After-the-fact Benchmarks!

BoxScore

Mainframe Measurement Software

As an information systems professional, you make or approve changes to your mainframe software and hardware almost daily, anything from a new release of software to putting your work on a brand new processor. And every time you make these changes you have to answer certain questions. "What effect did this change have on my work? Did it improve things? For which jobs or transactions? Did I actually get the amount of improvement predicted? On the other hand, did the change degrade any workloads? Specifically which users got hurt? Prove it."

I've designed BoxScore to answer these questions. **As long as you have SMF and RMF data from before and after any change, you can now know and show the exact effect on Batch, TSO, CICS, IMS, DB2, performance groups or your service classes.** It's like always having a set of benchmarks, stable by definition, which have already been run and are ready for anaylsis.

Please read this brochure to discover the many ways BoxScore can help you do your job, discover problems, improve customer service and show management the results you work so hard to achieve.

Cheryl Watson

***Cheryl Watson** has been involved with mainframe measurement and performance and passing her experience on to others since 1965. Over 10,000 analysts all over the world now rely on her practical advice and industry analysis.*

*She has written over 2000 pages in her newlsetter alone (**Cheryl Watson's TUNING Letter**), and has given speeches, taught courses and written many other articles.*

*Now she has put her knowledge to work for you in the form of software. This brochure describes BoxScore, the first in Cheryl's ADVISOR series of measurement and peformance software. BoxScore shows not only the results of a hardware or software change, but also **advises** you via informative messages as to what might be the problem or what steps to take next.*

We think this approach will save you time and effort and help you maintain and improve the performance of your systems.

Box Score

Mainframe Measurement Software

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What is BoxScore?

BoxScore is a suite of SAS programs designed by Cheryl Watson that shows the increase or decrease in effective CPU usage of an application or workload after any hardware or software change to your system. This change could be a hardware upgrade, a software migration, a change in LPAR configuration, a tuning effort, a change to an application, or any similar event. In addition, BoxScore can show you exactly which transactions, steps or jobs suffered the most or benefited the most due to those changes!

BoxScore can be used by capacity planners or management to determine the effect on an application due to a change in processor speed. It can be used by anyone in a charge back environment, such as outsourcers or time sharing services, where customers want to know the impact on their jobs of changes to the system. BoxScore can be used by application programmers to determine the overhead of Language Environment or new releases of software. You can use BoxScore to determine the amount of CPU overhead due to a data sharing environment or a change in LPAR configuration. You can use it to confirm that nothing has changed, to discover problems you were unaware of, or even to find out what's happening when something is wrong with a system but that system has had no apparent changes.

BoxScore has eight components: Batch, CICS, CICSTMON, TSO, IMS, DB2, Compat, and Goal. The sources of this detailed data are:

BoxScore/BATCH	- Batch and started tasks - SMF type 30, subtype 4 (step terminations)
BoxScore/CICS	- SMF type 110 (CICS transaction)
BoxScore/CICSTMON	- Log data from Landmark's TMON/CICS
BoxScore/TSO	- SMF type 32 (TSO command)
BoxScore/IMS	- IMS log or Control IMS logs
BoxScore/DB2	- SMF type 101 data (DB2 accounting)
BoxScore/COMPAT	- SMF type 72 data (performance group periods)
BoxScore/GOAL	- SMF type 72 data (service class periods)
All components	- SMF type 70 data (CPU and LPAR activity)

More Than Just Data

BoxScore is the first in Cheryl Watson's "ADVISOR series." Most software products give you plenty of data but very little guidance, leaving it up to you to interpret the data, determine the problem, and devise the next step. BoxScore not only gives you the data, but it also provides interpretation of the data and recommended actions you may want to take. Comprehensive messages point out problem areas, explain why certain things might be happening, and suggest how to proceed in order to solve a problem. You'll see examples of these messages throughout these pages.

BoxScore is a suite of SAS programs that shows the increase or decrease in the effective CPU usage of an application or workload after any hardware or software change to your system. In addition, BoxScore can show you exactly which transactions, steps or jobs suffered the most or benefited the most due to those changes!

Determine the impact of a processor upgrade on your applications

How BoxScore Helps You

BoxScore can be used in many situations; we expect that most installations will use it continually. Here are a few examples of how to use BoxScore in your installation:

1. Determine the impact of a processor upgrade on your applications.
2. Determine the effect of moving an application from one processor to another.
3. See how a program or transaction differs when run on each of the machines in your installation.
4. Identify the amount of overhead due to a conversion to Language Environment (LE) or a new version of a compiler.
5. Quantify the savings achieved from an application tuning effort.
6. Determine the amount of overhead when a new LPAR is added to an existing system or a change is made to the LPAR configuration.
7. Determine the overall CPU impact of adding storage to an existing machine.
8. Identify which jobs or transactions were affected most by the addition of a memory upgrade.
9. See if anything changed when nothing was supposed to have changed. In other words, confirm that everyone has left the system alone.
10. Allow an outsourcer to show a customer the amount of savings produced by a system tuning change (such as a change in CICS or DB2 parameters).
11. Identify jobs for an outsourcer's customer that were most negatively impacted by a system change.
12. Obtain detail processing information for jobs most impacted by any change.
13. Find all large job steps (e.g. over an hour of CPU time) that changed characteristics for any time period.
14. Analyze the change in CPU usage for TSO commands after an upgrade to a new release of ISPF or OS/390. (Did you know that some sites saw a 12% increase when they went from ISPF 3.5 to ISPF 4.1?)
15. Compare how the CPU usage for IMS, CICS, or DB2 transactions differs between two regions.
16. Identify the work that was most affected by an upgrade to OS/390.
17. Determine the change in CPU usage after migrating CICS V2 programs to CICS V4.
18. Understand the CPU cost of data sharing after it is implemented.
19. Determine the overhead of using hardware data compression.
20. Understand whether there is a change in CPU time when a job is run at different times of the day.

We'll illustrate some of these in more depth later.

How Does BoxScore Work?

BoxScore analyzes job steps, online transactions, or performance group (or service class) periods to determine the change in CPU usage between two time frames or two configurations. It can be used to determine the effect on your workloads of a processor change, a system change, or an application modification. You specify a time period for the "control" period, which is most likely the "before" period, as well as a time period for the "study" period, or the "after" configuration. You also specify the type of analysis that you would like BoxScore to perform (Batch, TSO, IMS, CICS, CICSTMON, DB2, Compat, or Goal).

For most analyses, BoxScore will then extract certain detail data from the two time periods and look for only stable steps or transactions. "Stable" means that the step took close to the same amount of CPU time per I/O during every execution of the control period and was similarly consistent within the study period. BoxScore uses CPU per I/O (or optionally, CPU per transaction) in order to allow for differences in the amount of data or volume into each execution. Stable steps are defined by BoxScore as being those whose CPU per I/O or transaction is within a certain coefficient of variation (CV).

We call BoxScore an "after the fact" benchmark. That is, all you need is the detail data for the control and study periods in order to do the analysis. You can go back in time to analyze data from a year or more ago and compare it to today, without having run benchmarks at that time.

Once BoxScore has identified stable steps or transactions which occur in both the control and study periods, it calculates the change in CPU for all of the stable work. The average of these changes becomes the basis for the conclusions as to the observed MIPS for the study period.

Since many installations prefer to use MIPS when analyzing processor speeds, BoxScore translates the effective change in CPU speed into MIPS using Cheryl Watson's CPU Chart.

In addition, BoxScore can tell you exactly which job steps or online transactions were most affected, both negatively and positively, by the change. You can then do further analysis of this work.

BoxScore can tell you exactly which job steps or online transactions were most affected

The Summary Report shows how this work did compared to what was expected

A Tour Through the BoxScore Reports

To show you the wealth of information that BoxScore provides, here are excerpts from the 21 pages of reports produced by one execution of BoxScore. These reports are from a BoxScore/Batch run at a site that upgraded from a 9672-RX3 with ten CPUs to a 9672-R64 with six CPUs, a faster machine with fewer engines. It is important to note that these results are for the batch workload only. Other workloads, such as CICS, may experience different effects.

BoxScore Summary Report

The Summary Report of BoxScore shows how this work did compared to what was expected. The example in Figure 1 shows that there was 1.0% difference between the expected speed (38.3 MIPS) and capacity (229.7 MIPS) and the observed speed (37.9 MIPS) and capacity (227.4 MIPS) for the batch workload. Even though the average was close to the expected, we can see from the maximum speed that at least one job step experienced a higher speed than expected (69.1 MIPS versus 42.2 MIPS for a 63.9% improvement). We can also see that there was at least one job step that ran four times slower than the speed we expected (8.5 versus 34.8 MIPS). Later reports will show more detail about those job steps.

Figure 1 - Summary Report

```
                                                             BOXSCORE/BATCH                        23:49 Sunday, April 19, 1998   2
V1R1b (c) Watson & Walker, Inc.                                 Summary
                                                            ABC Corporation

+-BoxScore/BATCH: -1.0%   +----Capacity (MIPS/CEC)----+ +--% Delta--+ +-Speed (MIPS/Physical CPU)-+
+                         +   Expected   +  Observed  + +           + +   Expected   +  Observed  +
+ From a CEC view,        +-------------+-----------+ +-----------+ +-------------+-----------+
+   STUDY                 +              +            + +           + +              +            +
+   had 1.0% less         + Max  253.0   +    414.6   + +   63.9%   + + Max   42.2   +     69.1   +
+   speed and capacity    +              +            + +           + +              +            +
+   than expected from    + Avg  229.7   +    227.4   + +   -1.0%   + + Avg   38.3   +     37.9   +
+   published performance +              +            + +           + +              +            +
+   estimates.            + Min  209.0   +     51.2   + +  -75.5%   + + Min   34.8   +      8.5   +
+                         +              +            + +           + +              +            +
+-------------------------+-------------+-----------+ +-----------+ +-------------+-----------+

Start of period    04MAR97:00:00:00
End of period      09MAR97:00:00:00
System             SYSA
Processor          9672-R64
LPAR Configuration NO

The work analyzed during this period experienced a 56.0% decrease in CPU time per I/O or transaction between
  the two environments analyzed. Further detail about these environments is provided on the following pages.

This represents a 1.0% decrease in speed and capacity compared to predictions from published performance guidelines.
  A significant decrease could indicate that either the study or control configuration differed greatly from published estimates.

WWCB062-W CPU is faster                 WWCB064-W Slower than expected                WWCB066-W MIPS used for scaling only
```

The Summary report also shows the study period of analysis (March 04, 1997 through March 08, 1997 - midnight), the system (SYSA), and the processor (9672-R64). The two paragraphs at the bottom summarize the results from this analysis. The first paragraph is the key one. It identifies the resulting average change (56.0% decrease in CPU time per I/O), while the second paragraph summarizes the change from expectations (1.0% decrease from expectations). Additional messages at the bottom of the Summary report are pointers to their longer versions which provide more information. We'll see some examples later.

Parameters and Selection

The Parameters and Selection report shows you the dates and times you selected for the control and study periods, as well as the dates and times that were actually found on the input. The full report contains more parameter information, but Figure 2 shows you just the first part which contains the date and time selection for our example.

Figure 2 - Parameters and Selection

```
                                                   BOXSCORE/BATCH                          23:49 Sunday, April 19, 1998   3
V1R1b (c) Watson & Walker, Inc.               Parameters and Selection
                                                   ABC Corporation

Parameters:                  CONTROL          STUDY            Delta          % Delta   Comments
-----------------            ---------------- ---------------- -------------- --------  ---------
Time Period:
  Requested start of period  03FEB97:00:00:00  04MAR97:00:00:00  *****
  Requested end of period    09FEB97:00:00:00  09MAR97:00:00:00  *****
  Duration of period (HH:MM)     144:00            120:00          -24:00         -16.7%
  Earliest data used         03FEB97:00:00:09  04MAR97:00:00:03  *****
  Latest data used           08FEB97:23:59:51  08MAR97:23:59:45  *****
  Actual duration (HH:MM)        144:00            120:00          -24:00         -16.7%
```

CPU Comparison Report

The CPU Comparison report (Figure 3) provides the full comparison between the control period and the study period

The CPU Comparison report (Figure 3) provides the full comparison between the control period and the study period. The top section, Data Filtration Results, shows the number of job steps found in the input data, the number after filtration, and the resulting number of sets of matched steps that participated in the analysis. These last fields are counts of unique job sets, e.g. 15 executions of JOB100/STEP010/PROGAAA during the control and 10 more during the study period would count as one set under control and one set under study.

The second section defines the control and study configuration. In our example, SYSA is being moved from an IBM 9672-RX3 to an IBM 9672-R64, with SP 5.2.2 as the operating system. The move is from 10 CPUs to 6 CPUs. During the analysis period, the average CPU busy for the control period was 69.9% busy and that of the study period was 65.5%. You get the best results when both systems are running at about the same CPU utilization. However, note that BoxScore gave a warning that the CPU busy is low. Look at Figure 4 for an example of the complete version of that message, which is printed at the end of the report.

Figure 3 - CPU Comparison Report

```
                                                   BOXSCORE/BATCH                          23:49 Sunday, April 19, 1998   4
V1R1b (c) Watson & Walker, Inc.                    CPU Comparison
                                                   ABC Corporation

Item                              CONTROL          STUDY            Delta      % Delta   Comments
------------------------------    ---------------  ---------------  ---------  --------  ---------
Data Filtration Results:
  Recs found in input data             122778            97828        -24950    -20.3%
  Recs after filtration                 14751            12127         -2624    -17.8%
  Sets matched and analyzed              2670             2670
System Identification:
  System                          SYSA             SYSA
  Model/Version                   9672/0C          9672/56          *****
  Common name for processor       9672-RX3         9672-R64         *****
  Manufacturer                    IBM              IBM
  Number of logical CPUs          10               6                *****              WWCB022-I # of log. CPUs lower
  Number of physical CPUs         10               6                *****              WWCB024-I # of phys. CPUs lower
  MVS Release                     SP5.2.2          SP5.2.2
  LPAR status                     NONE             NONE
  Avg CPU busy                            69.9%            65.5%         -4.4    -6.3%   WWCB069-W CPU busy is low
  Max CPU busy                           100.0%           100.0%          0.0     0.0%
  Min CPU busy                             8.2%            25.4%         17.2   209.8%
Speed of one CPU (physical):
  Expected SU/second                     839.3           1902.3        1063.0   126.6%
  Expected avg MIPS/CPU                   16.7             38.3          21.6   129.5%   WWCB028-I Expected faster CPU
  Expected max MIPS/CPU                   18.6             42.2          23.6   126.7%
  Expected min MIPS/CPU                   15.1             34.8          19.7   130.7%
  Observed MIPS/CPU                       16.7             37.9          21.2   127.2%   WWCB030-I CPU is faster
Machine capacity (physical):
  Expected avg MIPS                      166.8            229.7          62.9    37.7%   WWCB032-I Expect more capacity
  Expected max MIPS                      186.0            253.0          67.0    36.0%
  Expected min MIPS                      151.0            209.0          58.0    38.4%
  Observed MIPS                          166.8            227.4          60.6    36.3%   WWCB034-I More capacity observed

Remarkable Programs (Job/Step/PGM)
  Best outcome (CPU speed)
    RABDD200/STEP0200/SORT                16.7             69.1          52.4   314.2%   WWCB044-W Large variance from average
  Worst outcome (CPU speed)
    TRXAD050/STEP0170/IKJEFT01            16.7              8.5          -8.2   -48.9%   WWCB045-I Large variance from average
```

The CPU Speed Distribution Plot helps you understand how jobs and transactions varied from the average change

The next section of the CPU Comparison report is the analysis of the control and study periods which shows the expected and observed MIPS per CPU and MIPS per machine. We can see that we are planning to move from a machine with 10 CPUs of 16.7 MIPS/CPU to a machine with only 6 CPUs, but a speed of 38.3 MIPS/CPU. The resulting capacity is expected to go from 166.8 to 229.7 MIPS. The row called 'Observed' shows that BoxScore calculated the average change in MIPS to go from 16.7 to 37.9 instead of the expected 38.3. The change to 37.9 MIPS is a 127.2% increase in speed and a 36.3% increase in capacity for the batch workload.

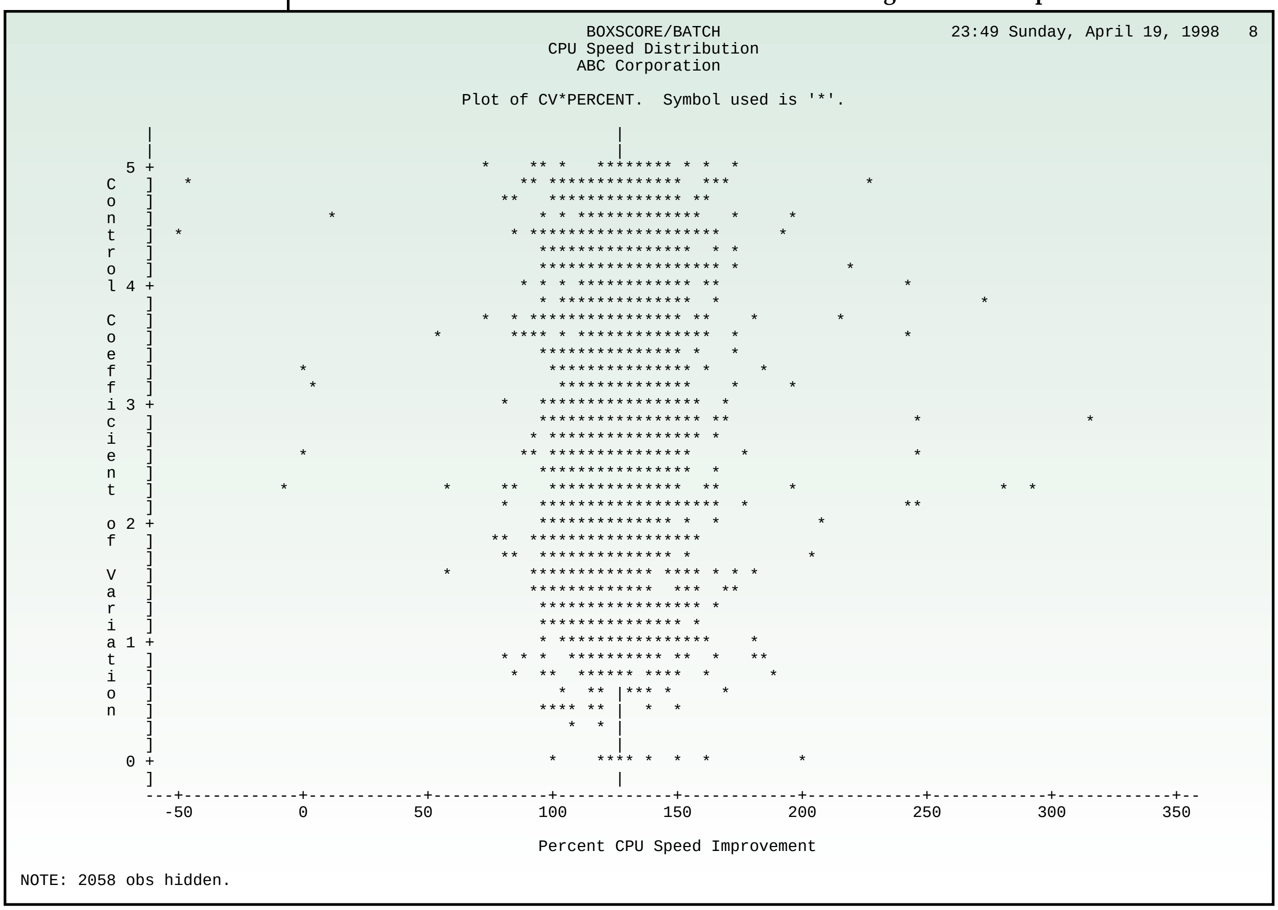
Figure 4 - Complete Messages

```
                                                   BOXSCORE/BATCH                            23:49 Sunday, April 19, 1998  18
V1R1b (c) Watson & Walker, Inc.               Complete Messages by Message Number
                                                    ABC Corporation

WWCB069: CPU busy is low
DESCRIPTION:
  The average CPU busy percent on the Control and/or Study configuration
  was less than 70%.

  It's important to understand that estimates from vendors are typically based on
  benchmarks run on very busy systems (100% for batch and 70% and 90% for online
  benchmarks).  If you are not running your system near capacity, in most cases
  you can expect to see lower job CPU times on these less busy systems.
RECOMMENDATION:
  Use the WINDOW parameter (effective on all but the Batch component) to
  select only a peak period for analysis. If your system never runs near capacity,
  understand that the resulting CPU usage is probably less than it will be when
  full capacity is reached.
```

Figure 5 - CPU Speed Distribution Plot



The last section of the CPU Comparison report shows the two job steps that were most affected by the processor upgrade. The best outcome was job RABDD200, step STEP0200, program SORT which saw a 314.2% improvement, while job/step/program TRXAD050/STEP0170/IKJEFT01 had worse performance by about 48.9% on this faster CPU. We'll see more about these later.

Figure 6 - Long Messages

```
WWCB044: Large variance from average
DESCRIPTION:
  The set of records with the best outcome is significantly higher than the
  average of all stable jobs. This could occur for one of the following reasons:

  1.  A change was made to the program between the analysis periods.

  2.  The work is very susceptible to the hardware changes made between the two
  machines. An example of this might be the higher CPU times on IBM and HDS
  CMOS processors for extensive use of packed decimal arithmetic. Some
  processors are also very different on how they handle hardware data
  compression.

  3.  The work was run at a different time of day during the two periods of
  analysis.
RECOMMENDATION:
  If a change was made to the program between the analysis periods, you
  should eliminate the set of records from analysis by excluding it with the
  EXCLUDE parameter. If the CONTROL was an IBM 9672 or HDS Pilot machine, look
  at message WWCB070 for more information about the CMOS and packed decimal
  arithmetic phenomenon. If you think there might be other work that is similar to
  this one, then leave the higher speed rating in the analysis.
```

CPU Speed Distribution Plot

The CPU Speed Distribution plot in Figure 5 shows how the stable job steps reacted. The vertical line shows the average increase in MIPS (127.2%) while each job step is plotted by using the coefficient of variation and the average increase. The points at the top of the plot are, therefore, the most variable, and the points at the bottom are the most stable. Notice that some steps show up with as much as a 48.9% decrease in speed and 314% increase in speed. Figure 6 shows one of the complete messages produced by these significant steps.

The Programs (or Transactions) With Best/Worst Outcome report shows you the work most affected by the change

Programs With Best/Worst Outcome

To find out more about the significant steps and whether you should be concerned about them, look at the reports in Figure 7, the Programs With Best Outcome and the Programs With Worst Outcome. As a default, the ten best and the ten worst job steps are reported, but you can request more or less job steps or transactions to be printed. In this example, we see that RABDD200/STEP0200/SORT is a step that averages 3.5 minutes of CPU time each run (1060.5 sec / 5 transactions) and it was improved by 314%. The question is, "Was the change due to the processor upgrade or to an application change?". If you know that the application was changed, you can run BoxScore again while excluding that step from analysis, and look at the new results.

Selected Execution Details Report

A detail report is also available if you want to find out more about each execution of the job steps. The Selected Execution Details report in Figure 8 is a list of the executions showing one line per execution of the step. As a default, the details for the Best and Worst step are printed, although you could have this detail printed for any of the job steps. We can see from this report that the number of EXCPs for the best job step (RABDD200/STEP0200/SORT) differed by about 40% for the two periods, and the CPU time was dramatically different (8ms per I/O versus 2ms). In this situation, the upgrade also included a memory upgrade, so the resulting CPU reduction is in part due to the memory upgrade. Since the SORT program is most affected by memory, you could run BoxScore and exclude all SORTs to find the results without the memory effect on SORT.

Figure 7 - Programs With Best Outcome

```
                                                    BOXSCORE/BATCH                    23:49 Sunday, April 19, 1998   9
V1R1b (c) Watson & Walker, Inc.               Programs With Best Outcome
                                                    ABC Corporation

Item Description             CONTROL          STUDY            Delta          % Delta   Comments
-----------------            ---------------  ---------------  -------------  --------  ---------
Job/Step/Pgm With Best Outcome:

  1: RABDD200/STEP0200/SORT
    Average CPU/IO, MSec           8.1              2.0              -6.1       -75.9%  WWCB053-W Large variance from average
    Observed MIPS/phys CPU        16.7             69.1              52.4       314.2%
    Rec count                     5                4                 -1.0       -20.0%
    Total EXCP count            131028           75742           -55286.0       -42.2%
    Transactions                  5                4                 -1.0       -20.0%
    Average Users                 5                4                 -1.0       -20.0%
    Total CPU time, seconds     1060.5            148.0            -912.5       -86.0%
    Coefficient of variation       2.9              0.5              -2.3       -82.1%

  2: PGJAD610/STEP0110/EASYTREV
    Average CPU/IO, MSec           9.7              2.5              -7.3       -74.6%  WWCB053-W Large variance from average
    Observed MIPS/phys CPU        16.7             65.6              49.0       293.5%
    Rec count                     6                4                 -2.0       -33.3%
    Total EXCP count            5880             4250             -1630.0       -27.7%
    Transactions                  6                4                 -2.0       -33.3%
    Average Users                 6                4                 -2.0       -33.3%
    Total CPU time, seconds       57.2             10.5             -46.7       -81.6%  WWCB055-I Small CPU usage
    Coefficient of variation       2.4              1.3              -1.0       -44.4%

  3: PSAPD140/STEP0100/GVRESTOR
    Average CPU/IO, MSec           9.4              2.5              -6.9       -73.6%  WWCB053-W Large variance from average
    Observed MIPS/phys CPU        16.7             63.3              46.6       279.5%
    Rec count                     6                5                 -1.0       -16.7%
    Total EXCP count            1533             2323               790.0        51.5%
    Transactions                  6                5                 -1.0       -16.7%
    Average Users                 6                5                 -1.0       -16.7%
    Total CPU time, seconds       14.3              5.7              -8.6       -60.1%  WWCB055-I Small CPU usage
    Coefficient of variation       2.4              1.8              -0.6       -24.2%

  4: PSAPD305/STEP0015/SORT
    Average CPU/IO, MSec          74.8             20.0             -54.8       -73.2%  WWCB053-W Large variance from average
    Observed MIPS/phys CPU        16.7             62.4              45.7       273.8%
    Rec count                     5                4                 -1.0       -20.0%
    Total EXCP count              42               20               -22.0       -52.4%
    Transactions                  5                4                 -1.0       -20.0%
    Average Users                 5                4                 -1.0       -20.0%
    Total CPU time, seconds        3.1              0.4              -2.7       -87.3%  WWCB055-I Small CPU usage
    Coefficient of variation       3.8              0.0              -3.8      -100.0%

  5: PSAPD140/STEP0120/GVRESTOR
    Average CPU/IO, MSec          16.7              4.8             -11.9       -71.2%  WWCB053-W Large variance from average
    Observed MIPS/phys CPU        16.7             57.8              41.2       246.8%
    Rec count                     6                5                 -1.0       -16.7%
    Total EXCP count             443              595               152.0        34.3%
    Transactions                  6                5                 -1.0       -16.7%
    Average Users                 6                5                 -1.0       -16.7%
    Total CPU time, seconds        7.4              2.9              -4.5       -61.3%  WWCB055-I Small CPU usage
    Coefficient of variation       2.5              1.0              -1.6       -62.5%
```

Figure 8 - Selected Execution Details

```
                                                    BOXSCORE/BATCH                    23:49 Sunday, April 19, 1998  22
                                              Selected Execution Details
                                                    ABC Corporation

                                                                                                   Average     CPU/IO
Jobname  Stepname Program  P    Start date/time      End date/time    Elapsed  CPU Time    EXCPs    Steps  Users        MSec Not Sel

RABDD200 STEP0200 SORT     C   03FEB97:21:36:33   03FEB97:21:41:09   0:04:35   0:03:32    26136       1    1.0          8.1
                               04FEB97:21:37:56   04FEB97:21:42:30   0:04:33   0:03:27    26175       1    1.0          7.9
                               05FEB97:21:35:25   05FEB97:21:40:47   0:05:22   0:03:43    26211       1    1.0          8.5
                               06FEB97:21:45:20   06FEB97:21:50:07   0:04:47   0:03:29    26219       1    1.0          8.0
                               07FEB97:21:34:13   07FEB97:21:38:45   0:04:32   0:03:30    26287       1    1.0          8.0
-------------------------- -                                        --------- --------- -------- ------- ------- ----------
RABDD200 STEP0200 SORT     C                                         0:23:50   0:17:41   131028       5    5.0         40.5

RABDD200 STEP0200 SORT     S   04MAR97:21:25:20   04MAR97:21:26:43   0:01:23   0:00:37    18882       1    1.0          2.0
                               05MAR97:21:28:25   05MAR97:21:30:08   0:01:42   0:00:37    18894       1    1.0          2.0
                               06MAR97:21:30:01   06MAR97:21:31:52   0:01:50   0:00:37    18978       1    1.0          2.0
                               07MAR97:21:27:41   07MAR97:21:29:04   0:01:23   0:00:37    18988       1    1.0          1.9
-------------------------- -                                        --------- --------- -------- ------- ------- ----------
RABDD200 STEP0200 SORT     S                                         0:06:18   0:02:28    75742       4    4.0          7.8
RABDD200 STEP0200 SORT                                               0:30:09   0:20:09   206770       9    9.0         48.3
```

2) The current license renewal fee for succeeding years is $1995 per year. Watson & Walker may from time to time increase the renewal fee but such increased fee shall not exceed the renewal fee paid by Customer for the period immediately prior to such increase by more than five percent (5%). Renewal invoices will be issued approximately 60 days prior to the annual expiration. Payment of the renewal invoice constitutes a renewal of this agreement. Non-payment constitutes cancellation of this agreement and Customer will remove the Software from Customer's system, communicate in writing that the Software has been removed and return all materials including the tape(s) and user manual to Watson and Walker. Customer will pay a reinstatement fee equal to the full license fee in effect at the time of reinstatement in order to receive any future copies of the Software.

B. The Customer agrees not to disclose, or otherwise make available the Software, or any Software related information (including but not limited to disk or tape files, diagnostic information, test results, screen images, printed output, product manuals, etc.) to any person other than employees of Customer or consultants performing work for the Customer who have a need to have such knowledge for normal commercial use of the Software. The Customer will use all reasonable efforts to allow the Software to be used only on Customer-controlled hardware authorized under this Agreement or Customer-controlled back-up hardware, and only by Customer's employees, or consultants performing work for the Customer on the Customer's premises.

C. Customer acknowledges that the Software is licensed for use only at the installation site set forth in Schedule A (BoxScore Order Form) attached hereto.

D. The Customer will keep records of where the Software is used, designate technical support contact(s) and other information on the form(s) provided by Watson & Walker, and will explain the terms of this Agreement to those affected by it.

E. If the customer believes the Software is being used in violation of this Agreement, Customer will promptly notify Watson & Walker in writing and cooperate in Watson & Walker's investigation and resolution of the situation.

F. The Customer acknowledges that Software and its components are protected by copyright and that they constitute a valuable asset to Watson & Walker. The Customer will use its best efforts not to permit anyone having access to the Software to modify, reverse engineer, or decompile the Software; or to mask, modify, or suppress any copyright notices or other proprietary rights notices, or fail to properly label any authorized copy; or to timeshare, rent or otherwise use the Software except as specifically permitted in this Agreement.

G. The Customer further agrees to exercise, with respect to the Software or any information pertaining to the Software, the same care and discretion to avoid disclosure, publication or dissemination as the Customer uses with respect to similar information of its own which it does not desire to have copied, disclosed, published or disseminated.

4. **General License Terms:**

A. Limitations of Liability:

1. The Customer agrees that Watson & Walker's liability to the Customer based on the parties' agreement and/or use of the Software, excluding liability for copyright, patent, trade secret or other proprietary rights violations under section 2(E) of this Agreement, will not exceed the Customer's current-year license or renewal fee paid for the Software.
2. The Customer agrees that Watson & Walker will not be liable for any lost profits or other consequential damages, even if Watson & Walker has been advised of the possibility of such damages.
3. The Customer further agrees that Watson & Walker will not be liable for any claim or demand against the Customer by anyone else except for a claim of copyright, patent, trade secret or other proprietary rights violations under section 2(E) of the Agreement.

B. The Customer's remedies as described in section 2(D) are exclusive.

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C. The Customer may make a non-supported copy of the Software to meet its security, installation, and restart and recovery needs. If the Customer's recovery needs include access by a disaster recovery contractor, that contractor's employees shall be considered the Customer's employees under this Agreement, and the Customer will remain responsible for any use of the Software in violation of this Agreement. The Customer will provide the name and address of the disaster recovery contractor to Watson & Walker before the Customer delivers a copy of the Software to the disaster recovery contractor.

D. This agreement is governed by the laws of the United States and of Florida. If any part of this agreement is held to be unconscionable or otherwise invalid, that part will be omitted, but the balance will remain in full force and effect. Customer agrees to pay the reasonable costs and attorney's fees of Watson and Walker whether for negotiation, trial, appellate proceedings, or other legal action necessary in the enforcement of this agreement.

E. This Agreement, any supplements, and invoices arising under it constitute the complete and exclusive statement of the parties' agreement about the Software, which supersedes all prior communications relating to the subject matter of this Agreement. Additional or conflicting terms on any current or future Customer purchasing documents are rejected. This Agreement can be modified only in writing signed by both parties. Both Watson & Walker and the Customer have read this Agreement, understand it, and accept its terms.

F. Watson & Walker, Inc. warrants that the Software meets the Year 2000 Compliance Standard and will record, store, and process and present calendar dates falling on or after January 1, 2000 in the same manner, and with the same functionality as the Software did on or before December 31, 1999. Watson & Walker's representative will consult with Customer's management as needed at no additional charge to ensure that the Software will lose no functionality with respect to the introduction of records containing dates falling on or after January 1, 2000 and to ensure that the Software will be interoperable, with respect to Year 2000 issues, with other Software used by Customer which may deliver records, receive records or interact with the Software in the course of processing data.

Accepted by:

Watson & Walker, Inc.

By (signature) ____________________________________

print____

title____

on ____

Customer.

By (signature) ____________________________________

print____

title____

on ____

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Schedule A to Master License Agreement
(BoxScore Order Form)

1 **Site Location**
(Where software is to be installed)

Company Name

Site Name

CPU Manufacturer

CPU Model Type / Serial Number

Approximate total MIPS at this site

CPU Location (*Street Address, Bldg.)*

City, State, Country

Zip/Postal Code

2 **Ordered by**

Name

Title

Company

Room, Floor, Dept. or Mail Code

Street address

City, State, Country

Zip/Postal Code Telephone

email

3 **Technical Contact**
(Designated to receive updates, support, etc.)

Name

Title

Company

Room, Floor, Dept. or Mail Code

Street address

City, State, Country

Zip/Postal Code Telephone

email

Fax Number

4 **Billing Address**
(Where invoices and renewals are sent)

Company

ATTN:

Street Address

Room, Floor, Dept. or Mail Code

City, State, Country

Zip/Postal Code Telephone

email

Fax Number

SHIP TO: (*circle one*) **1 2 3 4**
MEDIA *(circle one)* **Tape Diskette Email**

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