 33.2

System:	32.0	32.0a	32.1	32.2	32.3	32.4	33.0	33.1	33.1(2)	33.2
Date:	10/02/77	10/26/77	10/26/77	10/13/77	11/03/77	11/11/77	12/16/77	02/01/78	02/02/78	02/02/78
Write-through status:	dirw	dirw	dirw	dirw	dirw	dirw	dirw	dirw	dirw	dirw
SYSI:	none	none	none	none	none	none	none	none	none	none
TELAST:	1 sec	1 sec	1 sec	1 sec	1 sec	1 sec	1 sec	1 sec	1 sec	1 sec
CPU:	A	A	A	A	A	A	A	A	A,B	A
Cache:	on	on	on	on	on	on	on	on	on	on
Memories:	A,B	A,B	A,B	A,B	A,B	A,B	A,B	A,B	A,B	A,B
External Interface:	off	off	off	off	off	off	off	off	off	off
Disk Channels:	2,3	2,8	2,8	2,8	2,8	2,8	2,8	2,8	2,8	2,8
Elapsed Time:	59.8 min	56.2 min	60.5 min	60.6 min	62.1 min	61.7 min	61.4 min	59.7 min	63.2 min	60.8 min
Costs (shift 1):	$569.68	$553.44	$615.81	$612.42	$623.82	$610.61	$612.96	$598.49	$628.31	$600.92
CPU, total:	3167 sec	3004 sec	3175 sec	3184 sec	3230 sec	3180 sec	3163 sec	3186 sec	5496 sec	3181 sec
CPU, virtual:	1742 sec	1682 sec	1685 sec	1685 sec	1692 sec	1689 sec	1688 sec	1675 sec	1798 sec	1675 sec
CPU, good (1)	2266 sec	2167 sec	2231 sec	2233 sec	2250 sec	2229 sec	2228 sec	2288 sec	1790 sec	2231 sec
Memory Units:	43797	40757	46409	46899	47099	45913	46179	44892	46905	45112
Page Faults:	563275	527618	597650	598941	613828	599288	598775	581583	1041393	581663
ttm meters:										
Page Faults:	22.08%	22.01%	22.96%	23.09%	23.26%	22.72%	22.62%	22.55%	28.78%	22.58%
GetWork:	1.58%	1.46%	1.61%	1.63%	1.65%	1.64%	1.65%	1.56%	9.22%	1.58%
Seg Faults:	3.35%	2.81%	3.03%	3.11%	3.04%	3.06%	3.05%	2.91%	1.67%	2.85%
Bound Faults:	0.26%	0.33%	0.34%	0.28%	0.32%	0.31%	0.27%	0.29%	0.19%	0.31%
Interrupts:	3.94%	3.76%	3.88%	3.88%	4.11%	3.79%	3.79%	3.56%	2.88%	3.66%
Idle, zero:	0.21%	0.52%	1.97%	1.51%	1.65%	1.63%	1.81%	1.75%	1.52%	1.59%
Idle, MP:	5.39%	4.61%	4.34%	4.70%	5.26%	6.34%	5.82%	5.24%	12.38%	4.90%
Idle, NMP:	0.06%	0.12%	0.32%	0.28%	0.21%	0.16%	0.35%	0.35%	1.58%	0.46%
Idle, Loading:	0.13%	0.11%	0.09%	0.11%	0.13%	0.15%	0.14%	0.11%	0.25%	0.09%
Idle, total:	5.79%	5.36%	6.72%	6.60%	7.27%	8.28%	8.12%	7.45%	15.73%	7.84%
Other (good):	63.16%	64.28%	61.46%	61.41%	60.36%	60.19%	60.50%	61.68%	47.24%	62.88%
dvm meters:										
Bulk Prior Page I/O:	269507	251516	284345	284620	292229	285664	289391	282510	456209	285233
Bulk Other Page I/O:	572158	537093	613432	615917	630568	611925	615288	598280	1079741	607838
Bulk ATB I/O:	4.3	4.28	4.05	4.05	4.04	4.13	4.10	4.18	2.49	4.07
DSKA Prior Page I/O:	36338	33180	36991	36989	40367	38948	38891	35366	48143	35815
DSKA Other Page I/O:	29976	28857	31187	30986	34501	33412	33113	30213	32719	30155
DSKA ATB I/O:	38.7	40.5	39.8	39.9	37.9	38.7	38.7	40.9	39.5	40.8
DSKA Avg. Page Wait:	39.2	40.9	40.1	39.2	41.2	41.6	41.9	40.7	42.7	40.4

Notes:

(1) Based on Elapsed Time * percentage good (from ttm meters)
(2) 2 CPU 2 Memory Test

Metering Comparisons for 33.0, 33.1, 33.2, 33.3, 33.4, 33.5b, 33.6, 33.7

System:	33.0	33.1	33.1(2)	33.2	33.3	33.4	33.5b	33.6	33.7
Date:	12/18/77	02/01/78	02/02/78	02/02/78	02/22/78	04/30/78	05/11/78	05/07/78	05/18/78
Write-through status:	dirw	dirw	dirw	dirw	dirw	dirw	dirw	dirw	dirw
SYST:	none	none	none	none	none	none	none	none	none
TELAST:	1 sec	1 sec	1 sec	1 sec	1 sec	1 sec	1 sec	1 sec	1 sec
CPU:	A	A	A,B	A	A	A	A	A	A
Cache:	on	on	on	on	on	on	on	on	on
Memories:	A,B	A,B	A,B	A,3	A,B	A,B	A,B	A,B	A,B
External Interface:	off	off	off	off	off	off	off	off	off
Disk Channels:	2,8	2,8	2,8	2,8	2,8	2,8	2,8	2,8	2,8
Elapsed Time:	61.4 min	59.7 min	63.2 min	60.8 min	60.8 min	62.9 min	60.7 min	61.5 min	59.6 min
Costs (shift 1):	$612.96	$598.49	$628.31	$600.92	$609.24	$599.31	$608.77	$595.34	$601.76
CPU, total:	3163 sec	3106 sec	5496 sec	3101 sec	3142 sec	3246 sec	3155 sec	3173 sec	3124 sec
CPU, virtual:	1680 sec	1675 sec	1798 sec	1675 sec	1675 sec	1672 sec	1674 sec	1673 sec	1671 sec
CPU, good (1)	2228 sec	2208 sec	1790 sec	2231 sec	2219 sec	2245 sec	2238 sec	2249 sec	2215 sec
Memory Units:	46179	44892	46905	45112	45868	44981	45829	44614	45211
Page Faults:	598775	581503	1041393	581663	597642	617194	604382	588074	586787
ttm meters:									
Page Faults:	22.62%	22.55%	23.78%	22.58%	22.97%	24.16%	22.96%	23.21%	22.69%
Getwork:	1.65%	1.56%%	9.22%	1.58%	1.57%	1.57%	1.57%	1.61%	1.59%
Seg Faults:	3.05%	2.91%	1.67%	2.85%	2.72%	2.87%	2.88%	2.91%	2.94%
Bound Faults:	0.27%	0.29%	0.19%	0.31%	0.34%	0.30%	0.28%	0.31%	0.32%
Interrupts:	3.79%	3.56%	2.08%	3.66%	3.64%	3.59%	3.59%	3.71%	3.68%
Idle, zero:	1.81%	1.75%	1.52%	1.59%	1.38%	1.82%	1.86%	1.55%	1.96%
Idle, HP:	5.82%	5.24%	12.38%	4.90%	5.12%	5.70%	4.99%	5.24%	4.36%
Idle, NMP:	0.35%	0.35%	1.58%	0.46%	0.44%	0.43%	0.44%	0.48%	0.43%
Idle, Loading:	0.14%	0.11%	0.25%	0.09%	0.12%	0.06%	0.10%	0.08%	0.08%
Idle, total:	8.12%	7.45%	15.73%	7.04%	7.06%	8.01%	7.39%	7.37%	6.83%
Other (good):	60.50%	61.68%	47.24%	62.80%	61.69%	59.49%	61.32%	60.98%	61.96%
dvm meters:									
Bulk Prior Page I/O:	289391	282510	456209	285233	287119	292434	291096	298196	285523
Bulk Other Page I/O:	615288	598280	1079741	607838	613534	632403	622829	633748	604985
Bulk ATB I/O:	4.10	4.10	2.49	4.07	4.03	4.11	4.01	3.99	4.06
DSKA Prior Page I/O:	38891	35366	40143	35815	37075	39408	36719	39141	37321
DSKA Other Page I/O:	33113	30213	32719	30155	31321	29733	30219	30876	30952
DSKA ATB I/O:	38.7	40.9	39.5	40.8	40.8	41.8	40.9	40.2	39.6
DSKA Avg. Page Wait:	41.9	40.7	42.7	40.4	41.7	44.6	43.8	38.9	37.7

Notes:

(1) Based on Elapsed Time * percentage good (from ttm meters)