

"A Little SAS[®] Magic:

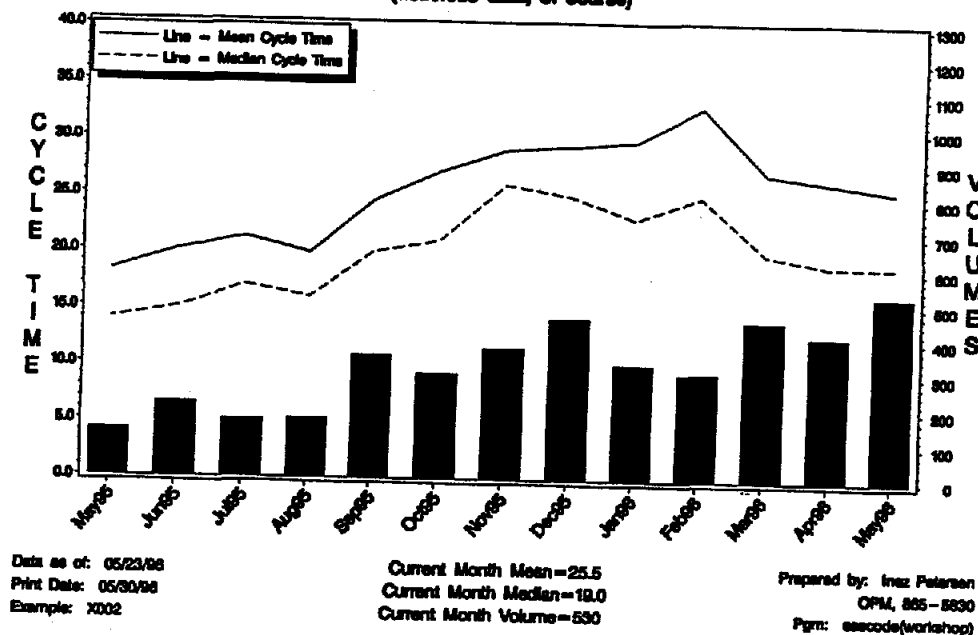
A Lineplot and Vbar in One Easy Step"

Presented by Inez P. Petersen, Boeing Information & Support Services

Featured Tools

- ☑ Proc SORT, Proc UNIVARIATE, Proc PRINT, and Proc GPLOT
- ☑ Plot and plot2 statements
- ☑ Determine "numobs" w/o reading dataset
- ☑ FORMAT and LABEL statements
- ☑ IF-THEN-ELSE logic and DO Loops
- ☑ Partial fielding (aka substring)
- ☑ Data _null_ step (call symput)
- ☑ Footnotes and titles using macro variables
- ☑ Automated horizontal axis
- ☑ Varied use of symbol statements; interpol=needle
- ☑ "IN" SAS operator
- ☑ MACRO examples

Cycle Time vs Volumes
ENGINEERING GROUP
(fictitious data, of course)



OVERVIEW

This workshop is a potpourri of SAS programming intended to spark your imagination about ways to do your own coding. The graph itself uses symbol statements to create multiple lineplots, as well as to produce what appears to be vertical bars. The "journey" which leads ultimately to this end product will expose you to a variety of SAS procedures and SAS statements, and it is this journey which I hope you will find informational. It goes without saying that the source data is fictitious, as is the reference to "group" and "company total."

"PLAIN VANILLA" APPROACH

Situation: A customer comes to you with a "need it now" requirement for:

- ☒ Graphs to depict task cycle times against task volumes
- ☒ Summary back-up data

You take the "plain vanilla" approach (as shown on Attachment A) to produce it quickly. (This example is based on a job which runs on TSO batch.)

THE PROGRAM

Set options

```
OPTIONS MPRINT SYMBOLGEN MACROGEN MLOGIC ;
GOPTIONS DEVICE=GDDMFAM4 GDDMNICKNAME=IBM3800 GDDMTOKEN=IMG240X ;
```

```
goptions gunit=pct
         cback=white
         htitle=6
         htext=3
         vpos=80
         hpos=160
         vsize=7.5 in
         hsize=10.0 in
         vorigin=0.4 in
         hororigin=0.4 in
         ftext=swiss ;
```

Data Step

```
data sasfill ;
  infile 'hws.ipp.myfile' ;
  %include 'mtl004.input.cntl(myfile)';
  if yymm gt "9504" and respcode in('SW','BB','XX') then output ;
run;
```

Proc Sort

```
proc sort data=sasfill out=sasfill;
  by respcode yymm ; run ;
```

Proc Univariate

```
proc univariate data=sasfill noprint;
  output out=sasfil2
    n=tasks
    mean=avgcycle
    median=medcycle ;
  var cycles ;
  by respcode yymm ; run ;
```

Proc Print

```
proc print data=sasfil2 noobs ;
  var respcode yymm tasks avgcycle medcycle ;
  title4 "Detail Backup - Plain Vanilla Version" ;
run ;
```

Proc Gplot

```
goptions reset=(title) ;
proc gplot data=sasfil2 nocache;
  plot (avgcycle medcycle) * yymm / overlay
    vzero
    hminor=0
    haxis=axis1
    vaxis=axis2
    legend=legend1
    frame
  ;
  plot2 tasks * yymm /
    vzero
    hminor=0
    haxis=axis1
    vaxis=axis3
    legend=legend2
    frame;
  by respcode ;

  axis1 offset=(3) label=none v=(a=50 h=2.35) ;
  axis2 label= ('CYCLE TIME')
    value=(h=1.85) ;
  axis3 label= ('VOLUMES')
    value=(h=1.85) ;
```

Proc Gplot - contd

```
legend1 label=none
        across=1
        position=(top inside left )
        shape=symbol(6,3)
        value=(height=1.85 'Line = Mean Cycle Time'
                  'Line = Median Cycle Time' )
        mode=protect
        cborder=black
        cshadow=black ;
legend2 label=none ;

symbol1 i=join v=none l=1 ;
symbol2 i=join v=none l=3 ;
symbol3 c=gray i=needle w=100 ;

title1 font=swissb h=4 "Cycle Time vs Volumes" ;
title2 font=swissb h=3 "Plain Vanilla Version" ;

footnote1 h=2.0 j=r "Prepared by: Inez Petersen" ;
footnote2 h=2.0 j=l "Print Date: &sysdate"
           h=2.0 j=r "OPM, 865-5830" ;
footnote3 h=2.0 j=r "Pgm: sascode(workshop)" ;

run ;
```

OOOPS!
Customer is
Back...

Situation: As is the normal in the end-user reporting arena, the customer comes back the next day with expanded requirements; he likes what you did yesterday but now he wants:

- ☒ A "Total Company" view
- ☒ Graphs that contain information on current-month actuals
- ☒ Better titles
- ☒ A separate back-up report for each graph
- ☒ An exception report listing areas for which no graph could be produced
- ☒ And the customer wants to receive data routinely every month
- ☒ Plus you have some efficiencies you want to build into this job

Attachment B shows what you have in mind.

KEY
STEPS -
"CADILLAC"
APPROACH

- ☒ Execute Proc FORMAT
- ☒ Read date card and load macro variables
- ☒ Create SAS datasets from 'external' source data
- ☒ Execute the NUMOBS Macro
- ☒ Execute the LINEBAR Macro
- ☒ Execute the NODATA Macro
- ☒ Print exception report

THE
PROGRAM

```
OPTIONS MPRINT SYMBOLGEN MACROGEN MLOGIC ;
GOPTIONS DEVICE=GDDMFAM4 GDDMNICKNAME=IBM3800 GDDMTOKEN=IMG240X ;
```

Set options

```
goptions gunit=pct
         cback=white
         htitle=6
         htext=3
         vpos=80
         hpos=160
         vsize=7.5 in
         hsize=10.0 in
         vorigin=0.4 in
         horigin=0.4 in
         ftext=swiss ;
```

Execute

Proc FORMAT

```
proc format;
  value $areafmt
    'TOT'='COMPANY TOTAL'
    'BB' ='ENGINEERING GROUP'
    'SW' ='MANUFACTURING GROUP'
    'XX' ='PROCUREMENT GROUP' ;

  value $dat5fmt
    '9501'='Jan95'   '9502'='Feb95'   '9503'='Mar95'
    '9504'='Apr95'   '9505'='May95'   '9506'='Jun95'
    '9507'='Jul95'   '9508'='Aug95'   '9509'='Sep95'
    '9510'='Oct95'   '9511'='Nov95'   '9512'='Dec95'
    '9601'='Jan96'   '9602'='Feb96'   '9603'='Mar96'
    '9604'='Apr96'   '9605'='May96'   '9606'='Jun96'
    '9607'='Jul96'   '9608'='Aug96'   '9609'='Sep96'
    '9610'='Oct96'   '9611'='Nov96'   '9612'='Dec96' ;

  value $status
    '9601'='01/25/96'
    '9602'='02/22/96'
    '9603'='03/28/96'
    '9604'='04/25/96'
    '9605'='05/23/96'
    '9606'='06/27/96'
    '9607'='07/25/96'
    '9608'='08/22/96'
    '9609'='09/26/96'
    '9610'='10/24/96'
    '9611'='11/21/96'
    '9612'='12/31/96' ;
```

Date Card Processing

&qmdate=9605
&qstatus=05/23/96
&qback13=9504

```
data _null_;
  infile 'hws.w.graph.test.sasbuild(datecard)';
  %include 'mtl004.input.cntl(datecard)';
  if _n_ = 1 then do;
    call symput('qmdate',cmodate);
    call symput('qstatus',put(cmodate,$status.));
    call symput('qback13',back13);
  end;
  if _n_ = 1 then stop;
run;
```

INFO: The date card is a one-record file which looks like:
9605 9504
INFO: The input statements look like:
input cmodate \$ back13 \$;

Create SAS Datasets from Source Data

TIP: Sequence "if"
statements in
descending order of
probability

```
data SW BB XX TOT ;
  length respcode $ 3 ;
  infile 'hws.w.ipp.myfile' ;
  %include 'mtl004.input.cntl(myfile)';
  keep yymm respcode cycles ;
  if yymm gt "&qback13" then do ;
    if respcode = 'SW' then output SW ; else
    if respcode = 'BB' then output BB ; else
    if respcode = 'XX' then output XX ;
    if respcode in('BB','SW','XX') then do ;
      respcode = 'TOT' ; output TOT ; end ;
  end ;
run;
```

INFO: LRECL for source data looks like:
input currm2 \$ 2-5
yyymm \$ 9-12
respcode 207\$ 14-15
analcode \$ 17-20

TIP: Use "keep" to
restrict number of
variables

Input statements-contd

sas33c		26-26
sas31c		32-32
sas32c		38-38
rfero	\$	40-45
supref	\$	47-54
date1	\$	56-61
date2	\$	63-68
date3	\$	70-75
tskstat	\$	104-104
cycles		107-112
op_oecd		115-115
df_oecd		118-118
op_need		121-121
df_need		124-124
compcd	\$	127-127
bbp6	\$	130-135
scat	\$	138-144
suppdvv	\$	149-152
frmresp	\$	155-156
date4	\$	159-164
commod	\$	167-174
ms_oecd		176-181
ms_need		183-188 ;

Initialize Another SAS Dataset

(which will contain notes, notes to be merged into dsn later)

```
data nograph ;
  infile 'mtl004.sascode.cntl(nograph)' ;
  %include 'mtl004.input.cntl(nograph)' ;
run ;
```

Load Macro Variables and Execute MACRO's

```
%let n = 0 ;
%let sasfil1 = TOT ;
%let sasfil2 = TOT2 ;
%let sasfil3 = TOT3 ;
%let graph = X001 ;
%NUMOBS ;
%LINEBAR ;
%NODATA ;
```

Reinitialize macro variables

```
%let n = 0 ;
%let sasfil1 = BB ;
%let sasfil2 = BB2 ;
%let sasfil3 = BB3 ;
%let graph = X002 ;
%NUMOBS ;
%LINEBAR ;
%NODATA ;
```

```
%let num = 0 ;
%let sasfil1 = SW ;
%let sasfil2 = SW2 ;
%let sasfil3 = SW3 ;
%let graph = X003 ;
%NUMOBS ;
%LINEBAR ;
%NODATA ;
```

```
%let num = 0 ;
%let sasfil1 = XX ;
%let sasfil2 = XX2 ;
%let sasfil3 = XX3 ;
%let graph = X004 ;
%NUMOBS ;
%LINEBAR ;
%NODATA ;
```

Macro NUMOBS

(loads a global macro variable)

```
%macro NUMOBS(dsn) ;
  %global num ;
  data _null_ ;
    if 0 then set &sasfil1 nobbs=count ;
    call symput('num',left(put(count,8.))) ;
  stop; run ;
%mend NUMOBS ;
```

NOTE: The number of observations is available upon data compilation, so there is no need to read dataset; use of a global var makes the number of obs available for processing outside the Macro NUMOBS.

Macro LINEBAR

Reset Goptions

```
%macro LINEBAR;
```

```
goptions reset=(title footnote symbol);
```

Is it value-added to execute this macro?

```
%if &num ne 0 %then %do ;
```

Initialize Variables Before Processing Begins

```
%let qmean = 0 ;  
%let qmed = 0 ;  
%let qtasks = 0 ;  
%let qyymm = ' ' ;  
%let qtitle2 = ' ' ;
```

Sort for Univariate and to Facilitate Data _Null_ Step

```
proc sort data=&sasfill out=&sasfill;  
by descending yymm cycles;  
run;
```

Compute Variables to be Graphed (volume, mean, and median)

```
proc univariate data=&sasfill noprint;  
output out=&sasfil2  
  n=ntasks  
  mean=avgcycle  
  median=medcycle ;  
var cycles ;  
id respcode ;  
by descending yymm ; run ;
```

Format Numeric Variables

```
data &sasfil3 ;  
set &sasfil2 ;  
format avgcycle medcycle 4.1 ;  
format tasks 4. ;  
run ;
```

Load Variables for Use in Headers and Footers

```
data _null ;  
set &sasfil3;  
  
if _n_ = 1 then do ;  
call symput('qsysdat',left(put("&sysdate"d,mmdyy8.)));  
call symput('qyymm',yymm) ;  
call symput('qtitle1','Cycle Time vs Volumes') ;  
call symput('qtitle2',trim(put(respcode,$respfmt.))) ;  
call symput('qtitle3','(fictitious data, of course)');  
  
if "&sysdate"d gt "31DEC96"d then  
  ordervar = " '9512' '9601' '9602' '9603' '9604' '9605' '9606'  
             '9607' '9608' '9609' '9610' '9611' '9612' " ;  
else  
if "&sysdate"d gt "21NOV96"d then  
  ordervar = " '9511' '9512' '9601' '9602' '9603' '9604' '9605'  
             '9606' '9607' '9608' '9609' '9610' '9611' " ;  
else  
if "&sysdate"d gt "24OCT96"d then  
  ordervar = " '9510' '9511' '9512' '9601' '9602' '9603'  
             '9604' '9605' '9606' '9607' '9608' '9609' '9610' " ;  
else  
if "&sysdate"d gt "26SEP96"d then  
  ordervar = " '9509' '9510' '9511' '9512' '9601' '9602' '9603'  
             '9604' '9605' '9606' '9607' '9608' '9609' " ;  
else  
if "&sysdate"d gt "22AUG96"d then  
  ordervar = " '9508' '9509' '9510' '9511' '9512' '9601' '9602'  
             '9603' '9604' '9605' '9606' '9607' '9608' " ;  
else  
if "&sysdate"d gt "25JUL96"d then  
  ordervar = " '9507' '9508' '9509' '9510' '9511' '9512' '9601'  
             '9602' '9603' '9604' '9605' '9606' '9607' " ;  
else  
if "&sysdate"d gt "27JUN96"d then  
  ordervar = " '9506' '9507' '9508' '9509' '9510' '9511' '9512'  
             '9601' '9602' '9603' '9604' '9605' '9606' " ;
```

Create Variable Based on System Date Which Will Be Used for Horizontal Axis

Load Variables to be Used in Footnotes

```

else
if "&sysdate"d gt "23MAY96"d then
  ordervar = " '9505' '9506' '9507' '9508' '9509' '9510' '9512'
            '9512' '9601' '9602' '9603' '9604' '9605' " ;

call symput('qorder',ordervar);
end;

if _n_ = 1 and yymm = "&qmdate" then do ;
  call symput('qmean',left(put(avgcycle,4.1))) ;
  call symput('qmed',left(put(medcycle,4.1))) ;
  call symput('qtasks',left(put(tasks,4.1))) ;
end ;

if _n_ = 2 then stop ; run ;

```

NOTE: If there is no current month data, do not execute step.

Print Back-up Reports

```

title1 " " ;
title2 "EXAMPLE &graph" ;
title3 "&qtitle1" ;
title4 "Detail Backup - &qtitle2" ;
title5 "&qtitle3" ;
proc print data=&sasfil3 split='*' noobs ;
  label yymm = 'Month'
        tasks = 'Volume*Count'
        avgcycle = 'Mean*Cycle*Time'
        medcycle = 'Median*Cycle*Time' ;
  var yymm tasks avgcycle medcycle ;
  format yymm $dat5fmt. ;
run ;

```

Reset Title Statements

```

goptions reset=(title) ;

```

Conditional execution of proc GPLOT

plot=line plots

Plot2 creates right axis (and VBAR)

Horizontal axis controlled by &qorder

```

%if &qyymm = &qmdate %then %do;

proc gplot data=&sasfil3 nocache;
  plot (avgcycle medcycle) * yymm / overlay
    vzero
    hminor=0
    haxis=axis1
    vaxis=axis2
    legend=legend1
    frame
    ;
  plot2 tasks * yymm /
    vzero
    hminor=0
    haxis=axis1
    vaxis=axis3
    legend=legend2
    frame;

axis1 offset=(3) label=none v=(a=50 h=2.35)
      order=&qorder ;
axis2 label= ('CYCLE TIME')
      value=(h=1.85)
      order = (0 to 40 by 5) ;
axis3 label= ('VOLUMES')
      value=(h=1.85)
      order = (0 to 1300 by 100) ;

legend1 label=none
  across=1
  position=(top inside left )
  shape=symbol(6,3)
  value=(height=1.85 'Line = Mean Cycle Time'
            'Line = Median Cycle Time' )
  mode=protect
  cborder=black
  cshadow=black ;
legend2 label=none ;

symbol1 i=join v=none l=1 ;
symbol2 i=join v=none l=3 ;
symbol3 c=gray i=needle w=100 ;

```

Create Legend

Interpol=needle creates effect of VBAR

```

title1 font=swissb h=4 "&qtitle1";
title2 font=swissb h=3 "&qtitle2" ;
title3 font=swissb h=2.210"&qtitle3" ;

```

Variables from Data _Null_ Step Used Here

More formatting

```
footnote1 h=2.0 j=1 "Data as of: &qstatus"
           h=2.25 j=c "Current Month Mean=&qmean"
           h=2.0 j=r "Prepared by: Inez Petersen" ;
footnote2 h=2.0 j=1 "Print Date: &qsysdat"
           h=2.25 j=c "Current Month Median=&qmed"
           h=2.0 j=r "OPM, 865-5830" ;
footnote3 h=2.0 j=1 "Example: &graph"
           h=2.25 j=c "Current Month Volume=&qtasks"
           h=2.0 j=r "Pgm: sascode(workshop)" ;
```

```
format yymm $dat5fmt. ;
```

```
run ;
```

```
%end ; %end ;
```

```
%mend LINEBAR;
```

Macro NODATA (Creates a temp dsn, loads comment into it, then appends dsn to existing dataset)

```
%macro NODATA ;
%if &num = 0 %then %do ;
%let comm = "DSN &sasfill - no data selected" ;
data tgraph ;
    length note $ 132 ;
    note = &comm ;
    output ; run ;
data nograph ;
    set nograph tgraph; run ;
%end ;
%mend NODATA ;
```

Reset goptions before further processing

```
goptions reset=(title,footnote) ;
```

Substring and format

```
data nograph ;
    set nograph ;
    area = substr(note,5,3) ;
    format area $areafmt. ;
run ;
```

NOTE: Dataset name is the same as respcode, so format can be used again.

Establish titles and footnotes for exception report

```
title1 ' ' ;
title2 ' ' ;
title3 ' ' ;
title4 font=swissb h=3.0 "CYCLE TIME vs VOLUMES" ;
title5 font=swissb h=3.0
      "'No Graph' Listing (fictitious data, of course)" ;
```

```
footnote1 h=2.0 j=1 "Data as of: &qstatus"
           h=2.0 j=r "Prepared by: Inez Petersen" ;
footnote2 h=2.0 j=1 "Print Date: &qsysdate"
           h=2.0 j=r "OPM, 865-5830" ;
footnote3 h=2.0 j=r "Pgm: sascode(workshop)" ;
proc print data=nograph noobs ;
run ;
```

Print exception report

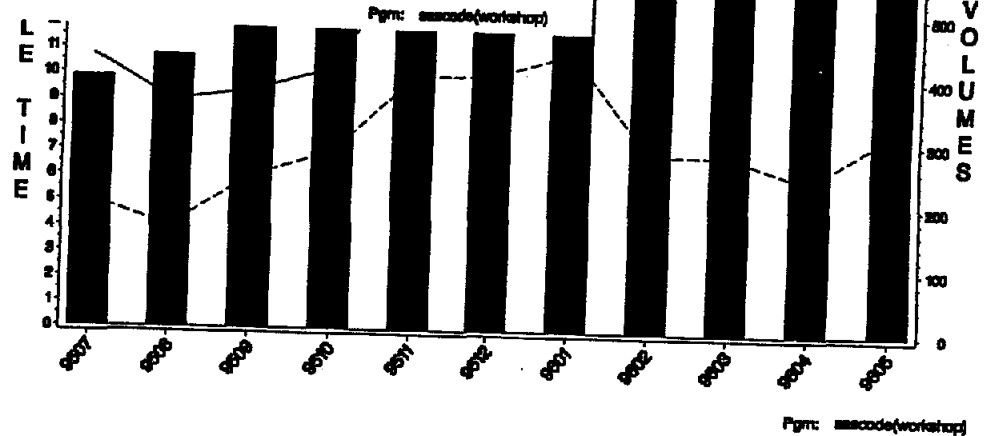
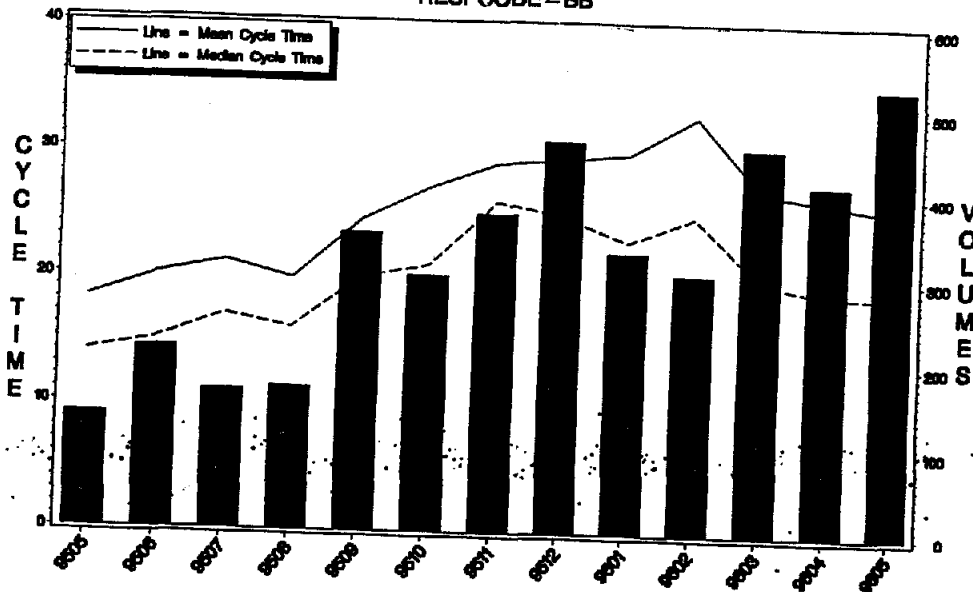
**"A Little SAS Magic:
The "Plain Vanilla" Version "**

Attachment A

Page 1 of 1

Cycle Time vs Volumes

Plain Vanilla Version
RESPCODE=BB



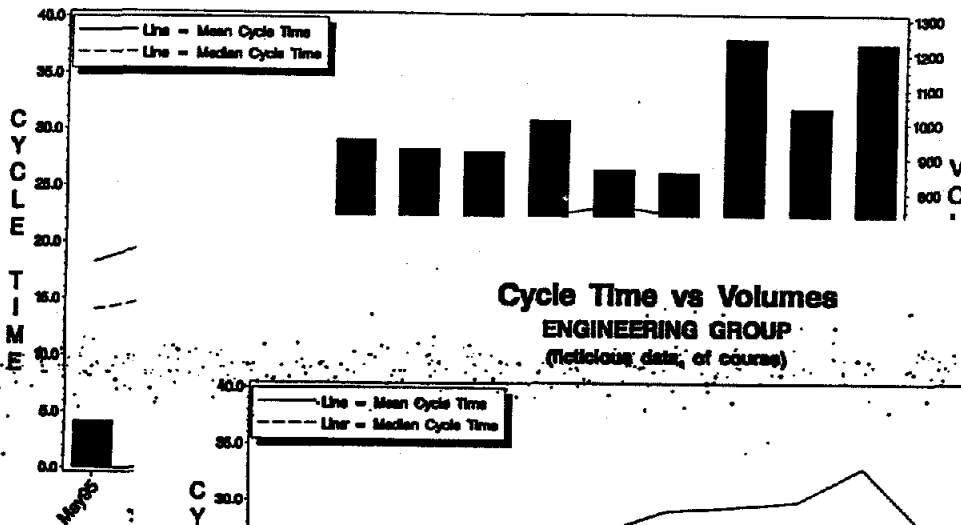
Detail Backup - Plain Vanilla Version

RESPCODE	YYMM	TASKS	AVGCYCLE	MEDCYCLE
BB	9505	136	18.2574	14
BB	9506	215	20.1186	15
BB	9507	165	21.1879	17
BB	9508	170	19.8471	16
BB	9509	353	24.5014	20
BB	9510	303	27.0941	21
BB	9511	376	29.0691	26
BB	9512	463	29.4266	25
BB	9601	332	29.9066	23
BB	9602	307	32.9674	25
BB	9603	457	27.0350	20
BB	9604	414	26.2862	19
BB	9605	530	25.5132	19
SW	9507	394	10.7183	5
SW	9508	428	8.9463	4
SW	9509	596	9.3750	6
SW	9510	619	10.2843	7
SW	9511	539	15.6289	10
SW	9512	544	16.8787	10
SW	9601	532	19.4201	11
SW	9602	549	16.9818	7
SW	9603	786	14.7163	7
SW	9604	631	14.8597	6
SW	9605	701	16.0635	8

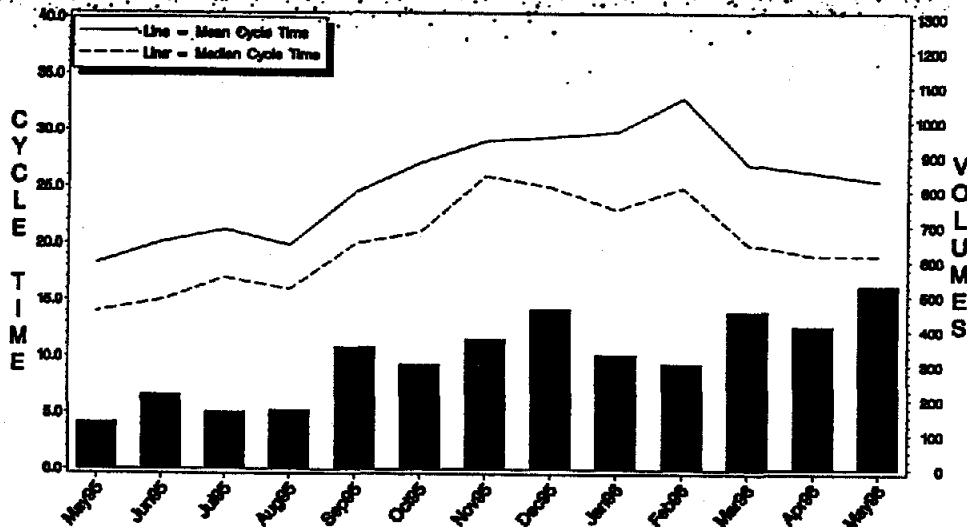
A Little SAS Magic: The "Cadillac" Version

Attachment B
Page 1 of 2

Cycle Time vs Volumes
COMPANY TOTAL
(fictitious data, of course)



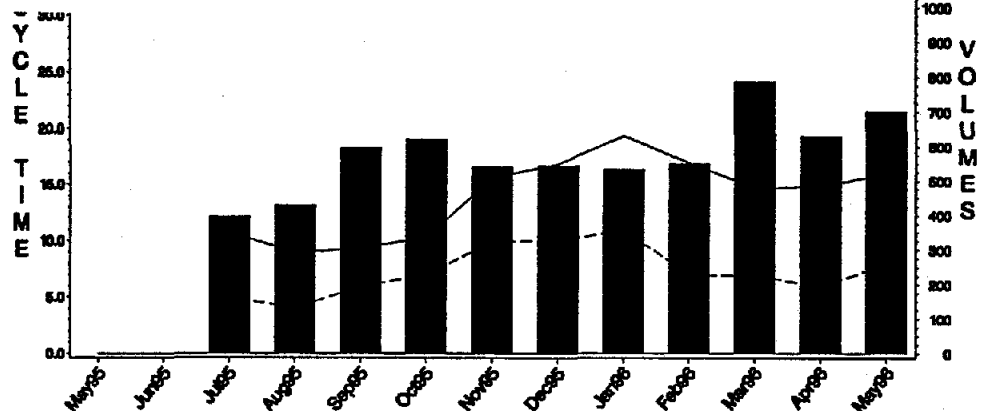
Cycle Time vs Volumes
ENGINEERING GROUP
(fictitious data, of course)



Data as of: 05/23/96
Print Date: 05/30/96
Example: X002

Current Month Mean=25.5
Current Month Median=19.0
Current Month Volume=530

Prepared by: Inez Petersen
OPM, 865-5830
Pgmc: asacode(workshop)



Data as of: 05/23/96
Print Date: 05/30/96
Example: X003

Current Month Mean=18.1
Current Month Median=8.0
Current Month Volume=701

Prepared by: Inez Petersen
OPM, 865-5830
Pgmc: asacode(workshop)

A Little SAS Magic:
The "Cadillac" Version

Attachment B

Page 2 of 2

EXAMPLE X001
Cycle Time vs Volumes
Detail Backup - COMPANY TOTAL
(fictitious data, of course)

Month	Volume Count	Mean Cycle Time	Median Cycle Time
May96	1231	20.1	15.0
Apr96	1045	19.4	14.0
Mar96	1243	19.2	14.0
Feb96	856	22.7	13.5
Jan96	864	23.4	18.0
Dec95	1007	22.6	19.0
Nov95	915	21.2	16.0
Oct95	922	15.8	11.0
Sep95	949	15.0	11.0
Aug95	598	12.0	7.0
Jul95	559	13.8	9.0
Jun95	215	20.1	15.0
May95	136	18.3	14.0

CYCLE TIME vs VOLUMES
'No Graph' Listing (fictitious data, of course)

NOTE **AREA**
DSN XX - no data selected **PROCUREMENT GROUP**

EXAMPLE X002
Cycle Time vs Volumes
Detail Backup - ENGINEERING GROUP
(fictitious data, of course)

Month	Volume Count	Mean Cycle Time	Median Cycle Time
May96	530	25.5	19.0
Apr96	414	26.3	19.0
Mar96	457	27.0	20.0
Feb96	307	33.0	25.0
Jan96	332	29.9	23.0
Dec95	463	29.4	25.0
Nov95	376	29.1	26.0
Oct95	303	27.1	21.0
Sep95	353	24.5	20.0
Aug95	170	19.8	16.0
Jul95	165	21.2	17.0
Jun95	215	20.1	15.0
May95	136	18.3	14.0

EXAMPLE X003
Cycle Time vs Volumes
Detail Backup - MANUFACTURING GROUP
(fictitious data, of course)

Month	Volume Count	Mean Cycle Time	Median Cycle Time
May96	701	16.1	8.0
Apr96	631	14.9	6.0
Mar96	786	14.7	7.0
Feb96	549	17.0	7.0
Jan96	532	19.4	11.0
Dec95	544	16.9	10.0
Nov95	539	15.6	10.0
Oct95	619	10.3	7.0
Sep95	596	9.4	6.0
Aug95	428	8.9	4.0
Jul95	394	10.7	5.0