Subject Index

A
A-optimal designs
See optimal designs, optimality criteria
aberration of a design
See minimum aberration
acceptance probability
double-sampling plan, 2002–2003
PROBACC2 function, 2002
acceptance sampling
evaluating double-sampling plans, 2012
evaluating single-sampling plans, 2011–2012
probability of choosing nonconforming items, 2003, 2005–2008
types of sampling plans, 2011
alias chains, 2036
alias structure
breaking links, example, 497–498
details, 534
examining, 2035–2036
example, 494–495, 509–512
finding, 2035–2036
listing with GLM procedure, 836
syntax, 483
analysis of variance, 523
analyzing designs, 2034
analyzing factorial designs, 2037
Anderson-Darling statistic, 66, 183
Anderson-Darling test, 51
annotating
cdf plots, 100
comparative histograms, 124
example, 782–784
histograms, 159
P-P plots, 283
probability plots, 311
Q-Q plots, 341
Shewhart charts, 1735
augment, factorial design
example, 494, 497
autocorrelation in process data, 1894–1896, 1898–1900, 1902
diagnosing and modeling, 1895–1896
strategies for handling, 1896, 1898–1900, 1902
average and range charts
See \( \bar{X} \) and \( R \) charts
average and range method
GAGE application, 1960
gage studies, 1951, 1968
average and standard deviation charts
See \( \bar{X} \) and \( s \) charts
average chart
GAGE application, 1959
gage studies, 1951, 1967
average charts
See \( \bar{X} \) charts
average outgoing quality
AOQ2 function, 1990
Type B single-sampling, 2011–2012
average run lengths (cusum charts)
See cumulative sum control charts
cusum schemes, 1998–1999
EWMA scheme, 2001–2002
average sample number
ASN2 function, 1991
Type B single-sampling, 2012
average total inspection
ATI2 function, 1994
Type B single-sampling, 2012
axes, Pareto charts, 903, 905
axes, Shewhart charts
See Shewhart charts, axes
axial portion of CCD designs, 2041–2042

B
balanced incomplete block design
See block designs
balanced lattice, 514
Bayesian optimal designs, 812, 823, 835
beta distribution
cdf plots, 101
chi-square goodness-of-fit test, 182
deviation from empirical distribution, 182
EDF goodness-of-fit test, 182
histograms, 159, 175
histograms, example, 193
P-P plots, 284
probability plots, 311
Q-Q plots, 341

block designs
balanced lattice, examples, 514
optimal designs, examples, 808, 837
randomized complete, examples, 498
block specification, FACTEX procedure
block pseudo-factors, 476, 481
block size, 476
block size restrictions, 482
minimum block size, 476
number of blocks, 476, 481
runs per block, 481

block structure
See blocks

blocking, FACTEX procedure
block pseudo-factor, 544
blocking factor, 544
example, 521
incomplete block design, example, 514
randomization, 529
rename block variable, 488

blocks
and aliasing, 2036
default names for, 2028, 2038, 2042
specifying, 2026, 2028, 2031, 2035, 2037–2038, 2042

box charts
box appearance, options, 1739, 1742–1743, 1756, 1765, 1777
box-and-whisker plots, description of, 1132
box-and-whisker plots, style of, 1739
capability indices, computing, 1136
control limit equations, 1133
control limits, specifying, 1746
displaying points, 1739
examples, advanced, 1146
examples, introductory, 1108
labeling axes, 1144
missing values, 1145
notation, 1132
ODS tables, 1139
options summarized by function, 1122, 1124–1127, 1129–1131
outlier identification color, 1754
outlier identification symbol, 1755
overview, 1107
percentile computation, 1143, 1770
plotting character, 1122
reading preestablished control limits, 1120, 1140
reading raw measurements, 1108–1111, 1139–1140
reading subgroup summary statistics, 1111–1114, 1140–1142
reading summary statistics and control limits, 1119, 1142–1143
saving control limits, 1116–1118, 1135–1136
saving subgroup summary statistics, 1114, 1116, 1136–1137
saving summary statistics and control limits, 1118, 1137–1138
schematic box-and-whisker plots, 1151
side-by-side box-and-whisker plots, 1107, 1134, 1150
skeletal box-and-whisker plots, 1150
standard deviation, estimating, 1143
syntax, 1121
tables, creating, 1787
Box-Cox transformations, 2026, 2032–2033
Box-Wilson designs
See central composite designs

C

c charts
central line, 1192
control limit equations, 1192–1193
control limit parameters, 1193
equations, advanced, 1203
equations, introductory, 1170
general, 1170
known number of nonconformities, specifying, 1205–1206
labeling axes, 1201
missing values, 1202
notation, 1191
c charts
ODS tables, 1198
c charts
options summarized by function, 1181, 1183, 1185–1188, 1190
overview, 1169
plotted points, 1191
plotting character, 1181
reading number of nonconformities, 1176–1178, 1199–1200
reading preestablished control limits, 1175–1176, 1199
reading raw data, 1170–1172, 1198–1199
reading subgroup data and control limits, 1200–1201
saving control limits, 1172–1174, 1194–1195
saving nonconformities per unit, 1178–1179
saving number of nonconformities, 1195
saving subgroup data and control limits, 1196–1197
syntax, 1180
tests for special causes, 1203–1205
candidate data set, OPTX procedure
See optimal designs, candidate data set
candidate points, generating with ADXXVERT macro, 2049
capability indices
$C_p(n, \alpha)$, 52
$P_{pk}$ versus $C_p$, 73
assumptions, 73
Boyles’ index $C_{pm}$, 78
computing, 74, 76–78
computing, example, 38
confidence interval, example, 89, 271
confidence limits, 48
estimation from Q-Q plots, 343, 360
estimation from Q-Q plots, example, 369
nonstandard indices, computing, 268
specialized, 78
specification limits, example, 38
specification limits, specifying, 56–57
terminology, 73
tests for normality, 47
the index \( C_{jk} \), 79
the index \( k \), 78
the indices \( C_{pt(5,15)} \), 80
the indices \( C_{pk(5,15)} \), 80
the indices \( C_{pn(a)} \), 79
the indices \( C_{pnk} \), 80
Wright's index \( C_{s} \), 81
CAPABILITY procedure
introduction, 31
learning about, 32
plot statements, 32
cdf plots
annotating, 100
axes, color of, 102
axes, specifying, 108
beta distribution, 101
creating, 94
defining character features, 49, 102, 107
density, 94
exponential distribution, 103
font, specifying, 103
gamma distribution, 103
getting started, 94
legends, 104
lognormal distribution, 104
normal distribution, 106
normal distribution, example, 110
options summarized by function, 97–100
overview, 93
reference lines, example, 111
reference lines, options, 102, 104–105, 107
suppressing empirical cdf, 106
suppressing legend, 105–106
Weibull distribution, 108
center points, example, 496
central composite designs, 2041–2043
centerpoints, 2041–2042
macros for, 2041–2043
centroids, and ADXXVERT macro, 2049
chart description, Shewhart charts, 1750
chi-square goodness-of-fit test, 182
compared to EDF test, 201
classification variable
See comparative histograms
classification variables, OPTEX procedure
See optimal designs, model
classification variables, Pareto charts, 923, 929
clipping points, Shewhart charts
See Shewhart charts, clipping points
coding designs, 2026
See also optimal designs, coding
coding, FACTEX procedure
block factor, 488
design factor, 487
coefficient of variation
computing, 63
collapsing factors, example, 505
coloring Pareto charts
See Pareto charts, coloring
coloring, Shewhart charts
See Shewhart charts, coloring
comparative histograms
annotating, 124
axes, color of, 125
bar width, specifying, 125
bins, specifying, 132
bins, specifying midpoints of, 132
classification variable, missing values of, 132
classification variable, ordering levels of, 134–135
classification variable, specifying, 126–127
color, options, 125–126, 128
columns, number of, 133
color, specifying, 129–130
genes, 116
girds, 129
intervals, information about, 136
kernel density estimation, options, 125, 130, 137
legend, 133, 136
line type, grids, 131
normal distribution, example, 117
normal distribution, options, 134, 137
one-way with inset statistics, example, 138
one-way, example, 116
options summarized by function, 120, 122–124
overview, 115
reference lines, options, 129–131, 136–137
rows, number of, 134
specification limits, 128
specification limits, filled areas, 55–56
suppressing plot features, 133–134
two-way, example, 139
vertical scale, 137
comparative Pareto charts
See Pareto charts, comparative
cumulative form of the cusum chart
See cumulative sum control charts
confidence intervals
See intervals, CAPABILITY procedure
confidence levels, 47
confidence limits, 47–49
basic parameters, 48
confidence levels, 47
distribution-free, 48
for percentiles, 68
normally distributed, 49
percentiles, 48–49
probability of exceeding specifications, 49
process capability indices, 48
quantiles, 48–49
confidence limits, CAPABILITY procedure
confidence level, 48–49, 53, 1744
type, 48–49, 53, 1744
confounding
See alias structure
confounding rules
Subject Index

- compare with alias structure, 534
- design factors, 542
- details, 534
- example, 509
- minimum aberration, 535
- notation, 534
- orthogonally confounded, 544
- partial confounding, example, 509
- run-indexing factors, 542
- searching, 545
- syntax, 483
- unconfounded effects, 543
- connecting points, Shewhart charts, 1746
- constants using functions to calculate, 2013
- constants, control charts
  - A2, 2013
  - A3, 2013
  - B3, 2013
  - B4, 2013
  - B5, 2013
  - B6, 2013
  - c4, 1997
  - c5, 2013
  - D1, 2013
  - d2, 1999
  - D2, 2013
  - d3, 2000
  - D3, 2013
  - D4, 2013
  - E2, 2013
  - E3, 2013
- constrained mixture designs
  - See mixture designs
- constrained mixture experiments
  - ADXMAMD macro, 2046
  - ADXXVERT macro, 2049
- constructing
  - macros for factorial designs, 2034, 2038
  - McLean-Anderson designs, 2046
  - Plackett-Burman designs, 2034, 2038
  - simplex-centroid designs, 2047
  - simplex-lattice designs, 2048–2049
- contamination, variance
  - BAYESACT call, 1995
- control chart functions
  - expected value of range, 1999
  - standard deviation of range, 2000
- control factor design, 532
- control factors, 532
- control factors, example, 518
- control limits, Shewhart charts
  - See Shewhart charts, control limits
- correlated runs, designs with
  - See optimal designs, optimal blocking
- covariance, optimal designs with
  - See optimal designs, optimal blocking
- covariates, optimal designs with
  - See optimal designs, optimal blocking
- Cramér-von Mises statistic, 67
- Cramér-von Mises test, 51
- Cramer-von Mises statistic, 184
- creating designs
  - See macros for experimental design
- cumulative distribution
  - See cdf plots
- cumulative percent curve
  - See Pareto charts, cumulative percent curve
- cumulative sum control charts
  - annotating, 388
  - average run length approach, 429–431
  - central reference value, 430
  - color, options, 417
  - compared with Shewhart charts, 433
  - computational form, 400–403
  - cusum schemes, specifying, 421
  - decision interval, defining, 426–427
  - designing a cusum scheme, 429–431
  - detecting shifts, 418, 421
  - economic design, 430
  - error probability approach, 430
  - examples, advanced, 442
  - examples, introductory, 394
  - FIR (fast initial response) feature, 424–425
  - graphics catalog, specifying, 389
  - headstart values, 418, 424–425
  - interpreting one-sided charts, 427
  - interpreting two-sided charts, 396, 429
  - introduction, 381
  - learning about, 383
  - line printer features, 388–389
  - line types, options, 419
  - line widths, options, 422
  - lineprinter plots, using, 390
  - lower cumulative sum, 424
  - missing values, 441
  - monitoring variability, example, 442–443
  - negative shifts, 424
  - nonstandardized data, 417
  - notation, 423
  - ODS tables, 438
  - one-sided (decision interval) schemes, 400–403, 424
  - options summarized by function, 409–416
  - origin, specifying, 420
  - overview, 393
  - plotting character, 409
  - positive shifts, 424
  - process mean, specifying, 419
  - process standard deviation, specifying, 421
  - reading raw measurements, 388, 394–396, 438–439
  - reading subgroup summary statistics, 389, 397–398, 440–441
  - reference values, specifying, 418
saving cusum scheme parameters, 403–404, 436–437
saving subgroup summary statistics, 399–400, 437
saving summary statistics and cusum parameters, 437
Shewhart charts, combined with, 447–448
standard deviation, estimating, 421, 433–436
suppressing average run length calculation, 419
suppressing display of V-mask, 419
syntax, 388, 408
two-sided (V-mask) schemes, 425–426
two-sided (V-mask) schemes, examples, 394–398
Type 1 error probabilities, 417, 421
Type 2 error probabilities, 417
upper and lower cumulative sum charts, combining, 445–446
upper cumulative sum, 424
V-mask, defining, 427–429
curvature, check for, example, 496
customizing designs, 2026, 2029

cusum charts
See cumulative sum control charts
cusum schemes
designing with CUSUMARL function, 1998–1999

D
D-optimal designs
See optimal designs, optimality criteria
data collection forms, creating, 2031
decoding designs, 2027, 2029
default factor names, 2028, 2038, 2046–2049
density estimation
See kernel density estimation
derived factors, FACTEX procedure
creating, 490
element, 504
descriptive statistics
computing, 61, 63
printing, example, 37
using PROC CAPABILITY, 37
design augmentation, 808, 812, 819, 831
design characteristics, FACTEX procedure
alias structure, 477, 534
confounding rules, 477, 534
design listing, 483
design criteria
See optimal designs, optimality criteria
design of experiments
See macros for experimental design
design size specification, FACTEX procedure
fraction, 476, 491
minimum runs, 476, 492
number of runs, 476, 491
run indexing factors, 476, 491
syntax, 491
design size specification, OPTEX procedure, 819
design, factorial
See factorial design

DETMAX algorithm

See optimal designs, search algorithms
distance from a point to a set, 862
distance-based designs
See optimal designs, space-filling designs
double-sampling plans
See acceptance sampling

E
EDF
See empirical distribution function
effect length, FACTEX procedure
limit, 480
effect length, OPTEX procedure
limit, 814
empirical distribution function
definition of, 65, 182
EDF test compared to chi-square goodness-of-fit test, 201
EDF test statistics, 65–66, 182
EDF test statistics, Anderson-Darling, 66, 183
EDF test statistics, Cramér-von Mises, 67
EDF test statistics, Cramer-von Mises, 184
EDF test statistics, Kolmogorov-Smirnov, 66, 183
EDF test, probability values, 184

estimable effects, 2034
EWMA charts
asymptotic control limits, displaying, 699
asymptotic control limits, example, 720
average run length, computing, 730
axis labels, 717
central line, 703
ccontrol limit equations, 703
control limits, computing, 699, 703
displaying subgroup means, example, 727
designs, advanced, 719
designs, introductory, 678
missing values, 718
notation, 702
ODS tables, 712
options summarized by function, 690–694, 696–698
overview, 677
plotted points, 702
plotting character, 690
plotting subgroup means, 700
probability limits, 699
process mean, specifying, 700
process standard deviation, specifying, 701
reading preestablished control limit parameters, 687–688, 713
reading probability limits, 700
reading raw measurements, 678–680, 712–713
reading subgroup summary statistics, 681, 683–684, 713–714
reading summary statistics and control limits, 686, 714–715
saving control limit parameters, 685, 709–710
saving subgroup summary statistics, 684–685, 710
saving summary statistics and control limits, 686, 710–711
specifying parameters for, 719–720
standard deviation, estimating, 715–717
syntax, 689
varying subgroup sample sizes, 721
weight parameter, choosing, 704
weight parameter, specifying, 701
examine design, FACTEX procedure
See design characteristics, FACTEX procedure
elements, FACTEX procedure
advanced, 493
alias links breaking, 494
center points, 496
collapsing factors, 505
completely randomized, 493
derived factors, 504
design replication, 499, 502
fold-over design, 497
full factorial, 465
full factorial in blocks, 467
getting started, 465
half-fraction factorial, 469
hyper-Graeco-Latin square, 506
incomplete block design, 514
minimum aberration, 507
mixed-level, 502, 504
partial confounding, 509
point replication, 499, 502
pseudo-factors, 504
randomized complete block design, 498
RCBD, 498
replication, 499, 502
resolution III design, 497
resolution IV, 507
resolution IV, augmented, 494
sequential construction, 509
exchange algorithm
See optimal designs, search algorithms
expected value
for range of iid normal variables, 1999–2000
for standard deviation of iid normal sample, 1997–1998
experimental design, macros for
See macros for experimental design
exponential distribution
cdf plots, 103
chi-square goodness-of-fit test, 182
development from empirical distribution, 182
EDF goodness-of-fit test, 182
histograms, 162, 176
P-P plots, 285–286
probability plots, 313
Q-Q plots, 344
exponentially weighted moving average charts
See EWMA charts
extreme vertex designs
See mixture designs
extreme vertices designs, 2049–2050

F
FACTEX procedure
block specification, 480
block specification options, summary, 476
design factor levels, 484
design size options, summary, 476
design size specification, 491
design specification options, summary, 476
examining design characteristics, 482
factor specification options, summary, 476
features, 463
getting started examples, 465
invoking, 480
learning about FACTEX, 464
listing design factors, 483
model specification, 484
model specification options, summary, 476
output, 487
overview, 463
randomization, 490
replication, 489
resolution, 485
statement descriptions, 480
summary of functions, 476
syntax, 475
using interactively, 471
factor names, defaults, 2028, 2038, 2046–2049
factor specification, FACTEX procedure
factor names, 476
levels, 476
factorial designs
examples, See examples, FACTEX procedure
balanced lattice, 514
efficiency, 485
finding, 2039–2040
fractional factorial, minimum aberration, 535
fractional factorial, theory, 541
macros for, 2034–2040
mixed-level, 490
orthogonal, 502
replicate, 489
resolution, 485
factorial portion of CCD designs, 2041
factors, FACTEX procedure
block factor, 525, 544
block pseudo-factor, 525, 534, 544
derived factor, 525
design factor, 525
design factor coding, 487
design factor levels, 484
design factor names, 484
pseudo-factor, 525
rung-indexing factor, 526, 534, 542
types, 525
Fedorov algorithm
See optimal designs, search algorithms
filling area underneath density
histograms, 163
FIR (fast initial response) feature
See cumulative sum control charts
fold-over design, example, 497
folded normal distribution, histograms
example, 206
fonts, customizing, 2017–2019
fonts, Shewhart charts, 1750
fractional factorial designs
See also factorial design
macros for, 2034–2040
frequency data, Pareto charts, 884–886
frequency tables, 50
full inspection and ASN2 function, 1991
functions
BAYESACT call, 1995–1997
CUSUMARL, 1998–1999
EWMAARL, 2001–2002
for acceptance sampling, 1989
for control chart analysis, 1989
for sampling plans, 1989
PROBMED, 2008–2009
STDME, 2009–2010
summary of, 1989

G
G-optimal designs
See optimal designs, optimality criteria
GAGE application
See gage studies
average and range method, 1960
average chart, 1959
data set format, 1975
entering data, 1955, 1957, 1965
gage catalog, 1953
introduction to, 1951
invoking, 1953
missing data, 1962
range chart, 1957
reading data set, 1965
saving data, 1963
variance components method, 1962
gage catalog, 1953
gage repeatability and reproducibility
average and range method, 1970
introduction to, 1951
variance components method, 1974
gage studies
See GAGE application
average and range method, 1951, 1968
average chart, 1951, 1967
example, 1953
introduction to, 1951
measurement system, 1951–1952
missing data, 1975
part-to-part variation, average and range method, 1970
part-to-part variation, average chart, 1959, 1967–1968
part-to-part variation, variance components method, 1974
range chart, 1951, 1966
repeatability, 1951–1952
repeatability and reproducibility, 1951
repeatability and reproducibility, average and range method, 1970
repeatability and reproducibility, variance components method, 1975
repeatability, average and range method, 1968
repeatability, range chart, 1957, 1966
repeatability, variance components method, 1974
reproducibility, 1951–1952
reproducibility, average and range method, 1970
reproducibility, average chart, 1959, 1967
reproducibility, variance components method, 1974
terminology, 1952
variance components method, 1951, 1972
gamma distribution
cdf plots, 103
chi-square goodness-of-fit test, 182
deviation from empirical distribution, 182
EDF goodness-of-fit test, 182
histograms, 163, 177
P-P plots, 286–287
probability plots, 314
Q-Q plots, 344–345
generalized faces and ADXXVERT macro, 2049
generalized moving average charts
See EWMA charts
generating started, CAPABILITY procedure
adding insets to plots, 216
creating histograms, 146
cumulative distribution plot, 94
distribution of variable across classes, 116
prediction, confidence, and tolerance intervals, 242
probability plot, 300
probability-probability plot, 278
quantile-quantile plot, 334
saving summary statistics, 258
summary statistics for process capability, 37
generating started, CUSUM procedure
adding insets to plots, 452
generating started, MACONTROL procedure
adding insets to plots, 788
generating started, SHEWHART procedure
adding insets to plots, 1714
Gini’s mean difference, 52
GLM procedure, 523–524
global macro variables, 2029
goodness-of-fit test
   See chi-square goodness-of-fit test
   See empirical distribution function
Graeco-Latin square, 506
graphical output, Pareto charts, 901
graphics catalog, specifying
   CAPABILITY procedure, 50
grid options, Shewhart charts, 1750, 1757, 1799

H
hanging histograms, 164
headstart values in cusum schemes, 1998
histograms
   comparative, See comparative histograms
   adding summary statistics, 152
   annotating, 159
   axis color, 161
   axis scaling, 173
   bar width, 168
   bars, suppressing, 169
   beta distribution, 159, 175
   beta distribution, example, 193
   capability indices, based on fitted distribution, 165
   capability indices, based on fitted distribution, computing, 185–186
   capability indices, based on fitted distribution, example, 202–203
   changing midpoints, example, 152
   chi-square goodness-of-fit for fitted distribution, 182
   color, options, 161–162
   endpoints of intervals, 171
   exponential distribution, 162, 176
   filling area underneath density, 163
   folded normal distribution, annotating, 206
   gamma distribution, 163, 177
   getting started, 146
   graphical enhancements, 190
   interval midpoints, 187
   kernel density estimation, 179
   kernel density estimation, example, 203
   kernel density estimation, options, 160, 165–166, 173
   legend, options, 162, 166, 170
   legends, suppressing, 169
   line type, 166
   lognormal distribution, 166, 177
   midpoints, 167–168
   multiple distributions, example, 195
   normal distribution, 170, 178
   normal distribution, example, 148
   ODS tables, 190
   options summarized by function, 154–157
   output data sets, 170, 187, 189–190
   overview, 145
   percentile axis, 170
   percentiles, 187
   plots, suppressing, 169
   printed output, 180–187
   printed output, capability indices based on fitted distribution, 185–186
   printed output, intervals, 187
   printed output, suppressing, 169–170
   quantiles, 170, 187
   saving curve parameters, 187
   saving goodness-of-fit results, 187
   specification limits, color, 55
   specification limits, example, 146
   specification limits, filled areas, 56
   symbols for curves, 172
   three-parameter lognormal distribution, example, 205
   three-parameter Weibull distribution, example, 205
   tick marks on horizontal axis, 165
   Weibull distribution, 173, 178
   hyper-Graeco-Latin square, example, 506

I
incomplete block design
   See block designs
independent estimate of error, examples, 496, 499
individual measurement and moving range charts
   axis labeling, 1250
   capability indices, computing, 1241
   central line, 1237
   control limit equations, 1238
   examples, advanced, 1251
   examples, introductory, 1214
   interpreting, 1249
   missing values, 1250
   moving range calculation, controlling, 1222–1223
   notation, 1237
   ODS tables, 1244
   options summarized by function, 1225–1226, 1228–1232, 1234, 1236
   overview, 1213
   plotted points, 1237
   plotting character, 1225
   reading measurements, 1214–1216, 1244–1245
   reading measurements and ranges, 1218–1219, 1245, 1247
   reading measurements, ranges, and control limits, 1221, 1247–1248
   reading preestablished control limits, 1221–1222, 1245
   saving control limits, 1219, 1239–1241
   saving measurements and ranges, 1217, 1241–1242
   saving measurements, ranges, and control limits, 1220, 1242–1243
   standard deviation, estimating, 1248
   standard values, specifying, 1253–1254
   syntax, 1224
   tests for special causes, 1251–1253
   univariate plots, displaying, 1255–1256
information matrix, 813, 818
initialization for design search
   See optimal designs, initialization initializing
designs, 2029
macro variables, 2026
inner array, 518, 532
input data sets, Shewhart charts
   See Shewhart charts, input data sets insets
   background color, 228, 1724
   background color of header, 229, 1724
displaying summary statistics, example, 216, 1714
   drop shadow color, 229, 1725
formatting values, example, 217, 1716
   frame color, 229, 1724
getting started, 216, 452, 788, 1714
goodness-of-fit statistics, example, 235
header text color, 229, 1724
header text, specifying, 218, 229, 1718, 1725
labels, example, 217, 1716
legend, example, 236
overview, 215, 451, 787, 1713
positioning, details, 231–234, 1727–1730
positioning, example, 218, 1718
positioning, options, 229–230, 1725
statistics associated with distributions, 223–226
   summary statistics grouped by function, 222–223, 1721
   suppressing frame, 230, 1725
text color, 229, 1725
interaction, FACTEX procedure
   alias structure, 534
   between control and noise factors, 521
dropping, 542
examples, 509, 522–523
   generalized, 502, 542, 544
   minimum aberration, 535
   minimum aberration, example, 507
   nonnegligible, 542
   resolution, 528
   specifying terms, 484, 526
interquartile range, 52
saving in output data set, 266
intervals
   ODS tables, 252
intervals, CAPABILITY procedure
   computing for process capability analysis, 246
computing intervals, example, 242
describing confidence levels, specifying, 247
certainty, for mean, 247, 251
data collection, 610–611
data presentation, 610–611
deleting arrows, 593–596
detail, decreasing, 611–615
detail, increasing, 611–615
describing editing existing diagrams, 643–644
describing editing labels, 581–584
exporting diagrams, 625–626
describing fonts, modifying, 627
highlighting arrows, 629–638
isolating arrows, 617–618
labeling arrows, 581–584
managing complexity, 611–615, 617–621
merging diagrams, 618–621
moving arrows, 585–593, 599–610
notepads, 610–611
prediction, k-values for, 247
    saving information, output data set, 248, 252
    specifying method used, 247
    specifying type of, 248
    suppressing output tables, 248
tolerance, 250
tolerance, for proportion of population, 247
tolerance, p-values for, 248
tolerance, specifying proportion of population, 248
Ishikawa diagrams
    arrow colors, 629–638
    arrow heads, 640
    arrow line style, 629–638
    arrow line width, 629–638
    box color, modifying, 628
    box shadow, 641
    clipboard graphics, 625–626
color, arrow, 629–638
color, box, 628
color, palette, 629–638
color, text, 639
context-sensitive operations, 559, 571–573
    Edit menu, 574
    examples, Integrated Circuit Failures, 653
    examples, Photo Development Process, 654
    examples, Quality of Air Travel Service, 652
File menu, 574
Help menu, 575
history, 557
hotspots, 559, 571–573
data collection, 610–611
line palette, 629–638
mouse sensitivity, 641
multiple diagrams, displaying, 618–621, 645
palettes, colors, 629–638
palettes, fonts, 627
palettes, lines, 629–638
syntax, 651
tutorial, 561, 563–568
View menu, 575
Ishikawadiagrams
    adding arrows, 576–580
    aligning arrows, 602–610
    balancing arrows, 602–610
data collection, 610–611
data presentation, 610–611
deleting arrows, 593–596
detail, decreasing, 611–615
detail, increasing, 611–615
describing editing existing diagrams, 643–644
describing editing labels, 581–584
exporting diagrams, 625–626
describing fonts, modifying, 627
highlighting arrows, 629–638
isolating arrows, 617–618
labeling arrows, 581–584
managing complexity, 611–615, 617–621
merging diagrams, 618–621
moving arrows, 585–593, 599–610
notepads, 610–611
Subject Index

output, bitmaps, 625–626
output, graphics, 622–623
output, SAS data set, 642, 648–650
overview, 557
printing, bitmaps, 625–626
printing, SAS/GRAPH output, 622–623
resizing arrows, 596–599
SAS data set, input, 643–644, 648–650
SAS data set, output, 642, 648–650
saving, bitmaps, 625–626
saving, clipboard graphics, 625–626
saving, graphics, 622–623
saving, SAS data set, 642
subsetting arrows, 596–599, 629–638
summary of operations, 571–575
swapping arrows, 599–602
tagging arrows, 596–599, 629–638
terminology, 559
text entry, 581–584
undo, 593–596
zooming arrows, 615, 641

K
k-exchange algorithm
See optimal designs, search algorithms
kernel
See kernel density estimation
kernel density estimation, 179
adding density curve to histogram, 166
area underneath density curve, 129, 163
bandwidth parameter, specifying, 125, 160
color, 128, 161
density curve, width of, 137, 173
density curve to area of, 129, 163
example, 203
filling area under density curve, 129, 163
kernel function, specifying type of, 130, 165
line type for density curve, 131, 166
options used with, 131, 166
kernel function
See kernel density estimation
Kolmogorov-Smirnov statistic, 66, 183
Kolmogorov-Smirnov test, 51
kurtosis
computing, 63
saving in output data set, 264

L
labeling central line, Shewhart charts
See Shewhart charts, labeling central line
labeling Shewhart charts
See Shewhart charts, labeling
line types, Shewhart charts
See Shewhart charts, line types
lists of designs
central composite designs, 2043
factorial design, 2039–2040
location parameter
probability plots, 325
Q-Q plots, 359
lognormal distribution
cdf plots, 104
chi-square goodness-of-fit test, 182
development from empirical distribution, 182
EDF goodness-of-fit test, 182
histograms, 166, 177, 205
P-P plots, 288
probability plots, 316
Q-Q plots, 346–347

M
macro variables
See global macro variables
macros for experimental design, 2023–2024, 2026–2043, 2045–2050
adding centerpoints, 2041
adding points to a design, 2045
adding variables for second-order models, 2030
ADXADCEN macro, 2041–2042
ADXALIAS macro, 2035–2036
ADXXCCD macro, 2042–2043
ADXXCODE macro, 2026–2027
ADXXDCODE macro, 2027–2029
ADXXFFA macro, 2037
ADXXFFD data set, 2037
ADXXFFD macro, 2038
ADXFFILL macro, 2045–2046
ADXINIT macro, 2029–2030
ADXXMAMD macro, 2046–2047
ADXXPBBD macro, 2038
ADXXPC macro, 2043
ADXXPFFF macro, 2039–2040
ADXXQMOD macro, 2030–2031
ADXXRPRT macro, 2031
ADXXSCD macro, 2047–2048
ADXXSLD macro, 2048
ADXXTRANS macro, 2032–2033
ADXXVERT macro, 2049–2050
analyzing factorial designs, 2037
Box-Cox transformations, 2032–2033
calling, 2024
central composite designs, 2042–2043
coding design factors, 2026
constructing factorial designs, 2038
decoding design factors, 2027, 2029
default factor names, 2028, 2038, 2046–2049
defining global macro variables, 2029
examining alias structure, 2035–2036
extreme vertices designs, 2049–2050
filling in the design region, 2045
fractional factorial design, 2034–2040
inclusion of files for, 2024
initializing designs, 2029
lists of factorial designs, 2039–2040
McLean-Anderson designs, 2046
overview of, 2023
Plackett-Burman designs, 2038
randomizing designs, 2031
renaming design factors, 2027, 2029

SAS OnlineDoc™: Version 7-1
simplex-centroid designs, 2047
simplex-lattice designs, 2048
software requirements, 2024
structure of, 2024
XVERT algorithm, 2049–2050
main effect, 526, 528, 542, 544
main effect, examples, 509–512, 522–523
main-effects-only designs, 2039
maximum likelihood and power transformations, 2032
maximum value
  saving in output data set, 264
McLean-Anderson designs, 2046–2047
mean
  saving in output data set, 264
mean and range charts
  See $\bar{X}$ and $R$ charts
mean and standard deviation charts
  See $\bar{X}$ and $s$ charts
mean charts
  See $\bar{X}$ charts
measurement system, gage studies, 1951–1952
measures of location
  mode, 73
median
  probability function for, 2008
  saving in output data set, 264
  standard deviation of, 2009
median absolute deviation about the median, 52
median and $R$ charts
  axis labels, 1340
  central line, 1325
  control limit equations, 1325
  examples, advanced, 1336
  examples, introductory, 1298
  labeling axes, 1334
  missing values, 1335
  notation, 1324
  ODS tables, 1330
  options summarized by function, 1312–1313, 1315–1316, 1318, 1320, 1323
  overview, 1297
  plotted points, 1325
  plotting character, 1312
  reading preestablished control limits, 1309–1310, 1331
  reading raw measurements, 1298–1300, 1330–1331
  reading subgroup summary statistics, 1301–1305, 1331–1332
  reading summary statistics and control limits, 1308, 1332–1333
  saving control limits, 1306, 1326–1327
  saving subgroup summary statistics, 1305–1306, 1327–1328
  saving summary statistics and control limits, 1307–1308, 1328–1329
  standard deviation, estimating, 1333–1334
  syntax, 1311
median and range charts
  See median and $R$ charts
median charts
capability indices, computing, 1286
central line, 1283
control limit equations, 1284
examples, introductory, 1260
labeling axes, 1293
missing values, 1294
notation, 1283
ODS tables, 1288
options summarized by function, 1273–1274, 1276–1280, 1282
overview, 1259
plotted points, 1283
plotting character, 1273
reading preestablished control limits, 1270–1271, 1290
reading raw measurements, 1260–1261, 1289–1290
reading subgroup summary statistics, 1262–1265, 1290–1292
reading summary statistics and control limits, 1269, 1292–1293
saving control limits, 1267–1268, 1285–1286
saving subgroup summary statistics, 1265–1267, 1286–1287
saving summary statistics and control limits, 1268–1269, 1287–1288
standard deviation, estimating, 1293
syntax, 1272
minimum aberration, 535
aberration vector, 535
blocked design, 536
eexample, 507
limitation, 509
minimum value
  saving in output data set, 264
missing values
  CAPABILITY procedure, 81
  CUSUM procedure, 441
  MACONTROL procedure, 718
  output data set, 264
  SHEWHART procedure, 1651
mixed-level, factorial design
  construction, examples, 502–506
derived factors, 490
mixture designs
  examples, 808, 844
  plotting, 845–848
mixture designs, macros for, 2045
mixture-process designs
  See mixture designs
mode
  saving in output data set, 264
model specification, FACTEX procedure
directly, 484
estimated effects, 476, 484
indirectly, 484
minimum aberration, 476, 485
nonnegligible effects, 476, 484
resolution, 476, 485
resolution, maximum, 485
specifying effects, 526
modes, 51
modified Fedorov algorithm
See optimal designs, search algorithms
moving average control charts
See EWMA charts
See uniformly weighted moving average charts
adding features to, 670
average run lengths, displaying, 782
graphics catalog, specifying, 671
introduction, 665
learning about, 666
line printer features, 670–671
lineprinter plots, creating, 672
reading control limit parameters, 672
reading raw measurements, 670
reading subgroup summary statistics, 671–672
syntax, 670
moving range charts
See individual measurement and moving range charts
multi-vari charts
examples using the SHEWHART procedure, 1162
multivariate control charts, 1927–1931
chart statistic, calculating, 1927
principal component contributions, 1930
mutually orthogonal Latin square, 506, 514
N
names, default
See default factor names
naming quadratic variables in ADXQMOD macro, 2030
neighbor-balanced designs, 844
Newton-Raphson approximation
gamma shape parameter, 100, 158, 167
Weibull shape parameter, 102, 161, 167
noise factors, 518, 532
nonconforming items
nonnormal process data, 1922–1925
calculating probability limits, 1923
preliminary chart, 1922
normal distribution
cdf plots, 106
cdf plots, example, 110
chi-square goodness-of-fit test, 182
comparative histograms, 134
comparative histograms, example, 117
deviation from empirical distribution, 65, 182
EDF goodness-of-fit test, 65, 182
histograms, 169–170, 178
histograms, example, 148
P-P plots, 289
P-P plots, example, 278
probability plots, 317–318
Q-Q plots, 348
normal plots
ADXFFA macro, 2037
normal random variables
expected value of standard deviation, 1997
standard deviation of range, 2000
normality tests, 51, 64
Anderson-Darling test, 51
changes made to, 65
Cramér-von Mises test, 51
Kolmogorov-Smirnov test, 51
Shapiro-Wilk test, 51
np charts
central line, 1370
control limit equations, 1370
control limit parameters, 1371
control limits, specifying, 1385–1387
designed control limits, 1385–1387
examples, advanced, 1378
getting started, 1348
labeling axes, 1377
missing values, 1377
notation, 1369
ODS tables, 1373
options summarized by function, 1359, 1361, 1363–1366, 1368
overview, 1347
plotted points, 1369
plotting character, 1359
reading preestablished control limits, 1356–1357, 1374–1375, 1385–1387
reading raw data, 1348–1350, 1374
reading subgroup data, 1350–1352, 1375–1376
reading subgroup data and control limits, 1355–1356, 1376–1377
saving control limits, 1354, 1371–1372
saving subgroup data, 1352–1353, 1372
saving subgroup data and control limits, 1354–1355, 1372–1373
standard average proportion, specifying, 1380–1381
syntax, 1358
tests for special causes, 1378–1379 unequal subgroup sample sizes, 1381–1384
null hypothesis
location parameter, 51
O
observation exclusion, 49
OC Curve, 1433, 1604
ODS tables
CAPABILITY procedure, 81
FACTEX procedure, 537
OPTTEx procedure, 869
one-way comparative Pareto charts
See Pareto charts, comparative
Operating Characteristic Curve, 1433, 1604
optimal blocking
See optimal designs, optimal blocking
optimal designs
A-efficiency, 856
Bayesian optimal designs, 812, 823, 835
covariate designs, 811, 823
customizing design search, 819
D-efficiency, 856
data set roles, 849–851
design augmentation, 808, 812, 819, 831
design augmentation data set, 849–850
design characteristic options, summary, 812
design listing, 813, 818
design search defaults, 819
efficiency measures, 856
efficiency measures, comparing, 825–827
efficiency measures, interpreting, 856
epsilon value, 814
evaluating an existing design, 821, 841, 865, 867
examining, 818
G-efficiency, 856
going started examples, 802
including identification variables, 822, 850–852
information matrix, 813, 818
input data sets, 849
interactively, 818, 826
invoking, 814
learning about OPTEX procedure, 801
listing options, summary, 813
memory usage, 863
mixture designs, 844
number of design points, 812, 819, 822
number of search tries, 819, 821
number of tries to keep, 821
OPTEX procedure features, 799
OPTEX procedure overview, 799
optimal blocking, 867
output, 868
output data set, 852
prior precision values, 823, 835
random number seed, 815
resolution IV designs, 835
run-time considerations, 863
saturated design, 808, 822
saving options, summary, 813
search methods, 864
search strategies, 867
statement descriptions, 814
status of search, 815
summary of functions, 812–813
syntax, 811
treatment candidate points, 841
variance matrix, 813, 818
optimal designs, candidate data set
creating with ADXFILL macro, 847
creating with ADXXVERT macro, 808, 845
creating with DATA step, 808, 825
creating with FACTEX procedure, 808
creating with PLAN procedure, 802–803, 828
discussion, 849–850
examples of creating, advanced, 825
examples of creating, introductory, 802
recommendations, 833, 868
specifying, 814
optimal designs, coding
default coding, 858
discussion, 857
examples, 858
no coding, 859
orthogonal coding, 812, 839–841, 858
recommendations, 858
specifying, 814
static coding, 812, 858
summary of options, 812
optimal designs, examples
advanced, 825
Bayesian optimal designs, 835
block design, 808, 837
design augmentation, 808, 831
designs with correlated runs, 842
designs with covariates, 839
handling many variables, 808
initialization, 829
introductory, 802
mixture design, 808, 844
nonstandard modeling, 825
reducing candidate set, 833
resolution IV design, 835
saturated second-order design, 808
using different search methods, 827
optimal designs, initialization
defaults, 819–821
example, 829
initial design data set, 821, 830, 849–851
optimal blocking, 816
partially random, 820
random, 820
recommendations, 868
sequential, 820
specifying, 820
summary of options, 812–813
optimal designs, model
abbreviation operators, 854
classification variables, 816, 852
crossed effects, 853
discussion, 852
examples, 854
factorial model, 854
interactions, 853
main effects, 853
main effects model, 854
no-intercept model, 812, 823
nonstandard, 825
polynomial effects, 853
quadratic model, 855
regressor effects, 853
specifying, 814
summary of options, 812
types of effects, 823, 853
types of variables, 852
optimal designs, optimal blocking
A-efficiency, 856
block specification, 816
classification variables, 817
covariance specification, 815
covariate designs, 839
D-efficiency, 856
data sets, 851
discussion, 867
evaluating an existing design, 867
examples, 837, 839, 842
initialization, 816
number of search tries, 816
specifying, 812, 815
summary of options, 812
suppressing exchange step, 816
treatment candidate points, 815, 841
tries to keep, 816

optimal designs, optimality criteria
A-optimality, 819, 827, 861
computational limitations, 862–863
D-optimality, 819, 860
default, 819
definitions, 860–863
discussion, 859
distance-based, 859, 862
types, 859
U-optimality, 819, 844, 862

optimal designs, output
block variable name, 813, 824
design number, 824
options, 824
output data set, 824, 852
selecting design by efficiency, 824, 861
transfer variables, 813, 822

optimal designs, search algorithms
comparing different algorithms, 827, 829
default, 819
DETMAX, 821, 827, 829, 866
discussion, 864
example, 827, 829
exchange, 821, 865
k-excitation, 821, 865
modified Fedorov, 821, 866
rank-one updates, 864
sequential, 821, 827, 829, 865
specifying, 813, 821
speed, 822, 827, 829, 863
summary, 813

criteria, 859
definitions, 862
distance from a point to a set, 862
efficiency measures, 856
examples, 844
S-optimality, 862
specifying, 819–820
U-optimality, 862

optimality criteria
See optimal designs, optimality criteria

options, Shewhart charts
dictionary, 1733

orthogonal blocking
ADXPCC macro, 2043
orthogonal confounding, 525
orthogonal design
type, 541
orthogonal designs
ADXPCC macro, 2043
orthogonal fractional factorial designs, macros for, 2034
orthogonally confounded designs, 2034–2035
outer array, 518, 532

outgoing quality
See AOQ2 function

output
ADXTRANS macro, 2033
output data set, Pareto charts, 925–926

output data sets
ADXALIAS macro, 2036
ADXCCD macro, 2042–2043
ADXCODE macro, 2026–2027
ADXFDD macro, 2038
ADXMMAMD macro, 2046–2047
ADXQMOD macro, 2030–2031
ADXSCD macro, 2047–2048
ADXSLD macro, 2048
ADXTRANS macro, 2032–2033
ADXVERT macro, 2049–2050

output data sets, CAPABILITY procedure
creating, 267
getting started, 258
naming, 261
percentile variable names, 262
percentiles, 261
saving capability indices and related statistics, 265
saving specification limits and related statistics, 265
saving summary statistics, 264–266
saving test statistics, 266

output data sets, Shewhart charts
See Shewhart charts, output data sets

output, FACTEX procedure
code design factor levels, 477, 487
decode block factor levels, 477, 488
decode design factor levels, 477, 487
details, 536
options, 487
output data set, 487, 537
rename block variable, 477, 488
output, OPTEX procedure
   See optimal designs, output

P
  p charts
   central line, 1415
   control limit equations, 1415
   control limit parameters, 1415
   control limits, revising, 1431–1433
   examples, advanced, 1424
   getting started, 1392
   labeling axes, 1422
   missing values, 1423
   notation, 1414
   OC curves, 1433, 1435
   ODS tables, 1419
   options summarized by function, 1404–1405,
      1407–1410, 1413
   overview, 1391
   plotted points, 1414
   plotting character, 1403
   reading preestablished control limits, 1400–1401,
      1420
   reading raw data, 1392–1394, 1419
   reading subgroup data, 1394–1396, 1420–1421
   reading subgroup data and control limits, 1399,
      1421–1422
   saving control limits, 1397–1399, 1416–1417
   saving subgroup data, 1397, 1417
   saving subgroup data and control limits, 1398–
      1399, 1417–1418
   standard average proportion, specifying, 1426–
      1427
   syntax, 1402
   tests for special causes, 1424–1425
   unequal subgroup sample sizes, 1427, 1429–1430
  P-P plots
   annotating, 283
   axes, color of, 285
   axes, horizontal, 287
   axes, vertical, 290
   beta distribution, 284
   compared to Q-Q plots, 294
   distribution options, 281–282, 295
   distribution reference line, 279, 281
   exponential distribution, 285
   frame, color of, 285
   gamma distribution, 286
   general plot layout, 282
   getting started, 278
   graphics device, options, 283, 296
   interpreting, 292
   line printer, options, 282, 289
   line width, distribution reference line, 291, 296
   lognormal distribution, 288
   normal distribution, 289
   normal distribution, example, 278
   options summarized by function, 280, 282–283
   overview, 277
   reference lines, options, 285, 287, 290
   text, color of, 285
   Weibull distribution, 291
  Pareto charts
   avoiding clutter, 927
   axes, 903, 905, 919
   axis options, 897
   bars, displaying, 898
   before-and-after, 930–933
   classification variables, 923, 929
   dictionary of options, 900
   examples, advanced, 930
   examples, introductory, 881
   graphics catalog, 901
   grids, 896, 910
   highlighting, 941–945
   labeling chart features, 924
   large data sets, 929
   levels, 922
   merging columns, example, 949
   missing values, 913–914, 928
   options summarized by function, 894–898
   output data set, 925–926
   overview, 879
   Pareto curve, 883
   Pareto, Vilfredo, 879
   process variables, 882, 922, 929
   reading frequency data, 884–886
   reading raw data, 881–882, 884
   reference lines, 899
   restricting number of categories, 888–889, 895
   saving information, 925–926
   scaling bars, 919, 927
   seven basic QC tools, 879
   side-by-side, 880
   stacked, 880
   syntax, 893
   tied categories, 887, 889
   “trivial many”, 879, 941
   “useful many”, 879, 941
   using raw data, example, 881–882, 884
   vertical axis, 922
   visual clarity, 927
   “vital few”, 879, 941
  Pareto charts, categories, 883, 922
   legend, 884
   maximum number of, 929
   restricting, 888–889
   restricting number of, 912–913
   ties, 887, 889
   unbalanced, 924
  Pareto charts, classification variables
   examples, 930, 934
  Pareto charts, coloring
   axes, 905
   bar outlines, 905
   bars, 905
   cumulative percent curve, 906
grid lines, 906
highest bars, 906
labels, 906
lowest bars, 908
other category, 908
recommendations, 927
reference lines, 906, 909
secondary axis, 905
tick marks, 905
tiles, 909
Pareto charts, comparative, 880, 896, 923
cells, 923
classification variables, 932
classification variables, examples, 930, 934
creating, 907
frequency proportion bars, 908
key cell, 907, 923, 932, 940
merging columns, 949
one-way, 923
one-way, example, 938
ordering values, 916–917
rows and columns, ordering, 916–917
tiles, 923, 944
two-way, 923
two-way, examples, 934, 939, 941–942, 944, 946, 949
unbalanced categories, 917, 924
weighted charts, 952
Pareto charts, cumulative percent curve, 883, 915, 922
anchoring, 936
coloring, 906
enhancing, 897
scaling, 925
suppressing, 927, 938
Pareto charts, grid lines
width, 921
Pareto charts, legends
bar legend labels, 904
bar legends, 904
category legend labels, 905
highest and lowest bars legend labels, 910
sample size legend color, 906
sample size legends, 895, 915
tile legend labels, 919
tile legends, 919
Pareto charts, other category, 888–889, 917
coloring, 908
labeling, 912
pattern, 918
Pareto charts, restricted, 888–889, 912–913, 922, 929
large data sets, 929
Pareto charts, weighted, 922
example, 952
Pareto curve, 883
Pareto principle, 879
Pareto, Vilfredo, 879
partial confounding, example, 509
pattern tests
See Shewhart charts, tests for special causes
percent plots
See P-P plots
percentiles
axes, Q-Q plots, 348–349, 360
certainty limits, 68
defining, 52, 67
empirical distribution function, 67
saving in output data set, 261
visual estimates, Q-Q plots, 360
weighted, 68
weighted average, 67
Plackett-Burman designs, 2034, 2038
PLAN procedure, 516
plot statements, CAPABILITY procedure, 32
plots of estimated effects, 2037
power transformations
ADXTRANS macro, 2032
prediction intervals
See intervals, CAPABILITY procedure
printing
available designs, macros for, 2039–2040, 2043
factorial designs, macros for, 2034
probability functions
binomial, 2003, 2005
for median, 2008–2009
hypergeometric, 2006–2008
probability limits, Shewhart charts, 1735, 1771, 1778
probability of exceeding specifications, 49
probability plots
axes, color, 312
axes, horizontal, 315
axes, rotating, 319
axes, vertical, 320
beta distribution, 311
distribution reference lines, 320, 326
distribution reference lines, examples, 327–329
distributions, 324
exponential distribution, 313
frame, color, 312
gamma distribution, 314
general plot layout, 309
getting started, 300
graphics device, options, 310
graphics, options, 326
legends, 315
location parameter, 325
lognormal distribution, 316
lognormal distribution, example, 302
normal distribution, example, 300
options summarized by function, 307–310
overview, 299
percentile axis, 318
reference lines, 312–313, 315, 317, 321
scale parameter, 325
shape parameter, 319, 324
syntax, 306
text, color, 313
threshold parameter, 320, 325
Weibull distribution, 321–323
probability-probability plots
See P-P plots
PROC CAPABILITY statement, 35
process capability indices
confidence limits, 48
process distribution
See empirical distribution function
process potential
$P_{pk}$ versus $C_{pk}$, 73
process variables, Pareto charts, 882, 922, 929
pseudo-factors, example, 504

Q
Q-Q plots
axes, color, 343
axes, horizontal, 345
axes, options, 340
axes, percentile scale, 348–349, 360
axes, rotating, 350
axes, vertical, 352
beta distribution, 339, 341
capability indices, 343, 348, 360, 369
creating, 356
diagnostics, 357
distribution reference lines, 336, 359
distributions, 338, 358
estimating $C_{pk}$, 369
exponential distribution, 339, 344
frame, color, 343
gamma distribution, 339, 344
general plot layout, 340
getting started, 334
graphics device, options, 341, 361
interpretation, 357
legends, 346
legends, suppressing, 336, 347–348
line printer, options, 340, 350, 352
line width, 361
location parameter, 359
lognormal distribution, 339, 346–347
lognormal distribution, example, 363
nonnormal data, example, 362
normal distribution, 339, 348
normal distribution, example, 334, 369
options summarized by function, 338–339, 341
overview, 333
percentiles, estimates, 360
sample estimates, 348
scale parameter, 359
syntax, 337
text, color, 343
threshold parameter, 359
Weibull distribution, 339, 353–354
Weibull distribution, example, 367

quadratic terms, adding to model, 2030
quantile-quantile plots
See Q-Q plots
quantiles
defining, 67
empirical distribution function, 67
weighted average, 67

R
R charts
capability indices, computing, 1463
central line, 1461
control limit equations, 1461–1462
control limits, specifying, 1473–1474
examples, advanced, 1471
examples, introductory, 1440
labeling axes, 1470
missing values, 1470
notation, 1461
ODS tables, 1465
options summarized by function, 1452–1453, 1455–1458, 1460
overview, 1439
plotted points, 1461
plotting character, 1452
reading preestablished control limits, 1448, 1450, 1466
reading raw measurements, 1440–1442, 1465
reading subgroup summary statistics, 1442–1445, 1467–1468
reading summary statistics and control limits, 1448, 1468–1469
saving control limits, 1446–1447, 1462–1463
saving subgroup summary statistics, 1445–1446, 1463–1464
saving summary statistics and control limits, 1447–1448, 1464–1465
standard deviation, estimating, 1469
syntax, 1451
randomization, FACTEX procedure
blocking, 529
details, 529
example, 493, 498
prevent, 490, 531
seed, 490, 498
randomized complete block, example, 498
randomized treatments, example, 498
randomizing designs, 2026, 2031
range
saving in output data set, 264
range chart
GAGE application, 1957
gage studies, 1951, 1966
range charts
See $R$ charts
reference lines, Shewhart charts
See Shewhart charts, reference lines
reliability analysis

SAS OnlineDoc™: Version 7-1
analyzing accelerated life test data, 973–975, 977
analyzing arbitrarily-censored data, 982
analyzing binomial data, 997–998, 1000
analyzing groups of data, 970, 973
analyzing interval-censored data, 978–982, 985
analyzing regression models, 987–988, 990–991
analyzing repair data, 991–992, 994
analyzing right-censored data, 966–967, 969
analyzing two groups of repair data, 994–995, 997
arbitrarily censored data, 1047
binomial parameter estimation, 1063–1064
classification variables, 1007
confidence intervals for parameters, 1058–1059
covariance matrix of parameters, 1057
details, 1039
estimating distribution parameters, 1003–1004, 1006
examples, 966
fitting regression models, 1019–1022
frequency variables, 1008
insets, 1009–1011
least squares estimation, 1067
maximum likelihood estimation, 1052
mean cumulative function plots, 1013–1016, 1018, 1039
observation-wise percentiles, 1068–1070
observation-wise predicted values, 1068
observation-wise reliability function estimates, 1071
observation-wise statistics, 1068–1071, 1073
overview, 963, 965
parameter estimation, 1052, 1055–1059, 1061–1065, 1067
percentile estimation, 1061–1062
poisson parameter estimation, 1065, 1067
probability distributions, 1040–1041
probability plots, 1042–1047
readout data, 1023
recurrence data, 1074–1076
regression model parameters, 1055–1056
reliability function estimation, 1062–1063
residuals, 1071, 1073
specifying failure modes, 1008
specifying probability distributions, 1007
syntax, 1001
Turnbull algorithm, 1047
types of lifetime data, 1039
Weibayes estimation, 1067
renaming design factors, 2027, 2029
repeatability
  average and range method, 1968
  definition of, 1952
  introduction to, 1951
  range chart, 1957, 1966
variance components method, 1974
repeatability and reproducibility
  average and range method, 1970
  introduction to, 1951
  variance components method, 1975
replication, FACTEX procedure
data set, 477, 489
design point, 489
design replication, 531–532
details, 531
entire design, 489
example, 499, 502
fixed number of times, 477, 531
inner array, 532
number of times, 489
outer array, 532
point replication, 531–532
reproducibility
  average and range method, 1970
  average chart, 1959, 1967
  definition of, 1952
  introduction to, 1951
  variance components method, 1975
resolution of designs, 2034
resolution, FACTEX procedure
  comparison, 528
  definition, 528
  example, 469, 494, 507
  minimum aberration, 535
  number, 528
  numbering scheme, 528
  syntax, 485
response surface designs
  See central composite designs
response, factorial design, 523, 525
restricted Pareto charts
  See Pareto charts, restricted
robust estimators
  location, 70
  scale, 70
  trimmed means, 70
  Winsorized means, 70
robust measures of scale, 52
  $Q_n$, 52
  $S_n$, 52
rotatable designs, 2043
rounding, 52
rules for lack of control
  See Shewhart charts, tests for special causes
runs rules
  See Shewhart charts, tests for special causes
runs tests
  See Shewhart charts, tests for special causes
S
  $s$ charts
    capability indices, computing, 1503
    central line, 1501
    control limit equations, 1501
examples, advanced, 1513
examples, introductory, 1480
labeling axes, 1511
missing values, 1512
notation, 1501
\( \bar{x} \) charts
ODS tables, 1506
s charts
options summarized by function, 1491, 1493–1494, 1496–1500
overview, 1479
plotted points, 1501
plotting character, 1491
reading preestablished control limits, 1488–1489, 1507
reading raw measurements, 1480–1482, 1506–1507
reading subgroup summary statistics, 1483–1485, 1507–1508
reading summary statistics and control limits, 1488, 1508–1509
saving control limits, 1486–1487, 1502–1503
saving subgroup summary statistics, 1485–1486, 1503–1504
saving summary statistics and control limits, 1487–1488, 1504–1505
standard deviation, estimating, 1510–1511
standard deviation, specifying, 1513
syntax, 1490
S-optimal designs
See optimal designs, space-filling designs
sampling plans
See also acceptance sampling
double, 2012
single, 2011–2012
types of, 2011
saturated designs, analysis of, 1995
saturated designs, OPTEX procedure, 808, 822
save design, FACTEX procedure
See output, FACTEX procedure
scale parameter
probability plots, 325
Q-Q plots, 351, 359
screening designs, 2034, 2038
search algorithms, optimal designs
See optimal designs, search algorithms
search design, FACTEX procedure
confounding rules, 545
limit, 476, 480
maximum time, 476, 480
speeding, 546
second-order designs
with ADXQMOD macro, 2026
semicurtailed inspection and ASN2 function, 1991
sequential algorithm
See optimal designs, search algorithms
seven basic QC tools, 879
shape parameter
probability plots, 319, 324
Q-Q plots, 351, 358
Shapiro-Wilk test, 51
Shewhart charts
annotating, 1735
average run lengths, example, 1514
between-subgroup variance, 1907
capability indices, computing, 1648, 1650
challenging assumptions of, 1893
chart description, 1750
chart naming, 1762
computing capability indices, 1759, 1788, 1796
connecting points, 1746, 1762
control chart statistics, 1760
displaying points, 1734
estimating \( \mu \), 1761
estimating \( \sigma \), 1779, 1785
exceptions charts, 1750, 1787
fonts, 1750
grids, 1750, 1757, 1799
horizontal axes, 1766
identifying unequal subgroup sample sizes, 1762
intervals between subgroups, 1755
missing values, 1651
options dictionary, 1733
plot margins, 1760, 1777
probability limits, 1735, 1771, 1778
separating, 1777
separating subgroups, 1770
subgroup sample size, 1785
subgroup-variables, 1646–1647
subgroups, 1761
vertical axes, 1799
Shewhart charts, axes
appearance, 1799
coloring, 1742
for multiple pages, 1776
horizontal, 1751, 1796
labeling, 1340, 1342–1343, 1849–1852
offset length, 1751
scaling on p charts, 1801
scaling primary and secondary charts, 1800
suppressing labels, 1763
tick mark labels, 1779, 1794
tick marks, 1751, 1796–1797
vertical axis truncation, 1766
Shewhart charts, box charts
See box charts
Shewhart charts, clipping points, 1743–1745, 1758
draws, 1844, 1846–1848
Shewhart charts, coloring
axes, 1742
axis labels, 1749
connecting lines, 1743, 1746
control limits, 1744
frames, 1744
HREF= lines, 1744
inside control limits, 1744
inside stars, 1747
label frames, 1744
outside control limits, 1746
phase labels, 1746
star outlines, 1747
STARCIRCLES= circles, 1747
TESTS= option, 1749
tick marks, 1749
VREF= lines, 1749
Shewhart charts, control limits
appearance, 1799
computing, 1735, 1764, 1778
for autocorrelated data, 1894–1896, 1898–1900, 1902
for data with multiple components of variation, 1903–1908, 1910
for nonnormal processes, 1922–1925
for short-run processes, 1911–1913, 1915–1920
labeling, 1756–1757, 1795
line type, 1758
multiple sets, 1817–1819, 1821–1826
observations used in computation, 1855
sample size, 1757–1758
Shewhart charts, fonts
customizing, 2017–2019
Shewhart charts, for autocorrelated data
See autocorrelation in process data
Shewhart charts, for data with multiple components of variation
See variation, multiple components of
Shewhart charts, for multivariate data
See multivariate control charts
Shewhart charts, for nonnormal process data
See nonnormal process data
Shewhart charts, for short-run processes
See short run process control
Shewhart charts, input data sets
control limits, 1772–1773
probability limits, 1771
specifying blocks, 1774
Shewhart charts, labeling
axes, 1340, 1342–1343, 1849–1852
control limits, 1756–1757, 1762, 1795
fonts for, 1756, 1789
height for, 1751, 1756, 1789
horizontal axis, 1850–1852
points, 1734
points outside control limits, 1768
reference lines, 1753, 1798
splitting labels, 1779
stars, 1782
tests for special causes, 1790
tick marks, 1779, 1794
vertical axis, 1766, 1850–1852
zone lines, 1801–1802
Shewhart charts, labeling central line
c chart, 1748
m chart, 1800
np chart, 1767
p chart, 1771
r chart, 1776
s chart, 1780
u chart, 1796
x chart, 1800
decimal digits, number of, 1762
Shewhart charts, line types
reference lines, 1761
star outlines, 1760
STARCIRCLES= circles, 1759
TESTS= option, 1760
Shewhart charts, nonnormal process data
example, 1706–1709
Shewhart charts, output data sets
chart information, 1769
control limits, 1768–1769
indicating parameters as estimates or standard values, 1794
subgroup summary statistics, 1767, 1769
Shewhart charts, pages
maximum, 1761
numbering, 1770
splitting, 1736
Shewhart charts, phase variables
delineating, 1771
labels, 1770
legends, 1771
Shewhart charts, reference lines
applying to all BY groups, 1763
horizontal axis, 1752–1753
label position, 1753, 1798
labels, 1753, 1798
line type, 1757, 1761
symbol, 1753, 1798
vertical axis, 1797–1798
Shewhart charts, specifying parameters
\( \mu_0 \), 1761
\( \sigma_0 \), 1777
\( \rho_0 \), 1769
\( \omega_0 \), 1795
Shewhart charts, star charts, 1827–1830, 1832–1837
contrasted with multivariate control charts, 1828
Shewhart charts, stars
circle outline width, 1799
creating, 1785
inner radius, 1781
labeling, 1782
legends, 1782
outer radius, 1780, 1783
process variables, 1827
reference circles, 1780, 1829–1830
standardizing, 1783–1784, 1835–1837
star outline width, 1800
style, 1784, 1832–1834
vertex angle, 1784
vertex variables, 1827–1828
Shewhart charts, stratification of data, 1806–1816
by block-variables, 1809–1814
by a _PHASE_ variable, 1814
by a _PHASE_ variable, 1815–1816
by a symbol-variable, 1807–1809
Shewhart charts, subgroup selection
  using switch variables, 1857, 1859
  using WHERE statement, 1853–1854, 1856–1857
Shewhart charts, suppressing features of
  central lines, 1763
  connecting line segments, 1763
  control limit frames, 1764
  control limit legends, 1764
  control limits, 1764
  entire chart, 1763
  frames, 1763
  horizontal axis labels, 1763
  labels, 1764
  legends, 1764
  line segments, 1766
  lower control limits, 1763–1764
  phase legend frames, 1764
  upper control limits, 1764, 1766
Shewhart charts, tables, 1787
  adding central line values, 1787
  adding control limit exceedances, 1788
  adding ID variables, 1787
  adding legends, 1788
  adding TESTS= results, 1788
  box charts, 1787
Shewhart charts, tests for special causes, 1789–1793, 1801
  across phases, 1789
  customizing tests, 1887, 1889
  definitions, 1863, 1865
  generalized patterns, 1884–1887
  label fonts, 1756, 1789
  label height, 1756, 1789
  labeling signaled points, 1874, 1882
  labels, 1790
  line segment character, 1789
  M-patterns, 1884–1887
  multiple phases, 1876
  multiple sets of control limits, 1877, 1879, 1881
  nonstandard tests, 1883–1887, 1889
  overlapping points, 1791
  range and standard deviation charts, 1883–1884
  run lengths, 1788–1789
  standard tests, 1863, 1865, 1867–1868, 1870–1874, 1876–1877, 1879, 1881–1882
  standard tests, interpreting, 1870
  standard tests, modifying, 1871
  standard tests, requesting, 1867–1868
  T-patterns, 1884–1887
  varying subgroup sample sizes, 1791, 1872–1873
  zone line labels, 1801–1802
  zones, 1801
Shewhart charts, trends
  displaying, 1800, 1838–1839, 1841–1842
  modeling, 1841
  recognizing, 1839
  trend variables, 1794
Shewhart charts, warning limits
  vertical axis, 1797
  short run process control, 1911–1913, 1915–1920
  difference from nominal approach, 1911–1913, 1915–1917
  standardization approach, 1919–1920
  testing for constant variances, 1918
  side-by-side Pareto charts, 880
  sign test, 50
  signal-to-noise ratio, 518
  signed rank statistic, computing, 63
  signed rank test, 50
  simplex-centroid designs, 2047
  simplex-lattice designs, 2045
  single-sampling plans
    See acceptance sampling
  size specification, FACTEX procedure
  See design size specification
  skewness
    saving in output data set, 264
  smoothing data distribution
    See kernel density estimation
  space-filling designs
    See optimal designs, space-filling designs
  specialized capability indices, 52
  specification limits, 52
  capability indices, confidence interval, 89
  comparative histograms, 128
  computing capability indices, example, 38
  examples, 85
  exceeding, 265
  histograms, example, 146
  identifying, 58
  lower limit, specification of, 56
  reading from data set, example, 85
  reference lines, color of, 55–56
  reference lines, example, 88
  reference lines, filled areas, 56
  reference lines, line type, 56
  reference lines, width of, 57
  summary information, 38
  suppressing legend for, 106, 170
  target line, color of, 55
  target line, line type, 56
  target value, specification of, 57
  upper limit, specification of, 57
  stacked Pareto charts, 880
  standard deviation
    boxcharts, 1771
    CAPABILITY procedure, 53
    for median of standard normal, 2009–2010
    range of iid normal variables, 2000
    saving in output data set, 264
    specifying, 106
  standard deviation charts
    See s charts
  star charts
    See Shewhart charts, star charts
subgroup variables
  dates or times, 1646
indices, 1646
  character, 1647
  numeric, 1647

sum
  saving in output data set, 264
sum of weights
  saving in output data set, 264
summary statistics, 47
  printing, example, 37
  saving, 51
  tables, 47
supplementary rules
  See Shewhart charts, tests for special causes
  suppressing features of Shewhart charts
    See Shewhart charts, suppressing features of suspended histograms, 164

T
  tables
    modes, 51
    sign test, 50
    signed rank test, 50
    trimmed means, 52
    winsorized means, 53
  tables, CAPABILITY procedure
    summary statistics, 47
  tables, Shewhart charts
    See Shewhart charts, tables
test statistics
  saving in output data set, 266
tests for normality, 47
tests for special causes
  data set, 1794
tests for special causes, Shewhart charts
    See Shewhart charts, tests for special causes
tests of location
  location parameter, 51
  threshold parameter
    probability plots, 320, 325
    Q-Q plots, 352, 359
tolerance intervals
  See intervals, CAPABILITY procedure
transformations
  See ADXTRANS macro
trimmed means, 52, 70
two-level designs, 2023
two-way comparative Pareto charts
  See Pareto charts, comparative
Type A sampling, 2011
Type B sampling, 2011
Type I sum of squares, 523

U
  u charts
    central line, 1543
    compared with c charts, 1543
    control limit equations, 1543–1544
    control limit parameters, 1544
    examples, advanced, 1553
examples, introductory, 1520
getting started, 1520
known number of nonconformities, specifying, 1526–1528, 1549–1550
  saving control limits, 1522–1524, 1544–1545
  saving nonconformities per unit, 1528, 1530
  saving number of nonconformities, 1545–1546
  saving subgroup data and control limits, 1546–1547
  syntax, 1531
tests for special causes, 1553–1554
unequal subgroup sample sizes, 1556–1558

U-optimal designs
  See optimal designs, space-filling designs
uniformly weighted moving average charts
  adding features to, 782–784
  annotating charts, 782–784
  asymptotic control limits, displaying, 759
  axis labels, 778
  central line, 762
  control limit equations, 762–764
  control limits, computing, 759
  examples, advanced, 780
  examples, introductory, 736
  missing values, 779
  notation, 762
  ODS tables, 772
  options summarized by function, 750–756, 758
  overview, 735
  plotted points, 762
  plotting character, 750
  plotting subgroup means, 760
  probability limits, 759
  process mean, specifying, 760
  process standard deviation, specifying, 761
  reading preestablished control limit parameters, 746–748, 773–774
  reading probability limits, 760
  reading raw measurements, 736–738, 772
  reading subgroup summary statistics, 740–741, 743, 774–775
  reading summary statistics and control limits, 746, 775–776
saving control limit parameters, 744–745, 769–770
saving subgroup summary statistics, 743–744, 770
saving summary statistics and control limits, 745–746, 770–771
span of moving average, choosing, 764
span parameter, specifying, 761
specifying parameters for, 780, 782
standard deviation, estimating, 777–778
syntax, 749

V
V-mask charts
See cumulative sum control charts

variance
divisors for, 53
saving in output data set, 264

variance components method
GAGE application, 1962
gage studies, 1951, 1972

variance of median
See STDMED function

variation, multiple components of, 1903–1908, 1910
determining components, 1907–1908, 1910
preliminary examination, 1903–1906

W
Weibull distribution
cdf plots, 108
chi-square goodness-of-fit test, 182
development from empirical distribution, 182
EDF goodness-of-fit test, 182
histograms, 173, 178, 205
P-P plots, 291
probability plots, 321–322
Q-Q plots, 353–354
weighted Pareto charts, 922

Western Electric rules
See Shewhart charts, tests for special causes

Wilcoxon signed rank test, 63

 Winsorized means, 53
Winsorized means, 70

X charts
$\bar{X}$
axis labels, 1596
capability indices, computing, 1587
central line, 1585
capability indices, saving, 1618
central line, 1635
capability indices, saving, 1618
central line, 1635
control limit equations, 1585–1586
equations, advanced, 1598
equations, introductory, 1562
missing values, 1597
notation, 1585
OC curves, 1604–1605
ODS tables, 1590
options summarized by function, 1575–1576, 1578–1582, 1584
overview, 1561
plotted points, 1585

tests for special causes, 1598–1599

$\bar{X}$ and $R$ charts
axis labels, 1651
capability indices, computing, 1639, 1648–1650
capability indices, saving, 1618
central line, 1635
control limit equations, 1636
equations, advanced, 1652
equations, introductory, 1610
missing values, 1651
notation, 1635
ODS tables, 1642
options summarized by function, 1624–1625, 1627–1628, 1630–1632, 1634
overview, 1609
plotted points, 1635
plotting character, 1624
reading preestablished control limits, 1621, 1643
reading raw measurements, 1610, 1642
reading subgroup summary statistics, 1614, 1643–1644
reading summary statistics and control limits, 1620–1621, 1644–1645
saving control limits, 1618, 1637, 1639
saving subgroup summary statistics, 1617, 1639–1640
saving summary statistics and control limits, 1619–1620, 1640–1641
specifying parameters for, 1656–1657
standard deviation, estimating, 1648
syntax, 1623
tests for special causes, 1562–1563, 1655

$\bar{X}$ and $s$ charts
capability indices, computing, 1693
central line, 1690
central line, 1690
control limit equations, 1691
equations, advanced, 1703
equations, introductory, 1666
labeling axes, 1701
missing values, 1702
notation, 1690
ODS tables, 1696
options summarized by function, 1679–1680, 1682–1684, 1686–1687, 1689
overview, 1665
plotted points, 1690
plotting character, 1679
reading preestablished control limits, 1676, 1697
reading raw measurements, 1666, 1668–1669, 1696–1697
reading subgroup summary statistics, 1670–1672, 1697–1698
reading summary statistics and control limits, 1675, 1698–1699
saving control limits, 1673–1674, 1692–1693
saving subgroup summary statistics, 1672–1673, 1693–1694
saving summary statistics and control limits, 1674–1675, 1694–1695
specifying parameters for, 1692
standard deviation, estimating, 1699–1700
syntax, 1678
Syntax Index

A
ADXADCEN macro, 2041–2042
ADXALIAS macro, 2035–2036
   NOPRINT specification, 2035
ADXCC file, 2041–2043
ADXCCD macro, 2031, 2041–2043
ADXCODE macro, 2026
ADXCONF, from ADXTRANS macro, 2033
ADXDS macro variable, 2029
ADXEFF data set, 2036
ADXFF file, 2034–2040
ADXFFA macro, 2037
ADXFFD data set, 2037
ADXFFD macro, 2028, 2036, 2038, 2042
ADXFILL macro, 2045–2046
ADXFIT macro variable, 2029–2030, 2036
ADXGEN file, 2026–2033
ADXINIT macro, 2028–2031
ADXLAM, from ADXTRANS macro, 2033
ADXLIKE, from ADXTRANS macro, 2033
ADXMAMD macro, 2046–2047
ADXMIX file, 2045–2050
ADXNB macro variable, 2029
ADXNF macro variable, 2029
ADXNFIT macro variable, 2029, 2036
ADXPDF macro, 2038–2039
ADXPCG macro, 2043
ADXPF macro, 2038–2040
ADXQMOD macro, 2030–2031
   naming quadratic variables, 2030
ADXREG data set, 2033
ADXRRES macro variable, 2029
ADXRPT macro, 2031
ADXSCD macro, 2047–2048
ADXSLD macro, 2048
ADXTRANS macro, 2032–2033
   output, 2033
   plots from, 2033
ADXVLST macro variable, 2029
ADXXVERT macro, 2049–2050
ALLLABEL option
   CUSUM procedure, 1734
   MACCONTROL procedure, 1734
   SHEWHART procedure, 1734
ALLLABEL2 option
   CUSUM procedure, 1734
   MACCONTROL procedure, 1734
   SHEWHART procedure, 1734

B
BARLABEL option
   PARETO procedure, 903
BARLABEL2 option
   PARETO procedure, 903
BARLEGEND option
   PARETO procedure, 904
BARLEGEND2 option
   PARETO procedure, 904
BARWIDTH option
   PARETO procedure, 904
BAYESACT call, 1995–1997
BETA option
   CUSUM procedure, 417
BILEVEL option
CUSUM procedure, 1736
MACONTROL procedure, 1736
SHEWHART procedure, 1736

block-variables, CUSUM procedure
XCHART statement, 409

block-variables, MACONTROL procedure
EWMACHART statement, 690
MACHART statement, 750

block-variables, SHEWHART procedure
BOXCHART statement, 1121
CCHART statement, 1181
displaying values, 1739
IRCHART statement, 1224
labels, 1736–1737
legends, 1737, 1742
MCHART statement, 1272
MRCHART statement, 1311
NPCHART statement, 1359
PCHART statement, 1403
RCHART statement, 1451
SCHART statement, 1532
XCHART statement, 1574
XRCART statement, 1623
XSCHART statement, 1678

BLOCKLABELPOS= option
CUSUM procedure, 1736
MACONTROL procedure, 1736
SHEWHART procedure, 1736, 1813–1814, 1917

BLOCKLABTYPE= option
CUSUM procedure, 1737
MACONTROL procedure, 1737
SHEWHART procedure, 1737, 1917

BLOCKPOS= option
CUSUM procedure, 1737
MACONTROL procedure, 1737
SHEWHART procedure, 1737, 1917

BLOCKREP option
CUSUM procedure, 1739
MACONTROL procedure, 1739
SHEWHART procedure, 1739

BLOCKS statement, FACTEX procedure
See FACTEX procedure, BLOCKS statement
options summarized by function, 476
syntax, 480

BLOCKS statement, OPTEX procedure
See OPTEX procedure, BLOCKS statement
syntax, 815

BOXCHART statement
See also SHEWHART procedure, BOXCHART statement
eexamples, advanced, 1146
eexamples, introductory, 1108
options summarized by function, 1122, 1124–1127, 1129–1131
overview, 1107
syntax, 1121

BOXCONNECT option
SHEWHART procedure, 1739

BOXSTYLE= option
SHEWHART procedure, 1162, 1739

CAPABILITY procedure
and PROC SHEWHART, 1923–1924
introduction, 31

CAPABILITY procedure, CDFPLOT statement
ALPHA= beta-option, 100
ALPHADELTA= gamma-option, 100
ALPHA= option, 100
ANNOATE= option, 100
BETA= option, 101
C= option, 101
CAXIS= option, 102
CDFSYMBOL= option, 102
CFRAME= option, 102
CINITIAL= option, 102
COLOR= option, 102
CTEXT= option, 102
CVREF= option, 102
DESCRIPTION= option, 102
EXPOENTIAL= option, 103
FONT= option, 103
GAMMA= option, 103
HAXIS= option, 104
HMNOR= option, 104
HREF= option, 104
HREFCHAR= option, 104
HREFLABELS= option, 104
LEGEND= option, 104
LHREF= option, 104
LOGNORMAL= option, 104
LVREF= option, 105
MAXITER= option, 105
MU= option, 105
NAME= option, 105
NOCDFLEGEND= option, 105
NOECDF= option, 106
NOFRAME= option, 106
NOLEGEND= option, 106
NORMAL= option, 106
NOSPECLEGEND= option, 106
SCALE= option, 106
SHAPE= option, 106
SIGMA= option, 107
SYMBOL= option, 107
THETA= option, 107
THRESHOLD= option, 107

SAS OnlineDoc™: Version 7-1
VAXIS= option, 107
VMINOR= option, 107
VREF= option, 107
VREFCHAR= option, 107
VREFLABELS= option, 107
VSCALE= option, 108
W= option, 108
WEIBULL Weibull-option, 108
ZETA= option, 108

CAPABILITY procedure, COMPHISTOGRAM statement

ANOKEY option, 124
ANNOTATE= option, 124
BARWIDTH= option, 125
C= option, 125
CAXIS= option, 125
CBARLINE= option, 125
CFILL= option, 125
CFRAME= option, 126
CFRAMELEG= option, 126
CFRAMESIDE= option, 126
CFRAMETOP= option, 126
CGRID= option, 126
CHREF= option, 126
CLASS= option, 120
CLASSKEY= option, 127
CLASSSSPECs= option, 128
COLOR= option, 128
CPROP= option, 128
CTEXT= option, 129
CVREF= option, 129
DESCRIPTION= option, 129
FILL option, 129
FONT= option, 129
GRID option, 129
HEIGHT= option, 130
HOFFSET= option, 130
HREF= option, 130
HREFLABELS= option, 130
HREFLABELPOS= option, 130
INFONT= option, 130
INHEIGHT= option, 130
INTERTILE= option, 130
K= option, 130
KERNEL kernel-option, 125, 130
L= option, 131
LGRID= option, 131
LHREF= option, 131
LVREF= option, 131
MAXNBIN= option, 131
MAXSIGMAS= option, 131
MIDPOINTS= option, 132
MISSING1 option, 132
MISSING2 option, 132
MU= option, 132
NAME= option, 133
NCOLS= option, 133
NLEGEND option, 126, 133
NLEGENDPOS option, 133
NOBARS option, 133
NOCHART option, 133
NOFRAME option, 133
NOHLABEL option, 133
NOKEYMOVE option, 133
NOPLOT option, 134
NORMAL normal-option, 134
NOVLABEL option, 134
NOVTICK option, 134
NROWS= option, 134
ORDER1= option, 134
ORDER2= option, 135
OUTHISTOGRAM= option, 136
PFILL= option, 136
RTINCLUDE option, 136
SIGMA= option, 136
TILELEGENDLABEL= option, 136
TURNVLABELS option, 136
VAXIS= option, 136
VAXISLABEL= option, 136
VAXISLABELPOS= option, 136
VOFFSET= option, 136
VREF= option, 136
VREFLABELS= option, 137
VREFLABELPOS= option, 137
VSCALE= option, 137
W= option, 137
WAXIS= option, 137

CAPABILITY procedure, HISTOGRAM statement

ALPHA= option, 158, 176
ALPHADELTA= gamma-option, 158
ALPHAINITIAL= gamma-option, 159
ANNOTATE= option, 159
BETA beta-option, 159, 175
BETAS= option, 160, 176
C= option, 160, 179
CAXIS= option, 161
CBARLINE= option, 161
CDELTA= option, 161
CFILL= option, 161
CFRAME= option, 161
CHREF= option, 161
CINITIAL= Weibull-option, 161
COLOR= option, 161
CTEXT= option, 162
CURVELEGEND= option, 162
CVREF= option, 162
DESCRIPTION= option, 162
EXPONENTIAL exponential-option, 162, 176
FILL option, 163
FONT= option, 163
FORCEHIST option, 163
HAXIS= option, 164
HANGING option, 164
HMINOR= option, 165
HREF= option, 165
HREFCHAR= option, 165
HREFLABELS= option, 165
INDICES option, 165, 185–186
### Syntax Index

**K**= option, 165, 179  
**KERNEL** option, 166, 179  
**L**= option, 166  
**LEGEND**= option, 166  
**LHREF**= option, 166  
**LOGNORMAL** lognormal-option, 166, 177  
**LVREF**= option, 167  
**MAXITER**= option, 167  
**MIDPERCENTS** option, 167, 187  
**MIDPOINTS**= option, 168  
**MIDPTAXIS**= option, 169  
**MU**= option, 169, 178  
**NAME**= option, 169  
**NOBARS** option, 169  
**NOCURVELegend** option, 169  
**NOFRAME** option, 169  
**NOLEGEND** option, 169  
**NOPLOT** option, 169  
**NOPRINT** option, 170  
**NORMAL** normal-option, 170, 178  
**NOSPECLEGEND** option, 170  
**OUTFIT**= option, 170, 187  
**OUTHISTOGRAM**= option, 170, 187, 189  
**PCTAXIS**= option, 170  
**PERCENTS**= option, 171, 187  
**PFILL**= option, 171  
**RTINCLUDE** option, 171  
**SCALE**= option, 171, 176–178  
**SHAPE**= option, 171, 177–178  
**SIGMA**= option, 171, 176, 178, 184  
**SPECLEGEND**= option, 172  
**SYMBOL**= option, 172  
**THETA**= option, 172, 176, 184  
**THRESHOLD**= option, 172, 177–178  
**VAXIS**= option, 172  
**VMINOR**= option, 172  
**VREF**= option, 172  
**VREFCHAR**= option, 173  
**VREFLABELS**= option, 173  
**VSCALE**= option, 173  
**W**= option, 173  
**WEIBULL** option, 173, 178  
**ZETA**= option, 174

**CAPABILITY** procedure, **INTERVALS** statement  
**ALPHA**= option, 247  
**K**= option, 247  
**METHODS**= option, 247, 249–251  
**NOPRINT** option, 248  
**OUTINTERVALS**= option, 248, 252  
**P**= option, 248  
**TYPE**= option, 248

**CAPABILITY** procedure, **OUTPUT** statement  
**OUT**= option, 261, 267  
**PCTLNAME**= option, 262  
**PCTLPRE**= option, 262  
**PCTLPTS**= option, 261

**CAPABILITY** procedure, **PPLOT** statement  
**ALPHA**= option, 283, 287  
**ANNOTATE**= option, 283  
**BETA** option, 281, 284  
**BETA**= option, 284  
**C**= option, 284, 291  
**CAXIS**= option, 284  
**CFRAME**= option, 285  
**CHREF**= option, 285  
**COLOR**= option, 279, 285  
**CTEXT**= option, 285  
**CVREF**= option, 285  
**DESCRIPTION**= option, 285  
**EXPONENTIAL** option, 281, 285  
**FONT**= option, 286  
**GAMMA** option, 281, 286  
**HAXIS**= option, 287  
**HMINOR**= option, 287  
**HREF**= option, 287  
**HREFCHAR**= option, 287  
**HREFLABELS**= option, 287  
**L**= option, 287  
**LHREF**= option, 287  
**LOGNORMAL** option, 282, 288  
**LVREF**= option, 288  
**MU**= option, 281, 288–289  
**NAME**= option, 289  
**NOLINE** option, 289  
**NOFRAME** option, 289  
**NOOBSLEGEND** option, 289  
**NORMAL** option, 282, 289  
**PPSYMBOL**= option, 289  
**SCALE**= option, 287–288, 290  
**SHAPE**= option, 287–288, 290  
**SIGMA**= option, 281, 287–291  
**SQUARE** option, 279, 290  
**SYMBOL**= option, 290  
**THETA**= option, 287–288, 290–291  
**THRESHOLD**= option, 287–288, 290  
**VAXIS**= option, 290, 292  
**VMINOR**= option, 290  
**VREF**= option, 290  
**VREFCHAR**= option, 290  
**VREFLABELS**= option, 290  
**W**= option, 291  
**WEIBULL** option, 282, 291
ZETA= option, 288, 291
CAPABILITY procedure, PROB PLOT statement
ALPHA= option, 310–311
ANNOTATE= option, 311
BETA option, 308, 311
BETA= option, 312
C= option, 312, 321, 323
CAXIS= option, 312
cFRAME= option, 312
CHREF= option, 312
COLOR= option, 313
CTEXT= option, 313
CVREF= option, 313
DESCRIPTION= option, 313
EXPONENTIAL option, 308, 313
FONT= option, 313
GAMMA option, 308, 314
GRID option, 315
GRIDCHAR= option, 315
HAXIS= option, 315
HMINOR= option, 315
HREF= option, 315, 329
HREFCHAR= option, 315
HREFLABELS= option, 315, 329
L= option, 315
LEGEND= option, 315
LGRID= option, 315
LHREF= option, 315, 329
LOGNORMAL option, 308, 316
LVREF= option, 317, 329
MU= option, 317–318
NAME= option, 317
NOFRAME option, 317
NOLEGEND option, 317
NOLINELEGEND option, 317
NOOBSLEGEND option, 317
NORMAL option, 308, 317
NOSPECLEGEND option, 318
PCTLMINOR option, 318, 329
PCTORDER= option, 318
PROBSYMBOL option, 318
RANKADJ= option, 318, 322
ROTATE option, 319
SCALE= option, 313, 315, 319, 322
SHAPE= option, 319, 321
SIGMA= option, 312, 318–319, 323
SLOPE= option, 320
SQUARE option, 320, 329
SYMBOL= option, 320
THETA= option, 312, 316, 320
THRESHOLD= option, 313, 315, 320, 322
VAXIS= option, 320, 327
VMINOR= option, 321
VREF= option, 321
VREFCHAR= option, 321
VREFLABELS= option, 321
W= option, 321
WEIBULL option, 308, 321
WEIBULL2 option, 309, 322
ZETA= option, 316, 323
CAPABILITY procedure, PROC CAPABILITY statement
ALL option, 47
ALPHA= option, 47–49, 53, 89, 1744
ANNOTATE= option, 47, 59
CHECKINDICES option, 47
CIBASIC= option, 48
CIINDICES= option, 48
CIPCTLDF= option, 48
CIPCTLNORMAL= option, 49
CIPROBEX option, 49
CIQUANTDF= option, 48
CIQUANTNORMAL= option, 49
CPMA= option, 49
DATA= option, 49, 58
DEF= option, 49, 52
EXCLNPWGT option, 49
FORMCHAR= option, 49
FREQ option, 50
GOUT= option, 50
LINEPRINTER option, 50
LOCATION= option, 51
LOCCOUNT option, 50
missing values, 81
MODE option, 51
MODES option, 51, 73
MUO= option, 51
NEXTRBS= option, 51
NEXTRVAL= option, 51
NOPRINT option, 51
NORMALTEST option, 51, 64
ODS tables, 81
OUTTABLE= option, 51, 60
PCTLDEF= option, 49, 52, 67
ROBUSTSCALE option, 52, 70
ROUND= option, 52
SPECIALINDICES option, 52
TRIM option, 52
TRIMMED option, 52
TRIMMED= option, 70
TYPE= option, 48–49, 53, 1744
VARDEF= option, 53
WINSOR option, 53
WINSORIZED option, 53
WINSORIZED= option, 70
CAPABILITY procedure, QQPLOT statement
ALPHA= option, 341, 344
ANNOTATE= option, 341
BETA option, 338–339, 341
BETA= option, 342
C= option, 343, 353–354
CAXIS= option, 343
cFRAME= option, 343
CHREF= option, 343
COLOR= option, 336, 338, 343
CPKREF option, 343, 348, 369
### Syntax Index

- **CPKSCALE option**, 343, 348, 369
- **CTEXT= option**, 343
- **CVREF= option**, 344
- **DESCRIPTION= option**, 344
- **EXPONENTIAL option**, 338–339, 344
- **FONT= option**, 344
- **GRID option**, 349
- **GRIDCHAR= option**, 349
- **HAXIS= option**, 345
- **HMINOR= option**, 345
- **HREF= option**, 345
- **HREFCHAR= option**, 345
- **HREFLABELS= option**, 346
- **L= option**, 336, 346
- **LABEL= option**, 349
- **LEGEND= option**, 346
- **LGRID= option**, 349
- **LHREF= option**, 346
- **LOGNORMAL option**, 338–339, 346
- **LVREF= option**, 347
- **MU= option**, 336, 338, 347–348
- **NADJ= option**, 347, 356
- **NAME= option**, 347
- **NOFRAME option**, 347
- **NOLEGEND option**, 347
- **NOLINELEGEND option**, 347
- **NORMAL option**, 338–339, 348, 369
- **NOSPECLEGEND option**, 336, 348
- **PCTLAXIS option**, 348, 360
- **PCTLMINOR option**, 349
- **PCTLSCALE option**, 349, 360
- **QQSYMBOL= option**, 350
- **RANKADJ= option**, 350, 356
- **ROTA TE option**, 350
- **SCALE= option**, 342, 344–345, 347, 351, 353
- **SHAPE= option**, 344, 346, 351, 353
- **SLOPE= option**, 347, 351, 354
- **SQUARE option**, 336, 352
- **SYMBOL= option**, 352
- **THETA= option**, 342, 344–345, 347, 352–354
- **THRESHOLD= option**, 342, 344–345, 347, 352–354
- **VAXIS= option**, 352
- **VMINOR= option**, 352
- **VREF= option**, 352
- **VREFCHAR= option**, 352
- **VREFLABELS= option**, 352
- **W= option**, 353
- **WEIBULL option**, 338–339, 353
- **WEIBULL2 option**, 338–339, 354
- **ZETA= option**, 347, 355
- **CAPABILITY procedure, SPEC statement**
  - **CLEFT= option**, 55
  - **CLSL= option**, 55
  - **CRIGHT= option**, 55
- **CTARGET= option**, 55
- **CUSL= option**, 56
- **LLSL= option**, 56
- **LSL= option**, 56
- **LSLSYMBOL= option**, 56
- **LTARGET= option**, 56
- **LUSL= option**, 56
- **PLEFT= option**, 56
- **PRIGHT= option**, 56
- **TARGET= option**, 57
- **TARGETSYMBO L= option**, 57
- **USL= option**, 57
- **USLSYMBOL= option**, 57
- **WLSL= option**, 57
- **WTARGET= option**, 57
- **WUSL= option**, 57
- **CATLEGLABEL= option**
  - **PARETO procedure**, 905
- **CAXIS= option**
  - **CUSUM procedure**, 1742
  - **MACONTROL procedure**, 1742
  - **PARETO procedure**, 905
  - **SHEWHART procedure**, 1742
- **CAXIS2= option**
  - **PARETO procedure**, 905
- **CBARLINE= option**
  - **PARETO procedure**, 905
- **CBARS= option**
  - **PARETO procedure**, 905
- **CBLOCKLAB= option**
  - **CUSUM procedure**, 1742
  - **MACONTROL procedure**, 1742
  - **SHEWHART procedure**, 1742
- **CBLOCKVAR= option**
  - **CUSUM procedure**, 1742
  - **MACONTROL procedure**, 1742
  - **SHEWHART procedure**, 1742, 1812–1814
- **CBOXES= option**
  - **SHEWHART procedure**, 1743
- **CBOXFILL= option**
  - **SHEWHART procedure**, 1743
- **CCHART statement, SHEWHART procedure**
  - **See also SHEWHART procedure, CCHART statement**
    - examples, advanced, 1203
    - examples, introductory, 1170
    - options summarized by function, 1181, 1183, 1185–1188, 1190
    - overview, 1169
    - syntax, 1180
- **CCLIP= option**
  - **MACONTROL procedure**, 1743
  - **SHEWHART procedure**, 1743
- **CCONNECT= option**
  - **CUSUM procedure**, 1743
  - **MACONTROL procedure**, 1743
  - **SHEWHART procedure**, 1743
- **CDFPLOT statement**

---

*SAS OnlineDoc™: Version 7-1*
See CAPABILITY procedure, CDFPLOT statement
examples, 110–111
getting started, 94
options summarized by function, 97–100
overview, 93
syntax, 96
CFRAME= option
CUSUM procedure, 1744
MACONTROL procedure, 1744
PARETO procedure, 906
SHEWHART procedure, 1744, 1815
CFRAMELAB= option
CUSUM procedure, 1744
MACONTROL procedure, 1744
SHEWHART procedure, 1744
CFRAMELEG= option
PARETO procedure, 906
CFRAMESIDE= option
PARETO procedure, 906
CFRAMETOP= option
PARETO procedure, 906
CGRID= option
PARETO procedure, 906
CGRID2= option
PARETO procedure, 906
character subgroup variables
SHEWHART procedure, 1761
CHIGH(n)= option
PARETO procedure, 906
CHREF= option
CUSUM procedure, 1744
MACONTROL procedure, 1744
PARETO procedure, 906
SHEWHART procedure, 1744
CINFILL= option
CUSUM procedure, 1744
MACONTROL procedure, 1744
SHEWHART procedure, 1744
CLASS statement, OPTEX procedure
See OPTEX procedure, CLASS statement
syntax, 816
CLASS= option
PARETO procedure, 907
CLASSKEY= option
PARETO procedure, 907
CLLIMITS= option
CUSUM procedure, 1744
MACONTROL procedure, 1744
SHEWHART procedure, 1744
CLIPCHAR= option
MACONTROL procedure, 1744
SHEWHART procedure, 1744
CLIPFACTOR= option
MACONTROL procedure, 1744
SHEWHART procedure, 1744
CLIPLEG= option
MACONTROL procedure, 1744
SHEWHART procedure, 1744
CLIPSYMBOL= option
MACONTROL procedure, 1744
SHEWHART procedure, 1744
CLIPSYMBOLHT= option
MACONTROL procedure, 1744
SHEWHART procedure, 1744
SHEWHART procedure, 1744
CLOW(n)= option
PARETO procedure, 908
CMASK= option
CUSUM procedure, 1744
MACONTROL procedure, 1744
SHEWHART procedure, 1744
CMPCTLABEL option
PARETO procedure, 908
CNEEDLES= option
CUSUM procedure, 1744
MACONTROL procedure, 1744
SHEWHART procedure, 1744
COMPHISTOGRAM statement
See CAPABILITY procedure, COMPHISTOGRAM statement
examples, 116–117
getting started, 116
options summarized by function, 120, 122–124
overview, 115
syntax, 119
CONNECTCHAR= option
CUSUM procedure, 1744
MACONTROL procedure, 1744
PARETO procedure, 908
SHEWHART procedure, 1744
CONTROLOSTAT= option
SHEWHART procedure, 1744
COTHER= option
PARETO procedure, 908
COUT= option
CUSUM procedure, 1744
MACONTROL procedure, 1744
SHEWHART procedure, 1744
COUTFILL= option
CUSUM procedure, 1744
MACONTROL procedure, 1744
SHEWHART procedure, 1744
CPHASEBOX= option
SHEWHART procedure, 1744
CPHASEBOXCONNECT= option
SHEWHART procedure, 1744
CPHASEBOXFILL= option
SHEWHART procedure, 1744
CPHASELEG= option
SHEWHART procedure, 1744
SHEWHART procedure, 1744
SHEWHART procedure, 1744
CPHASEMEANCONNECT= option
SHEWHART procedure, 1162, 1747
CPROP= option
PARETO procedure, 908
CSTARCIRCLES= option
CUSUM procedure, 1747
MACONTROL procedure, 1747
SHEWHART procedure, 1747
CSTARFILL= option
CUSUM procedure, 1747
MACONTROL procedure, 1747
SHEWHART procedure, 1747
CSTAROUT= option
CUSUM procedure, 1747
MACONTROL procedure, 1747
SHEWHART procedure, 1747
CSTARS= option
CUSUM procedure, 1747
MACONTROL procedure, 1747
SHEWHART procedure, 1747
CSYMBOL= option
SHEWHART procedure, 1748
CTESTS= option
SHEWHART procedure, 1749, 1882
CTEXT= option
CUSUM procedure, 1749
MACONTROL procedure, 1749
PARETO procedure, 909
SHEWHART procedure, 1749
CTEXTSIDE= option
PARETO procedure, 909
CTEXTTOP= option
PARETO procedure, 909
CTILES= option
PARETO procedure, 909
CUSUM procedure
ANNOTATE= option, 388
ANNOTATE2= option, 388
DATA= data set, 388
FORMCHAR= option, 388–389
GOUT= option, 389
GRAPHICS option, 404
HISTORY= data set, 389
introduction, 381
LIMITS= data set, 390
LINEPRINTER option, 390
overview, 387
syntax, 388
CUSUM procedure, XCHART statement
ALLN option, 425
ALPHA= option, 395, 408, 417, 428
BETA= option, 417, 428
CINFILL= option, 417
CLIMITS= option, 417
CMASK= option, 417
DATA= data set, 394–396, 438–439
DATAUNITS option, 417, 425
DELTA= option, 395, 408, 418, 423
H= option, 401–402, 408, 418, 428
HEADSTART= option, 418, 424–425
HISTORY= data set, 397–398, 440–441
INTERVAL= option, 427
K= option, 401–402, 418, 428
LIMITN= option, 419, 423, 425
LLIMITS= option, 419
LMASK= option, 419
missing values, 441
MU0= option, 395, 408, 419, 423
NOARL option, 419
NOMASK option, 419
NOREADLIMITS option, 419
ORIGIN= option, 420
OUTHISTORY= data set, 399–400, 437
OUTLIMITS= data set, 403–404, 436–437
OUTTABLE= data set, 437, 442, 445
READINDEX= option, 420
READLIMITS option, 420
READSIGMAS option, 420
SCHEME= option, 401–402, 408, 421
SHIFT= option, 421, 423
SIGMA0= option, 395, 421
SIGMAS= option, 421
SMETHOD= option, 421, 433–436
TABLEALL option, 401–402, 422
TABLECHART option, 422
TABLECOMP option, 422
TABLEID option, 422
TABLEOUT option, 422
TABLESUMMARY option, 422
TYPE= option, 422–423
VAXIS= option, 395
WLIMITS= option, 422
WMASK= option, 422
CUSUMARL function, 1998–1999
CVREF= option
CUSUM procedure, 1749
MACONTROL procedure, 1749
PARETO procedure, 909
SHEWHART procedure, 1749
CZONES= option
SHEWHART procedure, 1749, 1882
D
D2 function, 1999, 2013
D3 function, 2000, 2013
DATA= data set
PARETO procedure, 900
DATAUNIT= option
SHEWHART procedure, 1750
DATAUNITS option
CUSUM procedure, 417
DELTA= option
CUSUM procedure, 418
DESCRIPTION= option
CUSUM procedure, 1750
MACONTROL procedure, 1750
PARETO procedure, 909
SHEWHART procedure, 1750
DESCRIPTION= option
SHEWHART procedure, 1750
DIMEN variable
ADXXVERT output data set, 2048–2049
DIST variable
ADXXVERT output data set, 2049

E
ENDGRID option
CUSUM procedure, 1750
MACONTROL procedure, 1750
SHEWHART procedure, 1750
EWMAARL function, 2001
EWMACHART statement
See also MACONTROL procedure, EWMACHART statement
examples, advanced, 719
examples, introductory, 678
overview, 677
syntax, 689
EXAMINE statement, FACTEX procedure
See FACTEX procedure, EXAMINE statement
options summarized by function, 477
syntax, 482
EXAMINE statement, OPTEX procedure
See OPTEX procedure, EXAMINE statement
syntax, 818
EXCHAR option
CUSUM procedure, 1750
MACONTROL procedure, 1750
SHEWHART procedure, 1750

F
FACTEX procedure
getting started, 465
learning about FACTEX, 464
overview, 463
summary of functions, 476
syntax, 475
FACTEX procedure, BLOCKS statement
NBLKFACS= option, 481
NBLKFACS=MAXIMUM option, 482
NBLOCKS= option, 481
NBLOCKS= option, examples, 467, 509
NBLOCKS=MAXIMUM option, 482
SIZE= option, 481
SIZE=MINIMUM option, 482
FACTEX procedure, EXAMINE statement
ALIASING option, 483
ALIASING option, example, 470
CONFOUNDING option, 483
DESIGN option, 483
DESIGN option, example, 465
FACTEX procedure, FACTORS statement
example, 465
NLEV= option, 484
FACTEX procedure, MODEL statement
ESTIMATE= option, 484
ESTIMATE= option, examples, 495, 510
MINABS option, 485, 536
MINABS option, example, 508
MINABS option, limitation, 509
NONNEGIGIBLE= option, 484
RESOLUTION= option, 485
RESOLUTION= option, examples, 469, 494, 497
RESOLUTION=MAX option, 485
RESOLUTION=MAX option, examples, 467, 500–501
FACTEX procedure, OUTPUT statement
CVALS= option, 487–488, 527
CVALS= option, example, 498
decode design factors, 487
derived factors, 490
derived factors, examples, 504, 506
DESIGNREPL= option, 489
DESIGNREPL= option, examples, 499–504
NOVALRAN option, 490
NVALS= option, 487–488, 527
NVALS= option, example, 498
OUT= option, 487
OUT= option, example, 498
POINTREPL= option, 489
POINTREPL= option, examples, 499–504
RANDOMIZE= option, 490
RANDOMIZE= option, examples, 493, 498
RANDOMIZE= option, NOVALRAN option, 490
RANDOMIZE= option, seed, 490
recode block factor, 488
recode block factor levels, examples, 468, 498
recode design factor levels, examples, 466, 469, 498
FACTEX procedure, PROC FACTEX statement
example, 465
NAMELEN option, 480
NOCHECK option, 480, 509, 546
ODS tables, 537
SECONDS= option, 480
TIME= option, 480, 509
FACTEX procedure, SIZE statement
DESIGN= option, 491
DESIGN= option, examples, 469, 494
DESIGN=MINIMUM option, 492
FRACTION= option, 491
FRACTION=MAXIMUM option, 492
NRTUNFACS= option, 491
NRUNFACS=MINIMUM option, 492
FACTORS statement, FACTEX procedure
See FACTEX procedure, FACTORS statement
options summarized by function, 476
syntax, 483
FONTS= option
CUSUM procedure, 1750
MACONTROL procedure, 1750
PARETO procedure, 909
SHEWHART procedure, 1750
FORMCHAR= option
PARETO procedure, 900
FREQ= option
PARETO procedure, 910

G

GAGE application
average and range method, 1960
average chart, 1959
data set format, 1975
entering data, 1955, 1957, 1965
GAGE catalog, 1953
introduction to, 1951
invoking, 1953
missing data, 1962
range chart, 1957
reading data set, 1965
saving data, 1963
variance components method, 1962
GENERATE statement, OPTEX procedure
See OPTEX procedure, GENERATE statement
default options, 819
syntax, 819
GOUT= option
PARETO procedure, 901
GRID option
CUSUM procedure, 1750
MACONTROL procedure, 1750
PARETO procedure, 910
SHEWHART procedure, 1750
GRID2 option
PARETO procedure, 910

H

H= option
CUSUM procedure, 418
HAXIS= option
CUSUM procedure, 1751
MACONTROL procedure, 1751
SHEWHART procedure, 1751
HEADSTART= option
CUSUM procedure, 418
HEIGHT= option
CUSUM procedure, 1751
MACONTROL procedure, 1751
PARETO procedure, 910
SHEWHART procedure, 1751
HISTOGRAM statement
See CAPABILITY procedure, HISTOGRAM statement
going started, 146
options summarized by function, 154–157
overview, 145
syntax, 153
HLLEGLABEL= option
PARETO procedure, 910
HMINOR= option
CUSUM procedure, 1751
MACONTROL procedure, 1751
SHEWHART procedure, 1751
HOFFSET= option
CUSUM procedure, 1751
MACONTROL procedure, 1751
PARETO procedure, 910
SHEWHART procedure, 1751

I

ID statement, OPTEX procedure
See OPTEX procedure, ID statement
syntax, 822
IDCOLOR= option
SHEWHART procedure, 1754
IDCTEXT= option
SHEWHART procedure, 1754
IDFONT= option
SHEWHART procedure, 1755
IDHEIGHT= option
SHEWHART procedure, 1755
IDSYMBOL= option
SHEWHART procedure, 1755

SAS OnlineDoc™: Version 7-1
IMAGEMAP= option
  CUSUM procedure, 1755
  MACONTROL procedure, 1755
  SHEWHART procedure, 1755
INFONT= option
  PARETO procedure, 911
INHEIGHT= option
  PARETO procedure, 911
INSET and INSET2 statements
  See CUSUM procedure, INSET statement
  See MACONTROL procedure, INSET statement
  See SHEWHART procedure, INSET and INSET2 statements
    list of options, 1723
    overview, 1713
    syntax, 1720
INSET statement
  See CAPABILITY procedure, INSET statement
  getting started, 216, 452, 788, 1714
  keywords summarized by function, 222–223, 225–226, 1721
  list of options, 227
  overview, 215, 451, 787
  syntax, 220, 454, 790
INTERBAR= option
  PARETO procedure, 911
INTERTILE= option
  PARETO procedure, 911
INTERVAL= option
  CUSUM procedure, 1755
  MACONTROL procedure, 1755
  SHEWHART procedure, 1755
INTERVALS statement
  See CAPABILITY procedure, INTERVALS statement
  getting started, 242
  list of options, 246
  overview, 241
  syntax, 246
IRCHART statement
  See also SHEWHART procedure, IRCHART statement
  examples, advanced, 1251
  examples, introductory, 1214
  options summarized by function, 1225–1226, 1228–1232, 1234, 1236
  overview, 1213
  syntax, 1224
ISHIKAWA environment
  adding arrows, 576–580
  aligning arrows, 602–610
  balancing arrows, 602–610
  data collection, 610–611
  data presentation, 610–611
  deleting arrows, 593–596
  detail, decreasing, 611–615
  detail, increasing, 611–615
  editing existing diagrams, 643–644
  editing labels, 581–584
  exporting diagrams, 625–626
  fonts, modifying, 627
  highlighting arrows, 629–638
  isolating arrows, 617–618
  labeling arrows, 581–584
  managing complexity, 611–615, 617–621
  merging diagrams, 618–621
  moving arrows, 585–593, 599–610
  notepads, 610–611
  output, bitmaps, 625–626
  output, graphics, 622–623
  output, SAS data set, 642, 648–650
  overview, 557
  printing, bitmaps, 625–626
  printing, SAS/GRAPH output, 622–623
  resizing arrows, 596–599
  SAS data set, input, 643–644, 648–650
  SAS data set, output, 642, 648–650
  saving, bitmaps, 625–626
  saving, clipboard graphics, 625–626
  saving, graphics, 622–623
  saving, SAS data set, 642
  subsetting arrows, 596–599, 629–638
  summary of operations, 571–575
  swapping arrows, 599–602
  tagging arrows, 596–599, 629–638
  terminology, 559
  text entry, 581–584
  undo, 593–596
  zooming arrows, 615, 641

K
K= option
  CUSUM procedure, 418

L
LABELFONT= option
  MACONTROL procedure, 1756
  SHEWHART procedure, 1756, 1836–1837
LABELHEIGHT= option
  MACONTROL procedure, 1756
  SHEWHART procedure, 1756
LABOTHER= option
  PARETO procedure, 911
LAST= option
  PARETO procedure, 911
LBOXES= option
  SHEWHART procedure, 1756
LCLLABEL= option
  MACONTROL procedure, 1756
  SHEWHART procedure, 1756
LCLLABEL2= option
  SHEWHART procedure, 1757
LENDBAR= option
  MACONTROL procedure, 1756
  SHEWHART procedure, 1756
LENGRID= option
  CUSUM procedure, 1757
  MACONTROL procedure, 1757
  SHEWHART procedure, 1757
LGRID= option
  CUSUM procedure, 1757
<table>
<thead>
<tr>
<th>Syntax Index</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MACONTROL procedure, 1757</td>
<td></td>
</tr>
<tr>
<td>PARETO procedure, 911</td>
<td></td>
</tr>
<tr>
<td>SHEWHART procedure, 1757</td>
<td></td>
</tr>
<tr>
<td>LGRID2= option</td>
<td>PARETO procedure, 911</td>
</tr>
<tr>
<td>LHREF= option</td>
<td>CUSUM procedure, 1757</td>
</tr>
<tr>
<td></td>
<td>MACONTROL procedure, 1757</td>
</tr>
<tr>
<td></td>
<td>PARETO procedure, 912</td>
</tr>
<tr>
<td></td>
<td>SHEWHART procedure, 1757</td>
</tr>
<tr>
<td>LIMITN= option</td>
<td>CUSUM procedure, 419</td>
</tr>
<tr>
<td></td>
<td>MACONTROL procedure, 699, 759</td>
</tr>
<tr>
<td></td>
<td>SHEWHART procedure, 1757, 1868</td>
</tr>
<tr>
<td>LIMLABSUBCHAR= option</td>
<td>SHEWHART procedure, 1758</td>
</tr>
<tr>
<td>LINEPRINTER option</td>
<td>PARETO procedure, 901</td>
</tr>
<tr>
<td>LLIMITS= option</td>
<td>CUSUM procedure, 419</td>
</tr>
<tr>
<td></td>
<td>MACONTROL procedure, 1758</td>
</tr>
<tr>
<td></td>
<td>SHEWHART procedure, 1758</td>
</tr>
<tr>
<td>LMASK= option</td>
<td>CUSUM procedure, 419</td>
</tr>
<tr>
<td>LOTHER= option</td>
<td>PARETO procedure, 912</td>
</tr>
<tr>
<td>LSL= option</td>
<td>SHEWHART procedure, 1759</td>
</tr>
<tr>
<td>LSTARCIRCLES= option</td>
<td>CUSUM procedure, 1759</td>
</tr>
<tr>
<td></td>
<td>MACONTROL procedure, 1759</td>
</tr>
<tr>
<td></td>
<td>SHEWHART procedure, 1759, 1829–1830, 1836–1837</td>
</tr>
<tr>
<td>LSTARS= option</td>
<td>CUSUM procedure, 1760</td>
</tr>
<tr>
<td></td>
<td>MACONTROL procedure, 1760</td>
</tr>
<tr>
<td></td>
<td>SHEWHART procedure, 1760</td>
</tr>
<tr>
<td>LTESTS= option</td>
<td>SHEWHART procedure, 1760, 1882</td>
</tr>
<tr>
<td>LTMARGIN= option</td>
<td>SHEWHART procedure, 1760, 1813–1814</td>
</tr>
<tr>
<td>LTMPOINT= option</td>
<td>SHEWHART procedure, 1760</td>
</tr>
<tr>
<td>LVREF= option</td>
<td>CUSUM procedure, 1761</td>
</tr>
<tr>
<td></td>
<td>MACONTROL procedure, 1761</td>
</tr>
<tr>
<td></td>
<td>PARETO procedure, 912</td>
</tr>
<tr>
<td></td>
<td>SHEWHART procedure, 1761</td>
</tr>
<tr>
<td>LZONES= option</td>
<td>CUSUM procedure, 1761</td>
</tr>
<tr>
<td></td>
<td>MACONTROL procedure, 1761</td>
</tr>
<tr>
<td></td>
<td>SHEWHART procedure, 1761</td>
</tr>
</tbody>
</table>

**M**

MACHART statement
See also MACONTROL procedure, MACHART statement
examples, advanced, 780
examples, introductory, 736

overView, 735
syntax, 749

MACONTROL procedure
ANNOTATE= option, 670, 783
ANNOTATE2= option, 670
DATA= data set, 670
FORMCHAR= option, 670–671
GOUT= option, 671
HISTORY= data set, 671–672
introduction, 665
LIMITS= data set, 672
LINEPRINTER option, 672
overview, 669
syntax, 670
TABLE= data set, 672

MACONTROL procedure, EWMACHART statement
ALLN option, 725
ALPHA= option, 699
ASYMPTOTIC option, 699, 720
CMEANSYMBOL= option, 699
DATA= data set, 712–713
HISTORY= data set, 681, 683–684, 713–714
LIMITN= option, 699, 724
LIMITS= data set, 687–688, 713, 720
MEANCHAR= option, 699
MEANSYMBOl= option, 700, 729
missing values, 718
MU0= option, 700, 719–720
NMARKERS option, 725
NOREADLIMITS option, 700
OUTHISTORY= data set, 684–685, 710
OUTLIMITS= data set, 685, 709–710
OUTTABLE= data set, 686, 710–711
READALPHA option, 700
READINDEX= option, 700
READLIMITS option, 701
RESET option, 701
SIGMA0= option, 701, 719–720
SIGMAS= option, 701
SMETHOD= option, 716, 726
TABLE= data set, 686, 714–715
VREF= option, 729
WEIGHT= option, 679, 689, 701
XSsymbol= option, 719

MACONTROL procedure, MACHART statement
ALPHA= option, 759
ASYMPTOTIC option, 759
CMEANSYMBOL= option, 759
DATA= data set, 772–773
HISTORY= data set, 740–741, 743, 774–775
LIMITN= option, 759
LIMITS= data set, 720, 746–748, 773–774, 781
MEANCHAR= option, 760
MEANSYMBOl= option, 760
missing values, 779
MU0= option, 760, 780, 782
NOREADLIMITS option, 760
OUTHISTORY= data set, 743–744, 770
OUTLIMITS= data set, 744–745, 769–770
OUTTABLE= data set, 745–746, 770–771
READALPHA option, 760
READINDEX= option, 760
READLIMITS option, 761
SIGMA0= option, 761, 780, 782
SIGMAs= option, 761
SMETHOD= option, 777
SPAN= option, 737, 749, 761
TABLE= data set, 746, 775–776
XSsymbol= option, 780
MAXCMPCT= option
PARETO procedure, 912
MAXNCAT= option
PARETO procedure, 912
MAXPANELS= option
CUSUM procedure, 1761
MACONTROL procedure, 1761
SHEWHART procedure, 1761
MCHART statement
See also SHEWHART procedure, MCHART statement
examples, introductory, 1260
options summarized by function, 1273–1274, 1276–1280, 1282
overview, 1259
syntax, 1272
MEANCHAR= option
MACONTROL procedure, 699, 760
MEANSYMBOL= option
MACONTROL procedure, 700, 760
MEDCENTRAL= option
SHEWHART procedure, 1761
MINPCT= option
PARETO procedure, 913
MISSBREAK option
CUSUM procedure, 1761
MACONTROL procedure, 1761
SHEWHART procedure, 1761
MISSING option
PARETO procedure, 913
missing subgroup variable values
SHEWHART procedure, 1761
MISSING1 option
PARETO procedure, 914
MISSING2 option
PARETO procedure, 914
MODEL statement, FACTEX procedure
See FACTEX procedure, MODEL statement
options summarized by function, 476
syntax, 484
MODEL statement, OPTEX procedure
See OPTEX procedure, MODEL statement
syntax, 823
MRCHART statement
See also SHEWHART procedure, MRCHART statement
examples, advanced, 1336
examples, introductory, 1298
options summarized by function, 1312–1313, 1315–1316, 1318, 1320, 1323
overview, 1297
syntax, 1311
MU0= option
CUSUM procedure, 419
MACONTROL procedure, 700, 760
SHEWHART procedure, 1761, 1868, 1920
NAME= option
CUSUM procedure, 1762
MACONTROL procedure, 1762
PARETO procedure, 914
SHEWHART procedure, 1762
NAME2= option
SHEWHART procedure, 1762
NCOls= option
PARETO procedure, 914
NDECIMAL= option
MACONTROL procedure, 1762
SHEWHART procedure, 1762
NDECIMAL2= option
SHEWHART procedure, 1762
NEEDLES option
CUSUM procedure, 1762
MACONTROL procedure, 1762
SHEWHART procedure, 1762
NOARL option
CUSUM procedure, 419
NOBYREF option
CUSUM procedure, 1763
MACONTROL procedure, 1763
SHEWHART procedure, 1763
NOCHART option
CUSUM procedure, 1763
MACONTROL procedure, 1763
PARETO procedure, 915
SHEWHART procedure, 1763
NOCHART2 option
SHEWHART procedure, 1763
NOCONNECT option
CUSUM procedure, 1763
MACONTROL procedure, 1763
SHEWHART procedure, 1763
NOCTL option
MACONTROL procedure, 1763
SHEWHART procedure, 1763
NOCTL2 option
SHEWHART procedure, 1763
NOCURVE option
PARETO procedure, 915
NOFRAME option
CUSUM procedure, 1763
MACONTROL procedure, 1763
PARETO procedure, 915
SHEWHART procedure, 1763
NOHLABEL option
CUSUM procedure, 1763
MACONTROL procedure, 1763
PARETO procedure, 915
SHEWHART procedure, 1763
NOHLLEG option
PARETO procedure, 915
NOKEYMOVE option
PARETO procedure, 916
NOLCL option
MACONTROL procedure, 1763
SHEWHART procedure, 1763
NOLCL2 option
SHEWHART procedure, 1763
NOLEGEND option
CUSUM procedure, 419
MACONTROL procedure, 1764
SHEWHART procedure, 1766
NOLIMIT0 option
SHEWHART procedure, 1764
NOLIMIT1 option
SHEWHART procedure, 1764
NOLIMITLABEL option
MACONTROL procedure, 1764
SHEWHART procedure, 1764
NOLIMITS option
MACONTROL procedure, 1764
SHEWHART procedure, 1764, 1903–1904
NOLIMITSFRAME option
SHEWHART procedure, 1764
NOLIMITSLEGEND option
MACONTROL procedure, 1764
SHEWHART procedure, 1764
NOMASK option
CUSUM procedure, 419
NOPHASEFRAME option
SHEWHART procedure, 1764
NOPRINT specification
ADXALIAS macro, 2035
NOREADLIMITS option
CUSUM procedure, 419
MACONTROL procedure, 700, 760
SHEWHART procedure, 1764
NOTICHES option
SHEWHART procedure, 1765
NOTICKREP option
SHEWHART procedure, 1766
NOTRENDCONNECT option
CUSUM procedure, 1766
MACONTROL procedure, 1766
SHEWHART procedure, 1766
NOTRUNC option
SHEWHART procedure, 1766
NOUCL option
MACONTROL procedure, 1766
SHEWHART procedure, 1766
NOUCL2 option
SHEWHART procedure, 1766
NOVANGLE option
CUSUM procedure, 1766
MACONTROL procedure, 1766
SHEWHART procedure, 1766
NOVLABEL option
PARETO procedure, 916
NOVLABEL2 option
PARETO procedure, 916
NOVTICK option
PARETO procedure, 916
NOVTICK2 option
PARETO procedure, 916
NPANELPOS= option
CUSUM procedure, 1767
MACONTROL procedure, 1767
SHEWHART procedure, 1767
NPCHART statement, SHEWHART procedure
See also SHEWHART procedure, NPCHART statement
eamples, advanced, 1378
eamples, introductory, 1348
ptions summarized by function, 1359, 1361, 1363–1366, 1368
verview, 1347
ntax, 1358
PSYMBOL= option
SHEWHART procedure, 1767
NROWS= option
PARETO procedure, 916
OPTEX procedure
getting started, 802
learning about OPTEX, 801
order of statements, 811, 817, 823, 840
verview, 799
summary of functions, 812
tax, 811
OPTEX procedure, BLOCKS statement
COVAR= option, 815, 844
DESIGN= option, 816, 840
INIT= option, 816
ITER= option, 816
KEEP= option, 816
NOEXCHANGE option, 816
ptions summarized by function, 812
STRUCTURE= option, 816, 838
VAR= option, 844
OPTEX procedure, CLASS statement
eample, 803
ntax, 816
OPTEX procedure, EXAMINE statement
DESIGN option, 818
INFORMATION option, 818
NUMBER= option, 818
options summarized by function, 813
VARIANCE option, 818
OPTEX procedure, GENERATE statement
AUGMENT= option, 819, 831
CRITERION= option, 819, 848
INITDESIGN= option, 820, 830
ITER= option, 821
KEEP= option, 821
METHOD= option, 821, 848
N= option, 808, 822, 830
options summarized by function, 812–813
OPTEX procedure, ID statement, 822
OPTEX procedure, MODEL statement
example, 803
NOINT option, 823, 846
options summarized by function, 812
PRIOR= option, 823, 835
options summarized by function, 812–813
OUT= option, 824
OPTEX procedure, PROC OPTEX statement
CODING= option, 814, 840
DATA= option, 814
EPSILON= option, 814
example, 803
NAMELEN option, 814
NOCODE option, 814, 846
NOPRINT option, 815
options summarized by function, 812–813
SEED= option, 815
STATUS= option, 815
OPTEX procedure, PROC OPTTEX statement
ODS tables, 869
ORDER1= option
PARETO procedure, 916
ORDER2 specification
ADXQMOD macro, 2030
ORDER2= option
PARETO procedure, 917
ORIGIN= option
CSUM procedure, 420
OTHER= option
PARETO procedure, 917
OTHERCVAL= option
PARETO procedure, 917
OTHERNVAL= option
PARETO procedure, 917
OUT= data set
PARETO procedure, 918
OUTHISTORY= option
CSUM procedure, 1767
MACONTROL procedure, 1767
SHEWHART procedure, 1767
OUTINDEX= option
CSUM procedure, 1768
MACONTROL procedure, 1768
SHEWHART procedure, 1768
OUTLABEL= option
CUSUM procedure, 1768
MACONTROL procedure, 1768
SHEWHART procedure, 1768
OUTLABEL2= option
SHEWHART procedure, 1768
OUTLIMITS= option
CUSUM procedure, 1769
MACONTROL procedure, 1769
SHEWHART procedure, 1769
OUTPHASE= option
CUSUM procedure, 1769
MACONTROL procedure, 1769
SHEWHART procedure, 1769
OUTPUT statement, CAPABILITY procedure
See CAPABILITY procedure, OUTPUT statement
generating, 258
keywords summarized by function, 263, 266
overview, 257
syntax, 261
OUTPUT statement, FACTEX procedure
See FACTEX procedure, OUTPUT statement
options summarized by function, 477
syntax, 487
OUTPUT statement, OPTTEX procedure
See OPTTEX procedure, OUTPUT statement
syntax, 824
OUTTABLE= option
CUSUM procedure, 1769
MACONTROL procedure, 1769
SHEWHART procedure, 1769
P
P0= option
SHEWHART procedure, 1769
PAGENUM= option
CUSUM procedure, 1770
MACONTROL procedure, 1770
SHEWHART procedure, 1770
PAGENUMPOS= option
CUSUM procedure, 1770
MACONTROL procedure, 1770
SHEWHART procedure, 1770
PARETO procedure
examples, advanced, 930
examples, introductory, 881
options summarized by function, 894–898
overview, 879
syntax, 893
PARETO procedure, BY statement, 930–931
PARETO procedure, PROC PARETO statement
ANNOTATE= data set, 900
ANNOTATE2= data set, 900
DATA= data set, 900
FORMCHAR= option, 900
GOUT= option, 901
LINEPRINTER option, 901
PARETO procedure, VBAR statement
<table>
<thead>
<tr>
<th>Option</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANCHOR= option</td>
<td>902, 925, 936</td>
</tr>
<tr>
<td>ANGLE= option</td>
<td>902</td>
</tr>
<tr>
<td>ANNOKEY option</td>
<td>902</td>
</tr>
<tr>
<td>ANNOTATE= data set</td>
<td>902</td>
</tr>
<tr>
<td>ANNOTATE2= data set</td>
<td>903</td>
</tr>
<tr>
<td>AXISFACTOR= option</td>
<td>903</td>
</tr>
<tr>
<td>BARLABEL= option</td>
<td>903</td>
</tr>
<tr>
<td>BARLABPOS= option</td>
<td>903</td>
</tr>
<tr>
<td>BARLEGEND= option</td>
<td>904, 943–944</td>
</tr>
<tr>
<td>BARLEGLABEL= option</td>
<td>904</td>
</tr>
<tr>
<td>BARWIDTH= option</td>
<td>904</td>
</tr>
<tr>
<td>CATLEGEND= option</td>
<td>905, 937–938</td>
</tr>
<tr>
<td>CAXIS= option</td>
<td>905</td>
</tr>
<tr>
<td>CAXIS2= option</td>
<td>905</td>
</tr>
<tr>
<td>CBARLINE= option</td>
<td>905</td>
</tr>
<tr>
<td>CBARS= option</td>
<td>905, 936, 943–944</td>
</tr>
<tr>
<td>CCONNECT= option</td>
<td>906</td>
</tr>
<tr>
<td>CF RAME= option</td>
<td>906</td>
</tr>
<tr>
<td>CFRAMENLEG= option</td>
<td>885–886, 906, 933</td>
</tr>
<tr>
<td>CFrameside= option</td>
<td>906</td>
</tr>
<tr>
<td>CFrametop= option</td>
<td>906</td>
</tr>
<tr>
<td>CGRID= option</td>
<td>906</td>
</tr>
<tr>
<td>CGRID2= option</td>
<td>906</td>
</tr>
<tr>
<td>CHIGH((n))= option</td>
<td>906, 941–942</td>
</tr>
<tr>
<td>CHREF= option</td>
<td>906</td>
</tr>
<tr>
<td>CLASS= option</td>
<td>907, 929, 932, 937–940</td>
</tr>
<tr>
<td>CLASSKEY= option</td>
<td>907, 932</td>
</tr>
<tr>
<td>CLOW((n))= option</td>
<td>908, 941</td>
</tr>
<tr>
<td>CMPCTLABEL option</td>
<td>903, 908</td>
</tr>
<tr>
<td>CONNECTCHAR= option</td>
<td>908</td>
</tr>
<tr>
<td>OTHER= option</td>
<td>908</td>
</tr>
<tr>
<td>OTHERCVAL= option</td>
<td>908, 926</td>
</tr>
<tr>
<td>POTHER= option</td>
<td>908, 918</td>
</tr>
<tr>
<td>FO NT= option</td>
<td>909</td>
</tr>
<tr>
<td>FREQ= option</td>
<td>885–886, 910</td>
</tr>
<tr>
<td>GRID option</td>
<td>910</td>
</tr>
<tr>
<td>GR ID2= option</td>
<td>910</td>
</tr>
<tr>
<td>HEIGHT= option</td>
<td>910</td>
</tr>
<tr>
<td>HLEGEND= option</td>
<td>910</td>
</tr>
<tr>
<td>HOFFSET= option</td>
<td>910</td>
</tr>
<tr>
<td>HREF= option</td>
<td>910</td>
</tr>
<tr>
<td>HREFCHAR= option</td>
<td>910</td>
</tr>
<tr>
<td>HREFLABELS= option</td>
<td>910</td>
</tr>
<tr>
<td>HREFLABPOS= option</td>
<td>911</td>
</tr>
<tr>
<td>INFONT= option</td>
<td>911</td>
</tr>
<tr>
<td>INHEIGHT= option</td>
<td>911</td>
</tr>
<tr>
<td>INTERBAR= option</td>
<td>885–886, 911</td>
</tr>
<tr>
<td>INTERTILE= option</td>
<td>911, 933</td>
</tr>
<tr>
<td>LABOTHER= option</td>
<td>911</td>
</tr>
<tr>
<td>LAST= option</td>
<td>885–886, 911</td>
</tr>
<tr>
<td>LGRID= option</td>
<td>911</td>
</tr>
<tr>
<td>LGRID2= option</td>
<td>911</td>
</tr>
<tr>
<td>LHREF= option</td>
<td>912</td>
</tr>
<tr>
<td>LOTHER= option</td>
<td>912</td>
</tr>
<tr>
<td>LVREF= option</td>
<td>912, 938</td>
</tr>
<tr>
<td>MAXCMPCT= option</td>
<td>912</td>
</tr>
<tr>
<td>MAXNCAT= option</td>
<td>888–889, 912</td>
</tr>
<tr>
<td>MINPCT= option</td>
<td>913</td>
</tr>
<tr>
<td>MISSING option</td>
<td>913, 928</td>
</tr>
<tr>
<td>MISSING1 option</td>
<td>914, 928</td>
</tr>
<tr>
<td>MISSING2 option</td>
<td>914, 928</td>
</tr>
<tr>
<td>NAME= option</td>
<td>914</td>
</tr>
<tr>
<td>NCOLS= option</td>
<td>914, 923, 938–940</td>
</tr>
<tr>
<td>NLEGEND= option</td>
<td>915, 936</td>
</tr>
<tr>
<td>NLEGEND= option</td>
<td>885–886, 915, 933</td>
</tr>
<tr>
<td>NOCHART option</td>
<td>915</td>
</tr>
<tr>
<td>NOCURVE option</td>
<td>915</td>
</tr>
<tr>
<td>NOFRAME option</td>
<td>915</td>
</tr>
<tr>
<td>NOHLABEL option</td>
<td>915, 927, 937–938</td>
</tr>
<tr>
<td>NOKEYMOVE option</td>
<td>916</td>
</tr>
<tr>
<td>NOVLABEL option</td>
<td>916</td>
</tr>
<tr>
<td>NOVLABEL2 option</td>
<td>916</td>
</tr>
<tr>
<td>NOVTICK option</td>
<td>916</td>
</tr>
<tr>
<td>NOVTICK2 option</td>
<td>916</td>
</tr>
<tr>
<td>ORDER1= option</td>
<td>916, 929</td>
</tr>
<tr>
<td>ORDER2= option</td>
<td>917, 929</td>
</tr>
<tr>
<td>OTHER= option</td>
<td>888–889, 912–913, 917</td>
</tr>
<tr>
<td>OTHERCVAL= option</td>
<td>917, 926</td>
</tr>
<tr>
<td>O THERNVAL= option</td>
<td>917, 926</td>
</tr>
<tr>
<td>OUT= option</td>
<td>925–926</td>
</tr>
<tr>
<td>OUT= option</td>
<td>918</td>
</tr>
<tr>
<td>PBARS= option</td>
<td>918, 936, 943–944</td>
</tr>
<tr>
<td>PHIGH((n))= option</td>
<td>918, 941–942</td>
</tr>
<tr>
<td>PLOW((n))= option</td>
<td>918, 941</td>
</tr>
<tr>
<td>POTHER= option</td>
<td>918</td>
</tr>
<tr>
<td>SCALE= option</td>
<td>885–886, 919, 927, 933</td>
</tr>
<tr>
<td>SYMBOLCHAR= option</td>
<td>919</td>
</tr>
<tr>
<td>TILELEGEND= option</td>
<td>919, 944–945</td>
</tr>
<tr>
<td>TILELEGEND= option</td>
<td>919</td>
</tr>
<tr>
<td>TURNVLABEL option</td>
<td>919</td>
</tr>
<tr>
<td>VAXIS= option</td>
<td>919</td>
</tr>
<tr>
<td>VAXIS2= option</td>
<td>920</td>
</tr>
<tr>
<td>VAXIS2LABEL= option</td>
<td>920</td>
</tr>
<tr>
<td>VAXISLABEL= option</td>
<td>920</td>
</tr>
<tr>
<td>VOFFSET= option</td>
<td>920</td>
</tr>
<tr>
<td>VREF= option</td>
<td>920, 938</td>
</tr>
<tr>
<td>VREF2= option</td>
<td>920</td>
</tr>
<tr>
<td>VREF2LABELS= option</td>
<td>920</td>
</tr>
<tr>
<td>VREFCHAR= option</td>
<td>920</td>
</tr>
<tr>
<td>VREFLABELS= option</td>
<td>920</td>
</tr>
<tr>
<td>VREFLABPOS= option</td>
<td>920</td>
</tr>
<tr>
<td>WEIGHT= option</td>
<td>921, 952–953</td>
</tr>
<tr>
<td>WGRID= option</td>
<td>921</td>
</tr>
<tr>
<td>WGRID2= option</td>
<td>921</td>
</tr>
<tr>
<td>PATTERN statement</td>
<td>191</td>
</tr>
</tbody>
</table>

See also SHEWHART procedure, PCHART statement
examples, advanced, 1424
examples, introductory, 1392
options summarized by function, 1404–1405, 1407–1410, 1413
overview, 1391
syntax, 1402
PCTLDEF= option
  SHEWHART procedure, 1770
__PHASE__variables
  SHEWHART procedure, 1814
PHASEBREAK option
  CUSUM procedure, 1770
  MACONTROL procedure, 1770
  SHEWHART procedure, 1770, 1877, 1879, 1916
PHASELABTYPE= option
  CUSUM procedure, 1770
  MACONTROL procedure, 1770
  SHEWHART procedure, 1770
PHASELEGEND option
  CUSUM procedure, 1771
  MACONTROL procedure, 1771
  SHEWHART procedure, 1770, 1877, 1879, 1916
phases of subgroups
  SHEWHART procedure, 1746
PHIGH(\(n\))= option
  PARETO procedure, 918
PLOW(\(n\))= option
  PARETO procedure, 918
POTHER= option
  PARETO procedure, 918
PPPLOT statement
  See CAPABILITY procedure, PPPLOT statement
getting started, 278
options dictionary, 283
options summarized by function, 280, 282–283
overview, 277
syntax, 280
PROBMED function, 2008–2009
PROBPLOT statement
  See CAPABILITY procedure, PROBPLOT statement
getting started, 300
options summarized by function, 307–310
overview, 299
syntax, 306
PROC CAPABILITY statement
  See CAPABILITY procedure, PROC CAPABILITY statement
examples, 85
getting started, 37
options summarized by function, 43
overview, 35
syntax, 43
PROC FACTEX statement
  See FACTEX procedure, PROC FACTEX statement
options summarized by function, 476
syntax, 480
PROC OPTEX statement
  See OPTEX procedure, PROC OPTEX statement
syntax, 814
PROC SHEWHART statement
  options summarized by function, 1101
processes, CUSUM procedure
  XCHART statement, 408
processes, MACONTROL procedure
  EWMACHART statement, 689
  MACHART statement, 749
processes, SHEWHART procedure
  BOXCHART statement, 1121
  CCHART statement, 1180
  IRCHART statement, 1224
  MCHART statement, 1272
  MRCHART statement, 1311
  NPCHART statement, 1358
  PCHART statement, 1402
  RCHART statement, 1451
  SCHARTE statement, 1490
  UCHART statement, 1531
  XCHART statement, 1574
  XRCHART statement, 1623
  XSCHART statement, 1678
PSYMBOL= option
  SHEWHART procedure, 1771
Q
QQPLOT statement
  See CAPABILITY procedure, QQPLOT statement
getting started, 334
options summarized by function, 338–339, 341
overview, 333
syntax, 337
R
RANGES option
  SHEWHART procedure, 1771
RCHART statement
  See also SHEWHART procedure, RCHART statement
examples, advanced, 1471
examples, introductory, 1440
options summarized by function, 1452–1453, 1455–1458, 1460
overview, 1439
syntax, 1451
READALPHA option
  MACONTROL procedure, 700, 760
  SHEWHART procedure, 1771
READINDEX= option
### Syntax Index

- **CUSUM procedure**, 420
  - READLIMITS option
    - CUSUM procedure, 420
    - MACONTROL procedure, 701, 761
    - SHEWHART procedure, 1774
  - READPHASES= option
    - CUSUM procedure, 1774
    - MACONTROL procedure, 1774
    - SHEWHART procedure, 1774, 1814–1818, 1820–1825, 1876–1877, 1879–1880
  - READSIGMAS option
    - CUSUM procedure, 420

- **MACONTROL procedure**, 700, 760

- **SHEWHART procedure**, 1772, 1817–1818, 1820–1825, 1877, 1879–1880
  - READLIMITS option
    - CUSUM procedure, 420
    - MACONTROL procedure, 701, 761
    - SHEWHART procedure, 1773
  - READPHASES= option
    - CUSUM procedure, 1774
    - MACONTROL procedure, 1774
    - SHEWHART procedure, 1774, 1814–1818, 1820–1825, 1876–1877, 1879–1880
  - READSIGMAS option
    - CUSUM procedure, 420
  - REPEAT option
    - MACONTROL procedure, 701
    - RTMARGIN= variable, ADXTRANS macro, 2033
  - RTSYMBOL= option
    - SHEWHART procedure, 1774
  - RTMARGIN= option
    - SHEWHART procedure, 1777, 1922
  - RTMPLLOT= option
    - SHEWHART procedure, 1777, 1922

- **REL IABILITY procedure**, ANALYZE statement, 998, 1003–1004, 1006
  - CONVERGE= option, 1054
  - PPOS= option, 1043–1045
  - PREDICT option, 998
  - summary of options, 1004, 1006
  - TOLERANCE option, 998

- **REL IABILITY procedure**, BY statement, 1001–1002

- **REL IABILITY procedure**, CLASS statement, 1001–1002, 1007

- **REL IABILITY procedure**, DISTRIBUTION statement, 966–967, 974–975, 979–980, 988, 998, 1001–1002, 1007

- **REL IABILITY procedure**, FMODE statement, 1001–1002, 1008

- **REL IABILITY procedure**, FREQ statement, 974–975, 979–980, 1001–1002, 1008

- **REL IABILITY procedure**, INSET statement, 1001–1002, 1009–1011
  - keywords, 1009–1010
  - summary of options, 1011

- **REL IABILITY procedure**, MAKE statement, 988, 1001–1002, 1013

- **REL IABILITY procedure**, NENTER statement, 979–980, 1001–1002, 1023

- **REL IABILITY procedure**, ODS table keywords, 1077

- **REL IABILITY procedure**, ODS table names, 1077

- **REL IABILITY procedure**, PPLLOT statement
  - see **REL IABILITY procedure**, PROBPLOT statement

- **REL IABILITY procedure**, PROBPLOT statement, 966–967, 970, 979–980, 1001, 1024–1026, 1028–1029, 1031
  - CONVERGE= option, 1054
  - COVB option, 966–967
  - NOCONF option, 970, 979–980
  - OVERLAY option, 970
  - PCONFPLLOT option, 979–980
  - PPOS= option, 1043–1045
  - READOUT option, 979–980
  - summary of options, 1025–1026, 1028–1029, 1031

- **REL IABILITY procedure**, RELATIONPLOT statement, 974–975, 1001, 1031–1032, 1034–1036, 1038
  - CONVERGE= option, 1054
  - FIT= option, 974–975
  - LUPPER= option, 974–975
  - NOCONF option, 974–975
  - PLOTDATA option, 974–975
  - PLOTFIT option, 974–975
  - PPLOT option, 974–975
  - PPOS= option, 1043–1045
  - RELATION= option, 974–975
  - SLOWER= option, 974–975
  - summary of options, 1032, 1034–1036, 1038

- **REL IABILITY procedure**, RPLOT statement
  - see **REL IABILITY procedure**, RELATIONPLOT statement

- **REL IABILITY procedure**, UNITID statement, 992, 995, 1001–1002, 1039

- **REPEAT option
  - CUSUM procedure, 1776
  - MACONTROL procedure, 1776
  - SHEWHART procedure, 1776

- **RESET option
  - MACONTROL procedure, 701
  - _RMSE_ variable, ADXTRANS macro, 2033

- **RSYMBOL= option
  - SHEWHART procedure, 1776

- **RTMARGIN= option
  - SHEWHART procedure, 1777

- **RTMPLLOT= option
  - SHEWHART procedure, 1777, 1922

### S

- **SCALE= option
  - PARETO procedure, 919**

- **SCHART statement
  - See also SHEWHART procedure, SCHART statement**

- **examples, advanced, 1513**
examples, introductory, 1480
options summarized by function, 1491, 1493–1494, 1496–1500
overview, 1479
syntax, 1490

SCHEME= option
CUSUM procedure, 421

SEPARATE option
SHEWHART procedure, 1777

SERIFS option
SHEWHART procedure, 1777

SHEWHART procedure
and PROC ARIMA, 1895–1902
and PROC CAPABILITY, 1923–1924
and PROC MACONTROL, 1899
and PROC MIXED, 1907, 1909
and PROC PRINCOMP, 1928
SHEWHART procedure, all chart statements

ALLYLABEL= option, 1734
ALPHA= option, 1735
ANNOTATE= option, 1735
BLEVEL option, 1736

BLOCKLABELPOS= option, 1736
BLOCKLABTYPE= option, 1737
BLOCKPOS= option, 1737
BLOCKREP option, 1739

CAXIS= option, 1742
CBLOCKLAB= option, 1742
CBLOCKVAR= option, 1742
CCONNECT= option, 1743
CFRAME= option, 1744

CFRAMELAB= option, 1744
CHREF= option, 1744
CINFILL= option, 1744

CLIMITS= option, 1744
CONNECTCHAR= option, 1746
COUT= option, 1746

COUTFILL= option, 1746
CFRAME= option, 1746

CPHASELEG= option, 1746
CTESTS= option, 1749

CTEXT= option, 1749
CVREF= option, 1749
CZONES= option, 1749

DESCRIPTION= option, 1750
ENDGRID option, 1750

EXCHART option, 1750
FONT= option, 1750

GRID option, 1750
HAXIS= option, 1751
HEIGHT= option, 1751

HMARGIN= option, 1751
HOFFSET= option, 1751
HREF= option, 1752
HREF2DATA= option, 1752
HREFCHAR= option, 1753
HREFFDATA= option, 1753
HREFLABELS= option, 1753
HREFLABPOS= option, 1753
HTML= option, 1754

IMagemap= option, 1755
INTERVAL= option, 1755
LABELFONT= option, 1756
LABELHEIGHT= option, 1756
LCLLABEL= option, 1756
LENGGRID= option, 1757
LGGRID= option, 1757
LHREF= option, 1757
LIMITN= option, 1757
LLLIMITS= option, 1758
LTESTS= option, 1760
LVREF= option, 1761
LZONES= option, 1761
MAXPANELS= option, 1761
NAME= option, 1762
NDECIIMAL= option, 1762
NOBYREF option, 1763
NOCHART option, 1763
NOCONNECT option, 1763
NOFRAME option, 1763
NOFRAME option, 1763
NOHLABEL option, 1763
NOLCL option, 1763
NOLEGEND option, 1764
NOLIMITLABEL option, 1764
NOLIMITS option, 1764
NOLIMITSFRAME option, 1764
NOLIMITSLEGEND option, 1764
NOPHASEFRAME option, 1764
NOREADLIMITS option, 1764
NOUCL option, 1766
NOV ANGLE option, 1766
NPANELPOS= option, 1767
OUTHISTORY= option, 1767

OUTINDEX= option, 1768
OUTLABEL= option, 1768
OUTLIMITS= option, 1769
OUTLIMITS= option, 1769
OUTTABLE= option, 1769
PAGENUM= option, 1770

PAGENUMPOS= option, 1770
PAGENUMPOS= option, 1770
PHASEBREAK option, 1770
PHASELEGEND option, 1771
PHASELEGEND option, 1771
PHASEREFF option, 1771
READALPHA option, 1771
READINDEX= option, 1772
READLIMITS option, 1773
READPHASES= option, 1774
REPEAT option, 1776
SIGMAS= option, 1778

SKIPHLABELS= option, 1779
SYMBOLCHARS= option, 1786
SYMBOLLABELS= option, 1786
SYMBOLORDER= option, 1786
TABLE option, 1787
TABLEALL option, 1787
TABLECENTRAL option, 1787
TABLEID option, 1787
TABLELEGEND option, 1788
TABLEOUTLIM option, 1788
TABLETESTS option, 1788
TEST2RUN= option, 1788
TEST3RUN= option, 1789
TESTACROSS option, 1789
TESTCHAR= option, 1789
TESTFONT= option, 1789
TESTHEIGHT= option, 1789
TESTLABEL\[n\] option, 1790
TESTLABEL= option, 1790
TESTNMETHOD= option, 1791
TESTOVERLAP option, 1791
TESTS= option, 1791
TOTPANELS= option, 1794
TURNHLABELS option, 1794
TYPE= option, 1794
UCLLABEL= option, 1795
V AXIS= option, 1796
VMINOR= option, 1797
VOFFSET= option, 1797
VREF= option, 1797
VREFCHAR= option, 1798
VREFLABELS= option, 1798
VREFLABPOS= option, 1798
W AXIS= option, 1799
WGRID= option, 1799
WLIMITS= option, 1799
ZEROSTD= option, 1801
ZONECHAR= option, 1801
ZONELABPOS= option, 1801

SHEWHART procedure, BOXCHART statement, 1166
See also SHEWHART procedure, all chart statements
ALPHA= option, 1134
BOXSTYLE= option, 1149–1153
BOXWIDTHSCALE= option, 1154–1156
CONTROLSTAT= option, 1110, 1133
DATA= data set, 1139–1140
HISTORY= data set, 1111–1114, 1140–1142
LBOXES= option, 1157–1158
LIMITN= option, 1134
LIMITS= data set, 1120, 1140
LSL= option, 1136
MEDCENTRAL= option, 1133
missing values, 1145
MU= option, 1134
NOCHART option, 1114
NOLIMITS option, 1116, 1903–1904
NOTCHES option, 1153–1154
OUTHISTORY= data set, 1114, 1116, 1136–1137
OUTLIMITS= data set, 1116–1118, 1135–1136
OUTTABLE= data set, 1118, 1137–1138
RANGES option, 1771
SERIFS option, 1149–1150
SIGMA0= option, 1134
SIGMAS= option, 1134
SMETHOD= option, 1143
STDDEVIATIONS option, 1116, 1903–1904
TABLE= data set, 1119, 1142–1143
TARGET= option, 1136
TESTS= option, 1863
USL= option, 1136

SHEWHART procedure, CCHART statement
See also SHEWHART procedure, all chart statements
ALPHA= option, 1193
CSYMBOL= option, 1205–1206
DATA= data set, 1198–1199
HISTORY= data set, 1176–1178, 1199–1200
LIMITN= option, 1193
LIMITS= data set, 1175–1176, 1199
LTESTS= option, 1203–1205
missing values, 1202
NOCHART option, 1172–1173
NOLEGEND option, 1205–1206
OUTHISTORY= data set, 1178–1179, 1195–1196
OUTLIMITS= data set, 1172–1173, 1194–1195
OUTTABLE= data set, 1173–1174, 1196–1197
SIGMAS= option, 1193
SUBGROUPN= option, 1178–1179
TABLE= data set, 1173, 1200–1201
TABLELEGEND option, 1203–1205
TABLETESTS option, 1203–1205
TESTS= option, 1203–1205, 1863
U0= option, 1193, 1205–1206
ZONELABELS option, 1203–1205

SHEWHART procedure, INSET statement
CFILL= option, 1724
CFRAME= option, 1724
CFILLH= option, 1724
CTEXT= option, 1725
DA TA option, 1725
FONT= option, 1725
FORMA T= option, 1725
HEADER= option, 1725
HEIGHT= option, 1725
NOFRAME option, 1725
POSITION= option, 1725, 1727–1728
REFPOINT= option, 1726

SHEWHART procedure, IRCHART statement
See also SHEWHART procedure, all chart statements
ALPHA= option, 1239
DATA= data set, 1244–1245
HISTORY= data set, 1218–1219, 1245, 1247
LIMITN= option, 1222–1223, 1239
LIMITS= data set, 1221–1222, 1245
LSL= option, 1241
LTESTS= option, 1251–1253
LTMARGIN= option, 1256
LTMPLOT= option, 1256
missing values, 1250
Syntax Index  •  2099

MU0= option, 1239, 1253, 1920
NOCHART option, 1217
OUTHISTORY= data set, 1217, 1241–1242
OUTLIMITS= data set, 1219, 1239–1241
OUTTABLE= data set, 1220, 1242–1243
PHASEBREAK option, 1916
RTMPLOT= option, 1255–1256, 1922
SIGMA0= option, 1239, 1253, 1920
SIGMAS= option, 1239
TABLE= data set, 1221, 1247–1248
TABLETESTS option, 1251–1252
TARGET= option, 1241
TEST2RUN= option, 1251–1253
TESTS= option, 1251–1253, 1863
USL= option, 1241
XSYMBOL= option, 1253
ZONELABELS option, 1251–1253

SHEWHART procedure, MCHART statement
See also SHEWHART procedure, all chart statements
ALPHA= option, 1284
DATA= data set, 1289–1290
HISTORY= data set, 1262–1265, 1290–1292
LIMITN= option, 1284
LIMITS= data set, 1270–1271, 1290
LSL= option, 1286
MEDCENTRAL= option, 1284
missing values, 1294
MU0= option, 1284
NOCHART option, 1265–1266
OUTHISTORY= data set, 1265–1267, 1286–1287
OUTLIMITS= data set, 1267–1268, 1285–1286
OUTTABLE= data set, 1268–1269, 1287–1288
SIGMA0= option, 1284
SIGMAS= option, 1284
STDDEVATIONS option, 1266–1267
TABLE= data set, 1269, 1292–1293
TARGET= option, 1286
TESTS= option, 1863
USL= option, 1286

SHEWHART procedure, MRCHART statement
See also SHEWHART procedure, all chart statements
ALLN option, 1339
ALPHA= option, 1326
DATA= data set, 1330–1331
HISTORY= data set, 1301–1303, 1305, 1331–1332
LIMITN= option, 1326, 1338–1339
LIMITS= data set, 1309–1310, 1331
MEDCENTRAL= option, 1325
missing values, 1335
MU0= option, 1326
NMARKERS option, 1339
NOCHART option, 1305
OUTHISTORY= data set, 1305–1306, 1327–1328
OUTLIMITS= data set, 1306, 1326–1327
OUTTABLE= data set, 1307–1308, 1328–1329
SIGMA0= option, 1326

SHEWHART procedure, NPCHART statement
See also SHEWHART procedure, all chart statements
ALLN option, 1383–1384
ALPHA= option, 1371
DATA= data set, 1374
DATAUNIT= option, 1350–1351
HISTORY= data set, 1351–1352, 1375–1376
LIMITN= option, 1371, 1383–1384
LIMITS= data set, 1356, 1374–1375, 1380–1381, 1385–1387
OUTLIMITS= data set, 1355, 1372–1373
P0= option, 1371, 1380–1381
SIGMAS= option, 1371
SUBGROUPN= option, 1349, 1381–1384
TABLE= data set, 1355–1356, 1376–1377
TABLELEGEND option, 1378–1379
TABLETESTS option, 1378–1379
TESTS= option, 1378–1379, 1863
ZONELABELS option, 1378–1379

SHEWHART procedure, PCHART statement
See also SHEWHART procedure, all chart statements
ALLN option, 1430
ALPHA= option, 1416
DATA= data set, 1419
DATAUNIT= option, 1395
HISTORY= data set, 1395–1396, 1420–1421
LIMITN= option, 1416, 1430
LIMITS= data set, 1400, 1420, 1426–1427
P0= option, 1424–1425
missing values, 1423
NEEDLES option, 1426–1427
NOLEGEND option, 1426–1427
PNSYMBOL= option, 1380–1381
P0= option, 1371, 1380–1381
SIGMAS= option, 1371
SUBGROUPN= option, 1349, 1381–1384
TABLE= data set, 1355–1356, 1376–1377
TABLELEGEND option, 1378–1379
TABLETESTS option, 1378–1379
TESTS= option, 1378–1379, 1863
ZONELABELS option, 1378–1379

SHEWHART procedure, QCHART statement
See also SHEWHART procedure, all chart statements
ALLN option, 1430
ALPHA= option, 1416
DATA= data set, 1419
DATAUNIT= option, 1395
HISTORY= data set, 1395–1396, 1420–1421
LIMITN= option, 1416, 1430
LIMITS= data set, 1400, 1420, 1426–1427
NEEDLES option, 1426–1427
NOLEGEND option, 1426–1427
P0= option, 1424–1425
PSYMBOL= option, 1426–1427
READINDEX= option, 1433
SIGMAS= option, 1416
SUBGROUPN= option, 1393, 1427, 1429–1430
TABLE= data set, 1399, 1421–1422
TABLELEGEND option, 1424–1425
TABLETESTS option, 1424–1425
TESTS= option, 1424–1425, 1863
VREF= option, 1433
VREFLABELS= option, 1433
VREFLAPPOS= option, 1433
YSCALE= option, 1430
ZONELABELS option, 1424–1425

SHEWHART procedure, PROC SHEWHART statement

CIINDICES= option, 1744
TESTURLS= option, 1794

SHEWHART procedure, RCHART statement
See also SHEWHART procedure, all chart statements

ALPHA= option, 1462, 1471–1472
DATA= data set, 1465
HISTORY= data set, 1442–1445, 1467–1468
LIMITN= option, 1462
LIMITS= data set, 1448, 1450, 1466, 1472–1474
LSL= option, 1463
missing values, 1470
NOCHART option, 1445–1446
NOLIMIT0 option, 1474
OUTHISTORY= data set, 1445–1446, 1463–1464
OUTLIMITS= data set, 1446–1447, 1462–1463, 1471–1472
OUTTABLE= data set, 1447–1448, 1464–1465
READALPHA option, 1472
SIGMA0= option, 1462, 1474
SIGMAS= option, 1462
SMETHOD= option, 1469
TABLE= data set, 1448, 1468–1469
TARGET= option, 1463
TESTS2= option, 1883
USL= option, 1463

SHEWHART procedure, SCHART statement
See also SHEWHART procedure, all chart statements

ALPHA= option, 1502
DATA= data set, 1506–1507
HISTORY= data set, 1483–1485, 1507–1508
LIMITN= option, 1502
LIMITS= data set, 1488–1489, 1507
LSL= option, 1503
missing values, 1512
OUTHISTORY= data set, 1485–1486, 1503–1504
OUTLIMITS= data set, 1486–1487, 1502–1503
OUTTABLE= data set, 1487–1488, 1504–1505
SIGMA0= option, 1502, 1513
SIGMAS= option, 1502
SMETHOD= option, 1510–1511
SSYMBOL= option, 1513
TABLE= data set, 1488, 1508–1509
TARGET= option, 1503
TESTS2= option, 1883
USL= option, 1503

SHEWHART procedure, UCHART statement
See also SHEWHART procedure, all chart statements

ALPHA= option, 1544
DATA= data set, 1548–1549
HISTORY= data set, 1526–1528, 1549–1550
LIMITN= option, 1544
LIMITS= data set, 1525–1526, 1549
LTESTS= option, 1553–1554
missing values, 1552
NOCHART option, 1522–1523
OUTHISTORY= data set, 1528, 1530, 1545–1546
OUTLIMITS= data set, 1522, 1544–1545, 1556–1558
OUTTABLE= data set, 1523–1524, 1546–1547
SIGMAS= option, 1544
SUBGROUPN= option, 1520–1521, 1530, 1557–1558
TABLE= data set, 1524, 1550–1551
TABLETESTS option, 1553–1554
TESTS= option, 1553–1554, 1863
U0= option, 1544, 1554, 1556
USYMBOL= option, 1554, 1556
ZONELABELS option, 1553–1554

SHEWHART procedure, XCHART statement
See also SHEWHART procedure, all chart statements

ALPHA= option, 1586
BLOCKLABELPOS= option, 1813–1814, 1917
BLOCKLABTYPE= option, 1917
BLOCKPOS= option, 1811–1814
CBLOCKVAR= option, 1812–1814
CFRAME= option, 1815
CNEEDLES= option, 1842
CPHASELEG= option, 1815
DATA= data set, 1590–1591
HISTORY= data set, 1564–1567, 1591, 1593
LABELFONT= option, 1836–1837
LIMITN= option, 1586
LIMITS= data set, 1571–1573, 1591
LSL= option, 1587
LSTARCIRCLES= option, 1829–1830, 1836–1837
LTESTS= option, 1598–1599
LTMARGIN= option, 1813–1814
missing values, 1597
MU0= option, 1586
NOCHART option, 1567–1568
NOLEGEND option, 1598–1599, 1811–1815
OUTHISTORY= data set, 1567–1569, 1587–1588
OUTINDEX= option, 1603
OUTLIMITS= data set, 1569–1570, 1586–1587
OUTTABLE= data set, 1570–1571, 1589
PHASELEGEND option, 1815, 1820–1825
PHASEREF option, 1815, 1820–1825
READINDEXES= option, 1817–1818, 1820–1825
READPHASES= option, 1814–1818, 1820–1825
SIGMA0= option, 1586
SIGMAS= option, 1586
SMETHOD= option, 1593–1596, 1601, 1603
STARBDRADIUS= option, 1837
STARCIRCLES= option, 1829–1830
STARINRADIUS= option, 1830
STARLABEL= option, 1836–1837
STARLEGEND= option, 1836–1837
STAROUTRADIUS= option, 1830
STARSPECS= option, 1835–1837
STARSTART= option, 1829–1830, 1832–1834, 1836–1837
STARTYPE= option, 1832–1834
STARVERTICES= option, 1828–1830, 1832–1834, 1836–1837
STDDEVIATIONS option, 1601, 1603
SYMBOLCHARS= option, 1808
SYMBOLLEGEND= option, 1808
TABLE= data set, 1571, 1593
TABLECENTRAL option, 1598–1599
TABLELEGEND option, 1598–1599
TABLETESTS option, 1598–1599
TARGET= option, 1587
TESTS= option, 1598–1599, 1863
TRENDVAR= option, 1842, 1916
USL= option, 1639
WSTARCIRCLES= option, 1830
ZONELABELS option, 1598–1599
SHEWHART procedure, XRCHART statement
See also SHEWHART procedure, all chart statements
ALLN option, 1660, 1868
ALPHA= option, 1637
CLIPFACTOR= option, 1846–1848
CLIPLEGEND= option, 1848
CLIPLEGPOS= option, 1848
CLIPSUBCHAR= option, 1848
CLIPSYMBOL= option, 1848
CTESTS= option, 1882
CZONES= option, 1882
DATA= data set, 1642
HISTORY= data set, 1614–1616, 1643–1644
LIMITN= option, 1637, 1659, 1868
LIMITS= data set, 1621, 1643, 1657
LSL= option, 1639
LTESTS= option, 1653, 1882
NOCHART option, 1660
OUTTABLE= data set, 1619–1620, 1640–1641
PHASEBREAK option, 1877, 1879
READINDEXES= option, 1877
READPHASES= option, 1876–1877
SIGMA0= option, 1637, 1656–1657, 1868
SIGMAS= option, 1637
SMETHOD= option, 1648, 1660, 1873
subgroup-variable, 1646–1647
TABLE= data set, 1621, 1644–1645
TABLETESTS option, 1653
TARGET= option, 1639, 1650
TESTACROSS option, 1879, 1881
TESTCHAR= option, 1882
TESTLABELr= option, 1882
TESTLABEL= option, 1874, 1882
TESTMETHOD= option, 1872, 1879, 1881
TESTS= option, 1863, 1867–1868
TESTS2= option, 1883
USL= option, 1639
XSYMBOL= option, 1656
ZONECHAR= option, 1882
ZONELABELS option, 1653, 1882
ZONES option, 1882
SHEWHART procedure, XSCHART statement
See also SHEWHART procedure, all chart statements
ALPHA= option, 1692, 1703
DATA= data set, 1696–1697
HISTORY= data set, 1697–1698
LIMITN= option, 1692
LIMITS= data set, 1697
LSL= option, 1693
missing values, 1702
MU0= option, 1692
OUTHISTORY= data set, 1672–1673, 1693–1694
OUTLIMITS= data set, 1673–1674, 1692–1693, 1703
OUTTABLE= data set, 1674–1675, 1694–1695
SIGMA0= option, 1692
SIGMAS= option, 1692
SPLIT= option, 1851
TABLE= data set, 1675, 1698–1699
TARGET= option, 1693
TESTS= option, 1863
TESTS2= option, 1883
USL= option, 1693
SHIFT= option
CUSUM procedure, 421
SIGMA0= option
CUSUM procedure, 421
MACONTROL procedure, 701, 761
SHEWHART procedure, 1777, 1868, 1920
SIGMAS= option
CUSUM procedure, 421
MACONTROL procedure, 701, 761
SHEWHART procedure, 1778
SIZE statement, FACTEX procedure
See FACTEX procedure, SIZE statement
options summarized by function, 476
syntax, 491
SKIPHLABELS= option
CUSUM procedure, 1779
MACONTROL procedure, 1779
SHEWHART procedure, 1779
SMETHOD= option
CUSUM procedure, 421
MACONTROL procedure, 701, 761
SHEWHART procedure, 1779
SPAN= option
MACONTROL procedure, 761
SPEC statement
<table>
<thead>
<tr>
<th>Option</th>
<th>Procedure/Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPLIT=</td>
<td>CUSUM procedure, 1779 MACONTROL procedure, 1779 SHEWHART procedure, 1779, 1851</td>
</tr>
<tr>
<td>SSYMBOL=</td>
<td>SHEWHART procedure, 1780</td>
</tr>
<tr>
<td>STARBDRADIUS=</td>
<td>CUSUM procedure, 1780 MACONTROL procedure, 1780 SHEWHART procedure, 1780, 1837</td>
</tr>
<tr>
<td>STARCIRCLES=</td>
<td>CUSUM procedure, 1780 MACONTROL procedure, 1780 SHEWHART procedure, 1780, 1829–1830</td>
</tr>
<tr>
<td>STARINRADIUS=</td>
<td>CUSUM procedure, 1781 MACONTROL procedure, 1781 SHEWHART procedure, 1781, 1830</td>
</tr>
<tr>
<td>STARBSTART=</td>
<td>CUSUM procedure, 1782 MACONTROL procedure, 1782 SHEWHART procedure, 1782, 1836–1837</td>
</tr>
<tr>
<td>STARLEGEND=</td>
<td>CUSUM procedure, 1782 MACONTROL procedure, 1782 SHEWHART procedure, 1782, 1836–1837</td>
</tr>
<tr>
<td>STARLEGENDLAB=</td>
<td>CUSUM procedure, 1782 MACONTROL procedure, 1782 SHEWHART procedure, 1782, 1836–1837</td>
</tr>
<tr>
<td>STAROUTRADIUS=</td>
<td>CUSUM procedure, 1783 MACONTROL procedure, 1783 SHEWHART procedure, 1783, 1830</td>
</tr>
<tr>
<td>STARSPECS=</td>
<td>CUSUM procedure, 1783 MACONTROL procedure, 1783 SHEWHART procedure, 1783, 1830–1837</td>
</tr>
<tr>
<td>STARSTART=</td>
<td>CUSUM procedure, 1784 MACONTROL procedure, 1784 SHEWHART procedure, 1784, 1829–1830</td>
</tr>
<tr>
<td>STARLEGENDCHAR=</td>
<td>PARETO procedure, 919</td>
</tr>
<tr>
<td>SYMBOLCHAR=</td>
<td>PARETO procedure, 919</td>
</tr>
<tr>
<td>SYMBOLCHARS=</td>
<td>CUSUM procedure, 1786 MACONTROL procedure, 1786 SHEWHART procedure, 1786, 1808</td>
</tr>
<tr>
<td>SYMBOLLEGEND=</td>
<td>CUSUM procedure, 1786 MACONTROL procedure, 1786 SHEWHART procedure, 1786, 1808</td>
</tr>
<tr>
<td>SYMBOLORDER=</td>
<td>CUSUM procedure, 1786 MACONTROL procedure, 1786 SHEWHART procedure, 1786</td>
</tr>
</tbody>
</table>

### T

<table>
<thead>
<tr>
<th>Option</th>
<th>Procedure/Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE=</td>
<td>MACONTROL procedure, 1787 SHEWHART procedure, 1787</td>
</tr>
</tbody>
</table>
TABLEALL option
CUSUM procedure, 422
MACONTROL procedure, 1787
SHEWHART procedure, 1787
TABLEBOX= option
SHEWHART procedure, 1787
TABLECENTRAL option
MACONTROL procedure, 1787
SHEWHART procedure, 1787
TABLECHART option
CUSUM procedure, 422
TABLECOMP option
CUSUM procedure, 422
TABLEID option
CUSUM procedure, 422
MACONTROL procedure, 1787
SHEWHART procedure, 1787
TABLELEGEND option
SHEWHART procedure, 1788
TABLEOUT option
CUSUM procedure, 422
TABLEOUTLIM option
MACONTROL procedure, 1788
SHEWHART procedure, 1788
TABLESUMMARY option
CUSUM procedure, 422
MACONTROL procedure, 1787
SHEWHART procedure, 1787
TABLETESTS option
SHEWHART procedure, 1788
TARGET= option
SHEWHART procedure, 1788
TEST2RUN= option
SHEWHART procedure, 1788, 1871
TEST3RUN= option
SHEWHART procedure, 1789, 1871
TESTACROSS option
SHEWHART procedure, 1789, 1879, 1881
TESTCHAR= option
SHEWHART procedure, 1789, 1882
TESTFONT= option
SHEWHART procedure, 1789
TESTHEIGHT= option
SHEWHART procedure, 1789
TESTLABELn= option
SHEWHART procedure, 1790, 1882
TESTLABEL= option
SHEWHART procedure, 1790, 1874, 1882
TESTMETHOD= option
SHEWHART procedure, 1791, 1872, 1879, 1881
TESTOVERLAP option
SHEWHART procedure, 1791
TESTS= option
SHEWHART procedure, 1791, 1867–1868
TESTS2= option
SHEWHART procedure, 1793, 1883
TESTURLS= option
SHEWHART procedure, 1794
TILELEGLABEL= option
PARETO procedure, 919
UCLLABEL= option
MACONTROL procedure, 1795
SHEWHART procedure, 1795
UCLLABEL2= option
SHEWHART procedure, 1795
USL= option
SHEWHART procedure, 1796
USYMBOL= option
SHEWHART procedure, 1796
VAXIS= option
CUSUM procedure, 1796
MACONTROL procedure, 1796
PARETO procedure, 919
SHEWHART procedure, 1796
VAXIS2= option
PARETO procedure, 920
SHEWHART procedure, 1797
VAXIS2LABEL= option
PARETO procedure, 920
VAXISLABEL= option
PARETO procedure, 920
VMINOR= option
CUSUM procedure, 1797
MACONTROL procedure, 1797
SHEWHART procedure, 1797
VOFFSET= option
CUSUM procedure, 1797
MACONTROL procedure, 1797
PARETO procedure, 920
SHEWHART procedure, 1797
VREF= option
CUSUM procedure, 1797
MACONTROL procedure, 920
SHEWHART procedure, 1797
VREF2= option
CUSUM procedure, 1798
MACONTROL procedure, 1798
PARETO procedure, 920
SHEWHART procedure, 1798
VREFCHAR= option
CUSUM procedure, 1798
MACONTROL procedure, 1798
PARETO procedure, 920
SHEWHART procedure, 1798
VREFCHAR2= option
CUSUM procedure, 1798
MACONTROL procedure, 1798
PARETO procedure, 920
SHEWHART procedure, 1798
VZERO option
SHEWHART procedure, 1799
VZERO2 option
SHEWHART procedure, 1799
W
WAXIS= option
CUSUM procedure, 1799
MACONTROL procedure, 1799
PARETO procedure, 920
SHEWHART procedure, 1799
WBARLINE= option
PARETO procedure, 920
WEIGHT= option
MACONTROL procedure, 701
PARETO procedure, 921
WGRID= option
CUSUM procedure, 1799
MACONTROL procedure, 1799
PARETO procedure, 920
SHEWHART procedure, 1797
X
XCHART statement, CUSUM procedure
See also CUSUM procedure, XCHART statement
examples, advanced, 442
each, introductory, 394
notation, 423
overview, 393
syntax, 408
XCHART statement, SHEWHART procedure
See also SHEWHART procedure, XCHART statement
examples, advanced, 1598
each, introductory, 1562
options summarized by function, 1575–1576, 1578–1582, 1584
overview, 1561
syntax, 1574
XRCHART statement
See SHEWHART procedure, XRCHART statement
examples, advanced, 1652
each, introductory, 1610
options summarized by function, 1624–1625, 1627–1628, 1630–1632, 1634
overview, 1609
syntax, 1623
XSCHART statement
See SHEWHART procedure, XSCHART statement
examples, advanced, 1703
each, introductory, 1666
options summarized by function, 1679–1680, 1682–1684, 1686–1687, 1689
overview, 1665
Syntax Index

XSYMBOL= option
  MACONTROL procedure, 719, 780, 1800
  SHEWHART procedure, 1656, 1800

XVERT algorithm, 2049–2050

Y

YPCT1= option
  CUSUM procedure, 1800
  MACONTROL procedure, 1800
  SHEWHART procedure, 1800

YScale= option
  SHEWHART procedure, 1801

Z

ZEROSTD option
  SHEWHART procedure, 1801

ZONE2LABELS option
  SHEWHART procedure, 1801

ZONE2VALUES option
  SHEWHART procedure, 1801

ZONECHAR= option
  SHEWHART procedure, 1801, 1882

ZONELABELS option
  SHEWHART procedure, 1801, 1882

ZONELABPOS= option
  SHEWHART procedure, 1801

ZONES option
  SHEWHART procedure, 1801, 1882

ZONES2 option
  SHEWHART procedure, 1801

ZONEVALUES option
  SHEWHART procedure, 1802