

# Subject Index

## A

- A-optimal designs
    - See optimal designs, optimality criteria
  - aberration of a design
    - See minimum aberration
  - acceptance probability
    - double-sampling plan, 1853–1854
    - PROBACC2 function, 1853
    - Type A sampling, 1856–1858, 1861–1862
    - Type B sampling, 1854–1855, 1861–1862
  - acceptance sampling
    - average outgoing quality, 1842–1843, 1861–1862
    - average sample number, 1843–1844, 1861, 1863
    - average total inspection, 1845–1846, 1861–1862
    - evaluating double-sampling plans, 1863
    - evaluating single-sampling plans, 1861, 1863
    - probability of choosing nonconforming items, 1854–1858
    - types of sampling plans, 1861
  - alias chains, 1884
  - alias structure
    - breaking links, example, 461–463
    - details, 496
    - examining, 1884–1885
    - example, 458–460, 475–477
    - finding, 1884–1885
    - listing with GLM procedure, 754
    - syntax, 448
  - analysis of variance, 487
  - analyzing designs, 1883
  - analyzing factorial designs, 1885
  - Anderson-Darling statistic, 38, 160
  - Anderson-Darling test, 24
  - annotating
    - cdf plots, 72
    - comparative histograms, 96
    - example, 703–705
    - histograms, 131
    - P-P plots, 258
    - probability plots, 286
    - Q-Q plots, 315
    - Shewhart charts, 1615
  - augment, factorial design
    - example, 458, 461
  - autocorrelation in process data, 1756–1762
    - diagnosing and modeling, 1757–1758
    - strategies for handling, 1758–1762
  - average and range charts
    - See  $\bar{X}$  and  $R$  charts
  - average and range method
    - GAGE application, 1818
    - gage studies, 1809, 1825
  - average and standard deviation charts
    - See  $\bar{X}$  and  $s$  charts
  - average chart
    - GAGE application, 1817
    - gage studies, 1809, 1824
  - average charts
    - See  $\bar{X}$  charts
  - average outgoing quality
    - AOQ2 function, 1842
    - Type B single-sampling, 1861–1862
  - average run lengths (cusum charts)
    - See cumulative sum control charts
    - cusum schemes, 1849–1850
    - EWMA scheme, 1852
  - average sample number
    - ASN2 function, 1843
    - Type B single-sampling, 1862
  - average total inspection
    - ATI2 function, 1845
    - Type B single-sampling, 1862
  - axes, Pareto charts, 814, 816, 849–850
  - axes, Shewhart charts
    - See Shewhart charts, axes
  - axial portion of CCD designs, 1889–1890
- ## B
- balanced incomplete block design
    - See block designs
  - balanced lattice, 478
  - Bayesian optimal designs, 732, 742, 753
  - beta distribution
    - cdf plots, 72
    - chi-square goodness-of-fit test, 159
    - deviation from empirical distribution, 159
    - EDF goodness-of-fit test, 159
    - histograms, 131, 149
    - histograms, example, 170
    - P-P plots, 258
    - probability plots, 286
    - Q-Q plots, 315
  - block designs
    - balanced lattice, examples, 478
    - optimal designs, examples, 727, 755
    - randomized complete, examples, 463
  - block specification, FACTEX procedure
    - block pseudo-factors, 442, 447

- block size, 442
  - block size restrictions, 448
  - minimum block size, 442
  - number of blocks, 442, 447
  - runs per block, 447
  - block structure
    - See blocks
  - blocking, FACTEX procedure
    - block pseudo-factor, 505
    - blocking factor, 505
    - example, 485
    - incomplete block design, example, 478
    - randomization, 492
    - rename block variable, 453
  - blocks
    - and aliasing, 1884
    - default names for, 1877, 1886, 1890
    - specifying, 1876–1877, 1880, 1884–1886, 1890
  - box charts
    - box appearance, options, 1618, 1620–1622, 1634, 1643, 1654
    - box-and-whisker plots, description of, 1073
    - box-and-whisker plots, style of, 1618
    - capability indices, computing, 1076
    - control limit equations, 1073–1074
    - control limits, specifying, 1624
    - displaying points, 1618
    - examples, advanced, 1086
    - examples, introductory, 1050
    - labeling axes, 1084
    - missing values, 1085
    - notation, 1072
    - ODS tables, 1079
    - options summarized by function, 1063–1065, 1067–1069, 1071
    - outlier identification color, 1632
    - outlier identification symbol, 1633
    - overview, 1049
    - percentile computation, 1083, 1648
    - plotting character, 1063
    - reading preestablished control limits, 1061, 1080
    - reading raw measurements, 1050–1053, 1079–1080
    - reading subgroup summary statistics, 1053–1056, 1080–1082
    - reading summary statistics and control limits, 1060, 1082–1083
    - saving control limits, 1058–1059, 1075–1076
    - saving subgroup summary statistics, 1056–1058, 1076–1077
    - saving summary statistics and control limits, 1059–1060, 1077–1078
    - schematic box-and-whisker plots, 1090
    - side-by-side box-and-whisker plots, 1049, 1074, 1089
    - skeletal box-and-whisker plots, 1089
    - standard deviation, estimating, 1083
    - syntax, 1062
    - tables, creating, 1663
  - Box-Cox transformations, 1876, 1881–1882
  - Box-Wilson designs
    - See central composite designs
- ## C
- c charts
    - central line, 1126
    - control limit equations, 1126–1127
    - control limit parameters, 1127
    - examples, advanced, 1134
    - examples, introductory, 1106
    - getting started, 1106
    - known number of nonconformities, specifying, 1136–1137
    - labeling axes, 1133
    - missing values, 1133
    - notation, 1125
    - ODS tables, 1130
    - options summarized by function, 1117–1121, 1123
    - overview, 1105
    - plotted points, 1125
    - plotting character, 1116
    - reading number of nonconformities, 1111–1113, 1131–1132
    - reading preestablished control limits, 1110–1111, 1130–1131
    - reading raw data, 1106–1108, 1130
    - reading subgroup data and control limits, 1132–1133
    - saving control limits, 1108–1109, 1127–1128
    - saving nonconformities per unit, 1113–1114
    - saving number of nonconformities, 1128
    - saving subgroup data and control limits, 1129
    - syntax, 1115
    - tests for special causes, 1134–1136
  - candidate data set, OPTEX procedure
    - See optimal designs, candidate data set
  - candidate points, generating with ADXXVERT macro, 1896
  - capability indices
    - $C_{p_m}(a)$ , 24
    - $P_{pk}$  versus  $C_{pk}$ , 45
    - assumptions, 45
    - Boyles' index  $C_{p_m}^+$ , 50
    - computing, 46, 48–50
    - computing, example, 11
    - confidence interval, example, 60, 245
    - confidence limits, 20
    - estimation from Q-Q plots, 317, 334
    - estimation from Q-Q plots, example, 343
    - nonstandard indices, computing, 243
    - specialized, 50
    - specification limits, example, 11
    - specification limits, specifying, 28–29
    - terminology, 45
    - tests for normality, 19
    - the index  $C_{j_k p}$ , 51
    - the index  $k$ , 50

- the indices  $C_{p(5.15)}$ , 52
- the indices  $C_{pk(5.15)}$ , 52
- the indices  $C_{pm}(a)$ , 51
- the indices  $C_{pmk}$ , 52
- Wright's index  $C_s$ , 53
- CAPABILITY procedure
  - introduction, 3
  - learning about, 4
  - plot statements, 4
- cdf plots
  - annotating, 72
  - axes, color, 73
  - axes, specifying, 79
  - beta distribution, 72
  - creating, 66
  - defining character features, 22, 73, 78
  - example, 66
  - exponential distribution, 74
  - font, specifying, 74
  - gamma distribution, 74
  - getting started, 66
  - legends, 76
  - lognormal distribution, 76
  - normal distribution, 77
  - normal distribution, example, 81
  - options summarized by function, 68–71
  - overview, 65
  - reference lines, example, 82
  - reference lines, options, 73–76, 79
  - suppressing empirical cdf, 77
  - suppressing legend, 77
  - Weibull distribution, 79
- center points, example, 460
- central composite designs, 1889–1891
  - centerpoints, 1889–1890
  - macros for, 1889–1891
- centroids, and ADXXVERT macro, 1896
- chart description, Shewhart charts, 1628
- chi-square goodness-of-fit test, 159
  - compared to EDF test, 177
- classification variable
  - See comparative histograms
- classification variables, OPTEX procedure
  - See optimal designs, model
- classification variables, Pareto charts, 888, 893
- clipping points, Shewhart charts
  - See Shewhart charts, clipping points
- coding designs, 1876
  - See also optimal designs, coding
- coding, FACTEX procedure
  - block factor, 453
  - design factor, 452
- coefficient of variation
  - computing, 35
- collapsing factors, example, 469
- coloring Pareto charts
  - See Pareto charts, coloring
- coloring, Shewhart charts
  - See Shewhart charts, coloring
- comparative histograms
  - annotating, 96
  - axes, color of, 97
  - bar width, specifying, 97
  - bins, specifying, 104
  - bins, specifying midpoints of, 104
  - classification variable, missing values of, 104
  - classification variable, ordering levels of, 107
  - classification variable, specifying, 98–99
  - color, options, 97–98, 100
  - columns, number of, 105
  - font, specifying, 101–102
  - getting started, 88
  - grids, 102
  - intervals, information about, 108
  - kernel density estimation, options, 97, 103, 109
  - legend, 105, 108
  - line type, grids, 103
  - normal distribution, example, 90
  - normal distribution, options, 106, 109
  - one-way with inset statistics, example, 110
  - one-way, example, 88
  - options summarized by function, 93–96
  - overview, 87
  - reference lines, options, 101–103, 108–109
  - rows, number of, 106
  - specification limits, 100
  - specification limits, filled areas, 27–29
  - suppressing plot features, 105–106
  - two-way, example, 112
  - vertical scale, 109
- comparative Pareto charts
  - See Pareto charts, comparative
- computational form of the cusum chart
  - See cumulative sum control charts
- confidence intervals
  - See intervals, CAPABILITY procedure
- confidence levels, 19
- confidence limits, 19–21
  - basic parameters, 20
  - confidence levels, 19
  - distribution-free, 20
  - for percentiles, 40
  - normally distributed, 21
  - percentiles, 20–21
  - probability of exceeding specifications, 21
  - process capability indices, 20
  - quantiles, 20–21
- confidence limits, CAPABILITY procedure
  - confidence level, 20–21, 25–26, 1623
  - type, 20–21, 25–26, 1623
- confounding
  - See alias structure
- confounding rules
  - compare with alias structure, 496
  - design factors, 504
  - details, 496
  - example, 475
  - minimum aberration, 497

- notation, 496
- orthogonally confounded, 505
- partial confounding, example, 475
- run-indexing factors, 503
- searching, 506
- syntax, 449
- unconfounded effects, 505
- connecting points, Shewhart charts, 1624
- constants
  - using functions to calculate, 1863
- constants, control charts
  - A2, 1863
  - A3, 1863
  - B3, 1863
  - B4, 1863
  - B5, 1863
  - B6, 1863
  - c4, 1848
  - c5, 1863
  - D1, 1863
  - d2, 1850
  - D2, 1863
  - d3, 1851
  - D3, 1863
  - D4, 1863
  - E2, 1863
  - E3, 1863
- constrained mixture designs
  - See mixture designs
- constrained mixture experiments
  - ADXMAMD macro, 1893
  - ADXXVERT macro, 1896
- constructing
  - macros for factorial designs, 1883, 1886
  - McLean-Anderson designs, 1893
  - Plackett-Burman designs, 1883, 1887
  - simplex-centroid designs, 1894
  - simplex-lattice designs, 1895
- contamination, variance
  - BAYESACT call, 1846
- control chart functions
  - expected value of range, 1850
  - standard deviation of range, 1851
- control factor design, 495
- control factors, 495
- control factors, example, 482
- 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, 39
- Cramér-von Mises test, 24
- Cramer-von Mises statistic, 161
- 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, 356
  - average run length approach, 397–399
  - central reference value, 398
  - color, options, 385
  - compared with Shewhart charts, 401
  - computational form, 368–371
  - cusum schemes, specifying, 389
  - decision interval, defining, 394–395
  - designing a cusum scheme, 397–399
  - detecting shifts, 386, 389
  - economic design, 398
  - error probability approach, 398
  - examples, advanced, 410
  - examples, introductory, 362
  - FIR (fast initial response) feature, 392–393
  - graphics catalog, specifying, 357
  - headstart values, 386, 392–393
  - interpreting one-sided charts, 395
  - interpreting two-sided charts, 364, 397
  - introduction, 351
  - learning about, 352
  - line printer features, 356–357
  - line types, options, 387
  - line widths, options, 390
  - lineprinter plots, using, 358
  - lower cumulative sum, 392
  - missing values, 409
  - monitoring variability, example, 410–412
  - negative shifts, 392
  - nonstandardized data, 385
  - notation, 391
  - ODS tables, 406
  - one-sided (decision interval) schemes, 368–371, 392
    - options summarized by function, 376–384
    - origin, specifying, 388
    - overview, 361
    - plotting character, 376
    - positive shifts, 392
    - process mean, specifying, 387
    - process standard deviation, specifying, 389
    - reading cusum scheme parameters, 358, 373–374, 407–408
    - reading raw measurements, 356, 362–364, 406–407
    - reading subgroup summary statistics, 357, 365–366, 408–409
    - reference values, specifying, 386
    - saving cusum scheme parameters, 371–372, 404–405
    - saving subgroup summary statistics, 367–368, 405
    - saving summary statistics and cusum parameters, 405
  - Shewhart charts, combined with, 415–416

standard deviation, estimating, 389, 401–404  
 suppressing average run length calculation, 387  
 suppressing display of V-mask, 387  
 syntax, 356, 375  
 two-sided (V-mask) schemes, 393–394  
 two-sided (V-mask) schemes, examples, 362–366  
 Type 1 error probabilities, 385, 389  
 Type 2 error probabilities, 385  
 upper and lower cumulative sum charts, combining,  
 413–414  
 upper cumulative sum, 392  
 V-mask, defining, 395–397  
 curvature, check for, example, 460  
 customizing designs, 1876, 1878  
 cusum charts  
 See cumulative sum control charts  
 cusum schemes  
 designing with CUSUMARL function, 1849–1850

## D

D-optimal designs  
 See optimal designs, optimality criteria  
 data collection forms, creating, 1880  
 decoding designs, 1877–1878  
 default factor names, 1877, 1886, 1893–1896  
 density estimation  
 See kernel density estimation  
 derived factors, FACTEX procedure  
 creating, 455  
 example, 468  
 descriptive statistics  
 computing, 34–35  
 printing, example, 9  
 using PROC CAPABILITY, 9  
 design augmentation, 726, 732, 738, 750  
 design characteristics, FACTEX procedure  
 alias structure, 443, 496  
 confounding rules, 443, 496  
 design listing, 449  
 design criteria  
 See optimal designs, optimality criteria  
 design of experiments  
 See macros for experimental design  
 design size specification, FACTEX procedure  
 fraction, 442, 456  
 minimum runs, 442, 456  
 number of runs, 442, 456  
 run indexing factors, 442, 456  
 syntax, 455–456  
 design size specification, OPTEX procedure, 738  
 design, factorial  
 See factorial design  
 DETMAX algorithm  
 See optimal designs, search algorithms  
 distance from a point to a set, 778  
 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, 446  
 effect length, OPTEX procedure  
 limit, 734  
 empirical distribution function  
 definition of, 37, 159  
 EDF test compared to chi-square goodness-of-fit  
 test, 177  
 EDF test statistics, 37–38, 159  
 EDF test statistics, Anderson-Darling, 38, 160  
 EDF test statistics, Cramér-von Mises, 39  
 EDF test statistics, Cramer-von Mises, 161  
 EDF test statistics, Kolmogorov-Smirnov, 38, 160  
 EDF test, probability values, 161  
 estimable effects, 1883  
 EWMA charts  
 asymptotic control limits, displaying, 630  
 asymptotic control limits, example, 650  
 average run lengths, computing, 658  
 axis labels, 647  
 central line, 634  
 control limit equations, 634  
 control limits, computing, 630, 634  
 displaying subgroup means, example, 656  
 examples, advanced, 649  
 examples, introductory, 610  
 missing values, 648  
 notation, 633  
 ODS tables, 642  
 options summarized by function, 621–625, 627–  
 628  
 overview, 609  
 plotted points, 633  
 plotting character, 621  
 plotting subgroup means, 631  
 probability limits, 630  
 process mean, specifying, 631  
 process standard deviation, specifying, 632  
 reading preestablished control limit parameters,  
 618–619, 643  
 reading probability limits, 631  
 reading raw measurements, 610–612, 642  
 reading subgroup summary statistics, 612–615,  
 643–644  
 reading summary statistics and control limits, 618,  
 644–645  
 saving control limit parameters, 616–617, 639–  
 640  
 saving subgroup summary statistics, 615–616, 640  
 saving summary statistics and control limits, 617–  
 618, 640–641  
 specifying parameters for, 649–650  
 standard deviation, estimating, 645–647  
 syntax, 620  
 varying subgroup sample sizes, 651  
 weight parameter, choosing, 635

weight parameter, specifying, 632  
 examine design, FACTEX procedure  
   See design characteristics, FACTEX procedure  
 examples, FACTEX procedure  
   advanced, 457  
   alias links breaking, 458  
   center points, 460  
   collapsing factors, 469  
   completely randomized, 457  
   derived factors, 468  
   design replication, 464, 467  
   fold-over design, 461  
   full factorial, 431  
   full factorial in blocks, 433  
   getting started, 431  
   half-fraction factorial, 435  
   hyper-Graeco-Latin square, 471  
   incomplete block design, 478  
   minimum aberration, 472  
   mixed-level, 467–468  
   partial confounding, 475  
   point replication, 464, 467  
   pseudo-factors, 468  
   randomized complete block design, 463  
   RCBD, 463  
   replication, 464, 467  
   resolution III design, 461  
   resolution IV, 472  
   resolution IV, augmented, 458  
   sequential construction, 475  
 exchange algorithm  
   See optimal designs, search algorithms  
 expected value  
   for range of iid normal variables, 1850–1851  
   for standard deviation of iid normal sample, 1848–1849  
 experimental design, macros for  
   See macros for experimental design  
 exponential distribution  
   cdf plots, 74  
   chi-square goodness-of-fit test, 159  
   deviation from empirical distribution, 159  
   EDF goodness-of-fit test, 159  
   histograms, 134, 150  
   P-P plots, 259–260  
   probability plots, 288  
   Q-Q plots, 318  
 exponentially weighted moving average charts  
   See EWMA charts  
 extreme vertex designs  
   See mixture designs  
 extreme vertices designs, 1896–1897

**F**

FACTEX procedure  
 block specification, 446  
 block specification options, summary, 442  
 design factor levels, 450  
 design size options, summary, 442

design size specification, 455  
 design specification options, summary, 442  
 examining design characteristics, 448  
 factor specification options, summary, 442  
 features, 429  
 getting started examples, 431  
 invoking, 446  
 learning about FACTEX, 430  
 listing design factors, 449  
 model specification, 450  
 model specification options, summary, 442  
 output, 452  
 overview, 429  
 randomization, 454  
 replication, 454  
 resolution, 451  
 statement descriptions, 446  
 summary of functions, 442  
 syntax, 441  
 using interactively, 437  
 factor names, defaults, 1877, 1886, 1893–1896  
 factor specification, FACTEX procedure  
   factor names, 442  
   levels, 442  
 factorial designs  
   examples, See examples, FACTEX procedure  
   balanced lattice, 478  
   efficiency, 451  
   finding, 1887–1888  
   fractional factorial, minimum aberration, 497  
   fractional factorial, theory, 503  
   macros for, 1883–1888  
   mixed-level, 455  
   orthogonal, 467  
   replicate, 454  
   resolution, 451  
 factorial portion of CCD designs, 1889  
 factors, FACTEX procedure  
   block factor, 488, 505  
   block pseudo-factor, 488, 496, 505  
   derived factor, 488  
   design factor, 488  
   design factor coding, 452  
   design factor levels, 450  
   design factor names, 449  
   pseudo-factor, 488  
   run-indexing factor, 489, 496, 503  
   types, 488  
 Fedorov algorithm  
   See optimal designs, search algorithms  
 filling area underneath density  
   histograms, 135  
 FIR (fast initial response) feature  
   See cumulative sum control charts  
 fold-over design, example, 461  
 folded normal distribution, histograms  
   example, 182  
 fonts, customizing, 1867–1869  
 fonts, Shewhart charts, 1628

- fractional factorial designs
  - See also factorial design
  - macros for, 1883–1888
- frequency data, Pareto charts, 802–804, 838–839
- frequency tables, 23
- full inspection and ASN2 function, 1843
- functions
  - AOQ2, 1842–1843, 1863
  - ASN2, 1843–1844, 1863
  - ATI2, 1845–1846, 1863
  - BAYESACT call, 1846–1848
  - C4, 1848–1849, 1863
  - CUSUMARL, 1849–1850
  - D2, 1850–1851, 1863
  - D3, 1851–1852, 1863
  - EWMAARL, 1852
  - for acceptance sampling, 1841
  - for control chart analysis, 1841
  - for sampling plans, 1841
  - PROBACC2, 1853–1854, 1863
  - PROBBNML, 1854–1855, 1861
  - PROBHYP, 1856–1858, 1861
  - PROBMED, 1858–1859
  - STD MED, 1859–1860
  - summary of, 1841
- G**
- G-optimal designs
  - See optimal designs, optimality criteria
- GAGE application
  - See gage studies
  - average and range method, 1818
  - average chart, 1817
  - data set format, 1831
  - entering data, 1813–1815, 1822
  - gage catalog, 1811
  - introduction to, 1809
  - invoking, 1811
  - missing data, 1819
  - range chart, 1815
  - reading data set, 1822
  - saving data, 1821
  - variance components method, 1820
- gage catalog, 1811
- gage repeatability and reproducibility
  - average and range method, 1827
  - introduction to, 1809
  - variance components method, 1830
- gage studies
  - See GAGE application
  - average and range method, 1809, 1825
  - average chart, 1809, 1824
  - example, 1811
  - introduction to, 1809
  - measurement system, 1809–1810
  - missing data, 1831
  - part-to-part variation, average and range method, 1827
  - part-to-part variation, average chart, 1817, 1824–1825
  - part-to-part variation, variance components method, 1830
  - range chart, 1809, 1824
  - repeatability, 1809–1810
  - repeatability and reproducibility, 1809
  - repeatability and reproducibility, average and range method, 1827
  - repeatability and reproducibility, variance components method, 1830
  - repeatability, average and range method, 1826
  - repeatability, range chart, 1815, 1824
  - repeatability, variance components method, 1830
  - reproducibility, 1809–1810
  - reproducibility, average and range method, 1826
  - reproducibility, average chart, 1817, 1824
  - reproducibility, variance components method, 1830
  - terminology, 1810
  - variance components method, 1809, 1828
- gamma distribution
  - cdf plots, 74
  - chi-square goodness-of-fit test, 159
  - deviation from empirical distribution, 159
  - EDF goodness-of-fit test, 159
  - histograms, 136, 151
  - P-P plots, 260–261
  - probability plots, 289–290
  - Q-Q plots, 318–319
- generalized faces and ADXXVERT macro, 1896
- geometric moving average charts
  - See EWMA charts
- getting started, CAPABILITY procedure
  - adding insets to plots, 192
  - creating histograms, 118
  - cumulative distribution plot, 66
  - distribution of variable across classes, 88
  - prediction, confidence, and tolerance intervals, 218
  - probability plot, 276
  - probability-probability plot, 252
  - quantile-quantile plot, 308
  - saving summary statistics, 234
  - summary statistics for process capability, 9
- getting started, CUSUM procedure
  - adding insets to plots, 420
- getting started, MACONTROL procedure
  - adding insets to plots, 710
- getting started, PARETO procedure
  - adding insets to plots, 870
- getting started, SHEWHART procedure
  - adding insets to plots, 1596
- Gini's mean difference, 24
- GLM procedure, 487
- global macro variables, 1878
- goodness-of-fit test
  - See chi-square goodness-of-fit test
  - See empirical distribution function

Graeco-Latin square, 471  
 graphical output, Pareto charts, 795  
 graphics catalog, specifying  
   CAPABILITY procedure, 23  
 grid options, Shewhart charts, 1628–1629, 1635, 1675

**H**

hanging histograms, 137  
 HBAR charts  
   options summarized by function, 842–847  
   syntax, 842  
 headstart values in cusum schemes, 1849  
 histograms  
    $S_B$  distribution, 144, 151  
    $S_L$  distribution, 139  
    $S_N$  distribution, 142  
    $S_U$  distribution, 145, 153  
   comparative, *See* comparative histograms  
   adding summary statistics, 122  
   annotating, 131  
   axis color, 133  
   axis scaling, 147  
   bar width, 141  
   bars, suppressing, 141  
   beta distribution, 131, 149  
   beta distribution, example, 170  
   capability indices, based on fitted distribution, 138  
   capability indices, based on fitted distribution, computing, 162–163  
   capability indices, based on fitted distribution, example, 178–179  
   changing midpoints, example, 122  
   chi-square goodness-of-fit for fitted distribution, 159  
   color, options, 133–134  
   endpoints of intervals, 143  
   exponential distribution, 134, 150  
   filling area underneath density, 135  
   folded normal distribution, annotating, 182  
   gamma distribution, 136, 151  
   getting started, 118  
   graphical enhancements, 168  
   interval midpoints, 164  
   Johnson  $S_B$  distribution, 144, 151  
   Johnson  $S_L$  distribution, 139  
   Johnson  $S_N$  distribution, 142  
   Johnson  $S_U$  distribution, 145, 153  
   kernel density estimation, 156  
   kernel density estimation, example, 179  
   kernel density estimation, options, 132, 138, 147  
   legend, options, 134, 139, 143  
   legends, suppressing, 141–142  
   line type, 139  
   lognormal distribution, 139, 154  
   midpoints, 140–141  
   multiple distributions, example, 172  
   normal distribution, 142, 155  
   normal distribution, example, 120  
   ODS tables, 167

  options summarized by function, 125–127, 129–130  
   output data sets, 143, 164, 166–167  
   overview, 117  
   percentile axis, 143  
   percentiles, 164  
   plots, suppressing, 142  
   printed output, 157–164  
   printed output, capability indices based on fitted distribution, 162–164  
   printed output, intervals, 164  
   printed output, suppressing, 141–142  
   quantiles, 143, 164  
   reference lines, options, 133–134, 137–140, 147  
   saving curve parameters, 164  
   saving goodness-of-fit results, 164  
   specification limits, color, 27  
   specification limits, example, 118  
   specification limits, filled areas, 28–29  
   symbols for curves, 146  
   three-parameter lognormal distribution, example, 181  
   three-parameter Weibull distribution, example, 181  
   tick marks on horizontal axis, 137  
   Weibull distribution, 147, 155  
 hyper-Graeco-Latin square, example, 471

**I**

incomplete block design  
   *See* block designs  
 independent estimate of error, examples, 460, 464  
 individual measurement and moving range charts  
   axis labeling, 1173  
   capability indices, computing, 1167  
   central line, 1164  
   control limit equations, 1165  
   examples, advanced, 1175  
   examples, introductory, 1144  
   interpreting, 1173  
   missing values, 1174  
   moving range calculation, controlling, 1151–1152  
   notation, 1164  
   ODS tables, 1169  
   options summarized by function, 1154–1156, 1158–1160, 1162–1163  
   overview, 1143  
   plotted points, 1164  
   plotting character, 1154  
   reading measurements, 1144–1145, 1169  
   reading measurements and ranges, 1147–1148, 1170–1171  
   reading measurements, ranges, and control limits, 1150, 1171–1172  
   reading preestablished control limits, 1150–1151, 1169–1170  
   saving control limits, 1148, 1166–1167  
   saving measurements and ranges, 1146, 1167



- saving measurements, ranges, and control limits, 1149, 1168
- standard deviation, estimating, 1172
- standard values, specifying, 1177–1178
- syntax, 1153
- tests for special causes, 1175–1177
- univariate plots, displaying, 1179–1180
- information matrix, 733, 737
- initialization for design search
  - See optimal designs, initialization
- initializing
  - designs, 1878
  - macro variables, 1876
- inner array, 482, 495
- input data sets, Shewhart charts
  - See Shewhart charts, input data sets
- insets
  - background color, 205, 878, 1605
  - background color of header, 205, 878, 1605
  - displaying summary statistics, example, 192, 870, 1596
  - drop shadow color, 205, 878, 1605
  - formatting values, example, 193, 871, 1598
  - frame color, 205, 878, 1605
  - getting started, 192, 420, 710, 870, 1596
  - goodness-of-fit statistics, example, 211
  - header text color, 205, 878, 1605
  - header text, specifying, 194, 206, 873, 879, 1599, 1606
  - labels, example, 193, 871, 1598
  - legend, example, 212
  - overview, 191, 419, 709, 869, 1595
  - positioning, details, 207–210, 880–883, 1607–1610
  - positioning, example, 194, 873, 1599
  - positioning, options, 205–206, 878–879, 1606
  - statistics associated with distributions, 199–203
  - summary statistics grouped by function, 198–199, 876, 1602
  - suppressing frame, 206, 879, 1606
  - text color, 205, 878, 1606
- interaction, FACTEX procedure
  - alias structure, 496
  - between control and noise factors, 485
  - confounding, 504
  - examples, 475, 486–487
  - generalized, 467, 504–505
  - minimum aberration, 497
  - minimum aberration, example, 472
  - nonnegligible, 504
  - resolution, 491
  - specify terms, 450, 489
- interquartile range, 24
- saving in output data set, 241
- intervals
  - ODS tables, 229
- intervals, CAPABILITY procedure
  - computing for process capability analysis, 222
  - computing intervals, example, 218
  - confidence levels, specifying, 223
  - confidence, for mean, 223, 227
  - confidence, for standard deviation, 223, 227
  - list of options, 222
  - notation used in computing, 225
  - number of future observations, 223
  - one-sided limits, example, 220
  - prediction, for future observations, 223, 225
  - prediction, for mean, 223, 226
  - prediction, for standard deviation, 223, 227
  - prediction, *k*-values for, 223
  - saving information, output data set, 224, 228
  - specifying method used, 223
  - specifying type of, 224
  - suppressing output tables, 224
  - tolerance, 226
  - tolerance, for proportion of population, 223
  - tolerance, *p*-values for, 224
  - tolerance, specifying proportion of population, 224
- Ishikawa diagrams
  - adding arrows, 534–536
  - aligning arrows, 551–557
  - arrow colors, 572–577
  - arrow heads, 579
  - arrow line style, 572–577
  - arrow line width, 572–577
  - balancing arrows, 551–557
  - box color, modifying, 571
  - box shadow, 580
  - clipboard graphics, 568–569
  - color, arrow, 572–577
  - color, box, 571
  - color, palette, 572–577
  - color, text, 578
  - context-sensitive operations, 517, 529–531
  - data collection, 557–558
  - data presentation, 557–558
  - deleting arrows, 544–546
  - detail, decreasing, 558–560
  - detail, increasing, 558–560
  - Edit menu, 532
  - editing existing diagrams, 582–583
  - editing labels, 537–539
  - examples, Integrated Circuit Failures, 589
  - examples, Photo Development Process, 589
  - examples, Quality of Air Travel Service, 589
  - exporting diagrams, 568–569
  - File menu, 532
  - fonts, modifying, 570
  - Help menu, 533
  - highlighting arrows, 572–577
  - history, 515
  - hotspots, 517, 529–531
  - isolating arrows, 562–563
  - labeling arrows, 537–539
  - line palette, 572–577
  - managing complexity, 558–565
  - merging diagrams, 563–565
  - mouse sensitivity, 580

- moving arrows, 540–544, 549–557
- multiple diagrams, displaying, 563–565, 584
- notepads, 557–558
- output, bitmaps, 568–569
- output, graphics, 566–567
- output, SAS data set, 581, 586–587
- overview, 515
- palettes, colors, 572–577
- palettes, fonts, 570
- palettes, lines, 572–577
- printing, bitmaps, 568–569
- printing, SAS/GRAPH output, 566–567
- resizing arrows, 546–549
- SAS data set, input, 582–583, 586–587
- SAS data set, output, 581, 586–587
- saving, bitmaps, 568–569
- saving, clipboard graphics, 568–569
- saving, graphics, 566–567
- saving, SAS data set, 581
- subsetting arrows, 546–549, 572–577
- summary of operations, 529–533
- swapping arrows, 549–551
- syntax, 588
- tagging arrows, 546–549, 572–577
- terminology, 517
- text entry, 537–539
- tutorial, 519, 521–525
- undo, 544–546
- View menu, 533
- zooming arrows, 561–562, 580

**J**

- Johnson  $S_B$  distribution
  - histograms, 144, 151
- Johnson  $S_L$  distribution
  - histograms, 139
- Johnson  $S_N$  distribution
  - histograms, 142
- Johnson  $S_U$  distribution
  - histograms, 145, 153

**K**

- k-exchange algorithm
  - See optimal designs, search algorithms
- kernel
  - See kernel density estimation
- kernel density estimation, 156
  - adding density curve to histogram, 138
  - area underneath density curve, 101, 135
  - bandwidth parameter, specifying, 97, 132
  - color, 100, 133
  - density curve, width of, 109, 147
  - example, 179
  - filling area under density curve, 101, 135
  - kernel function, specifying type of, 102, 138
  - line type for density curve, 103, 139
  - options used with, 103, 138
- kernel function
  - See kernel density estimation

- Kolmogorov-Smirnov statistic, 38, 160
- Kolmogorov-Smirnov test, 24
- kurtosis
  - computing, 35
  - saving in output data set, 240

**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, 1891
  - factorial design, 1887–1888
- location parameter
  - probability plots, 300
  - Q-Q plots, 333
- lognormal distribution
  - cdf plots, 76
  - chi-square goodness-of-fit test, 159
  - deviation from empirical distribution, 159
  - EDF goodness-of-fit test, 159
  - histograms, 139, 154, 181
  - P-P plots, 262
  - probability plots, 291
  - Q-Q plots, 320–321

**M**

- macro variables
  - See global macro variables
- macros for experimental design, 1873–1874, 1876–1897
  - adding centerpoints, 1889
  - adding points to a design, 1892
  - adding variables for second-order models, 1879
  - ADXADCEN macro, 1889–1890
  - ADXALIAS macro, 1884–1885
  - ADXCCD macro, 1890–1891
  - ADXCDC macro, 1876–1877
  - ADXDCCD macro, 1877–1878
  - ADXFFA macro, 1885–1886
  - ADXFFD data set, 1886
  - ADXFFD macro, 1886–1887
  - ADXFILL macro, 1892–1893
  - ADXINIT macro, 1878–1879
  - ADXMAMD macro, 1893–1894
  - ADXPBD macro, 1887
  - ADXPCC macro, 1891
  - ADXPFF macro, 1887–1888
  - ADXQMOD macro, 1879–1880
  - ADXRPT macro, 1880
  - ADXSCD macro, 1894–1895
  - ADXSLD macro, 1895
  - ADXTRANS macro, 1881–1882
  - ADXXVERT macro, 1896–1897
  - analyzing factorial designs, 1885
  - Box-Cox transformations, 1881–1882

- calling, 1874
- central composite designs, 1890–1891
- coding design factors, 1876
- constructing factorial designs, 1886
- decoding design factors, 1877–1878
- default factor names, 1877, 1886, 1893–1896
- defining global macro variables, 1878
- examining alias structure, 1884–1885
- extreme vertices designs, 1896–1897
- filling in the design region, 1892
- fractional factorial design, 1883–1888
- including files for, 1874
- initializing designs, 1878
- lists of factorial designs, 1887–1888
- McLean-Anderson designs, 1893
- overview of, 1873
- Plackett-Burman designs, 1887
- randomizing designs, 1880
- renaming design factors, 1877–1878
- simplex-centroid designs, 1894
- simplex-lattice designs, 1895
- software requirements, 1874
- structure of, 1874
- XVERT algorithm, 1896–1897
- main effect, 489, 491, 504–505
- main effect, examples, 475–477, 486–487
- main-effects-only designs, 1887
- maximum likelihood and power transformations, 1881
- maximum value
  - saving in output data set, 240
- McLean-Anderson designs, 1893–1894
- mean
  - saving in output data set, 240
- 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, 1809–1810
- measures of location
  - mode, 45
- median
  - probability function for, 1858
  - saving in output data set, 240
  - standard deviation of, 1859
- median absolute deviation about the median, 24
- median and  $R$  charts
  - axis labels, 1257
  - central line, 1243
  - control limit equations, 1243
  - examples, advanced, 1253
  - examples, introductory, 1220
  - labeling axes, 1252
  - missing values, 1252
  - notation, 1242
  - ODS tables, 1247
  - options summarized by function, 1232–1233, 1235–1238, 1240
  - overview, 1219
  - plotted points, 1243
  - plotting character, 1232
  - reading preestablished control limits, 1229–1230, 1248–1249
  - reading raw measurements, 1220–1221, 1248
  - reading subgroup summary statistics, 1222–1225, 1249–1250
  - reading summary statistics and control limits, 1228, 1250–1251
  - saving control limits, 1226–1227, 1244–1245
  - saving subgroup summary statistics, 1225–1226, 1245–1246
  - saving summary statistics and control limits, 1227–1228, 1246–1247
  - standard deviation, estimating, 1251–1252
  - syntax, 1231
- median and range charts
  - See median and  $R$  charts
- median charts
  - capability indices, computing, 1209
  - central line, 1207
  - control limit equations, 1207
  - examples, introductory, 1184
  - labeling axes, 1215
  - missing values, 1215
  - notation, 1206
  - ODS tables, 1211
  - options summarized by function, 1196–1198, 1200–1201, 1203–1204
  - overview, 1183
  - plotted points, 1206
  - plotting character, 1196
  - reading preestablished control limits, 1193–1194, 1212
  - reading raw measurements, 1184–1185, 1211–1212
  - reading subgroup summary statistics, 1186–1189, 1213–1214
  - reading summary statistics and control limits, 1192–1193, 1214–1215
  - saving control limits, 1191–1192, 1208–1209
  - saving subgroup summary statistics, 1189–1191, 1209–1210
  - saving summary statistics and control limits, 1192–1193, 1210–1211
  - standard deviation, estimating, 1215
  - syntax, 1195
- minimum aberration, 497
  - aberration vector, 497
  - blocked design, 498
  - example, 472
  - limitation, 474
- minimum value
  - saving in output data set, 240
- missing values
  - CAPABILITY procedure, 53
  - CUSUM procedure, 409
  - MACONTROL procedure, 648

- output data set, 240
    - SHEWHART procedure, 1539
  - mixed-level, factorial design
    - construction, examples, 467–470
    - derived factors, 455
  - mixture designs
    - examples, 728, 762
    - plotting, 763–766
  - mixture designs, macros for, 1892
  - mixture-process designs
    - See mixture designs
  - mode
    - saving in output data set, 240
  - model specification, FACTEX procedure
    - directly, 450
    - estimated effects, 442, 450
    - indirectly, 450
    - minimum aberration, 442, 451
    - nonnegligible effects, 442, 450
    - resolution, 442, 451
    - resolution, maximum, 451
    - specifying effects, 489
  - modes, 23
  - modified Fedorov algorithm
    - See optimal designs, search algorithms
  - moving average control charts
    - See EWMA charts
    - See uniformly weighted moving average charts
    - adding features to, 602
    - average run lengths, displaying, 703
    - graphics catalog, specifying, 603
    - introduction, 597
    - learning about, 598
    - line printer features, 602–603
    - lineprinter plots, creating, 604
    - reading control limit parameters, 604
    - reading raw measurements, 602
    - reading subgroup summary statistics, 603–604
    - syntax, 602
  - moving range charts
    - See individual measurement and moving range charts
  - multi-vari charts
    - examples using the SHEWHART procedure, 1099
  - multivariate control charts, 1783–1787
    - chart statistic, calculating, 1783
    - principal component contributions, 1786
  - mutually orthogonal Latin square, 471, 478
- N**
- names, default
    - See default factor names
  - naming quadratic variables in ADXQMOD macro, 1879
  - neighbor-balanced designs, 762
  - Newton-Raphson approximation
    - gamma shape parameter, 71, 130, 140
    - Weibull shape parameter, 73, 133, 140
  - noise factors, 482, 495
  - nonconforming items
    - probability of choosing, 1854–1858
  - nonnormal process data, 1779–1782
    - calculating probability limits, 1780
    - preliminary chart, 1779
  - normal distribution
    - cdf plots, 77
    - cdf plots, example, 81
    - chi-square goodness-of-fit test, 159
    - comparative histograms, 106
    - comparative histograms, example, 90
    - deviation from empirical distribution, 37, 159
    - EDF goodness-of-fit test, 37, 159
    - histograms, 141–142, 155
    - histograms, example, 120
    - P-P plots, 263
    - P-P plots, example, 252
    - probability plots, 292–293
    - Q-Q plots, 322
  - normal plots
    - ADXFFA macro, 1885
  - normal random variables
    - expected value of standard deviation, 1848
    - standard deviation of range, 1851
  - normality tests, 24, 36
    - Anderson-Darling test, 24
    - changes made to, 37
    - Cramér-von Mises test, 24
    - Kolmogorov-Smirnov test, 24
    - Shapiro-Wilk test, 24
  - np* charts
    - central line, 1284
    - control limit equations, 1284
    - control limit parameters, 1285
    - control limits, specifying, 1298–1300
    - examples, advanced, 1292
    - getting started, 1264
    - labeling axes, 1291
    - missing values, 1291
    - notation, 1283
    - ODS tables, 1288
    - options summarized by function, 1275–1276, 1278–1282
    - overview, 1263
    - plotted points, 1283
    - plotting character, 1274
    - reading preestablished control limits, 1271–1272, 1289, 1298–1300
    - reading raw data, 1264–1266, 1288
    - reading subgroup data, 1266–1268, 1289–1290
    - reading subgroup data and control limits, 1270–1271, 1290–1291
    - saving control limits, 1269, 1285–1286
    - saving subgroup data, 1268, 1286
    - saving subgroup data and control limits, 1269–1270, 1286–1287
    - standard average proportion, specifying, 1294–1295
    - syntax, 1273

- tests for special causes, 1292–1293
- unequal subgroup sample sizes, 1295–1297
- null hypothesis
  - location parameter, 23

## O

- observation exclusion, 21
- OC Curve, 1342, 1497
- ODS tables
  - CAPABILITY procedure, 54
  - FACTEX procedure, 499
  - OPTTEX procedure, 784
  - RELIABILITY procedure, 1025–1026
- one-way comparative Pareto charts
  - See Pareto charts, comparative
- Operating Characteristic Curve, 1342, 1497
- optimal blocking
  - See optimal designs, optimal blocking
- optimal designs
  - A-efficiency, 773
  - Bayesian optimal designs, 732, 742, 753
  - covariate designs, 731, 742
  - customizing design search, 738
  - D-efficiency, 773
  - data set roles, 767–768
  - design augmentation, 726, 732, 738, 750
  - design augmentation data set, 767–768
  - design characteristic options, summary, 732
  - design listing, 733, 737
  - design search defaults, 738
  - efficiency measures, 773
  - efficiency measures, comparing, 744–747
  - efficiency measures, interpreting, 773
  - epsilon value, 734
  - evaluating an existing design, 740, 760, 781–782
  - examining, 737
  - G-efficiency, 773
  - getting started examples, 721
  - including identification variables, 741, 768–769
  - information matrix, 733, 737
  - input data sets, 767
  - interactively, 737, 745
  - invoking, 734
  - learning about OPTTEX procedure, 720
  - listing options, summary, 733
  - memory usage, 779
  - mixture designs, 762
  - number of design points, 732, 738, 741
  - number of search tries, 738, 740
  - number of tries to keep, 740
  - OPTTEX procedure features, 719
  - OPTTEX procedure overview, 719
  - optimal blocking, 782
  - output, 783
  - output data set, 769
  - prior precision values, 742, 754
  - random number seed, 735
  - resolution IV designs, 753
  - run-time considerations, 779
  - saturated design, 726, 741
  - saving options, summary, 733
  - search methods, 780
  - search strategies, 783
  - statement descriptions, 734
  - status of search, 735
  - summary of functions, 732–733
  - syntax, 731
  - treatment candidate points, 760
  - variance matrix, 733, 737
- optimal designs, candidate data set
  - creating with ADXFILL macro, 764
  - creating with ADXXVERT macro, 728, 763
  - creating with DATA step, 728, 744
  - creating with FACTEX procedure, 726–728
  - creating with PLAN procedure, 721–722, 747
  - discussion, 767–768
  - examples of creating, advanced, 744
  - examples of creating, introductory, 721
  - recommendations, 752, 783
  - specifying, 734
- optimal designs, coding
  - default coding, 774
  - discussion, 774
  - examples, 775
  - no coding, 776
  - orthogonal coding, 732, 758–760, 774
  - recommendations, 775
  - specifying, 734
  - static coding, 732, 774
  - summary of options, 732
- optimal designs, examples
  - advanced, 744
  - Bayesian optimal designs, 753
  - block design, 727, 755
  - design augmentation, 726, 750
  - designs with correlated runs, 760
  - designs with covariates, 758
  - handling many variables, 727
  - initialization, 749
  - introductory, 721
  - mixture design, 728, 762
  - nonstandard modeling, 744
  - reducing candidate set, 752
  - resolution IV design, 753
  - saturated second-order design, 726
  - using different search methods, 747
- optimal designs, initialization
  - defaults, 738–740
  - example, 749
  - initial design data set, 739, 749, 767–768
  - optimal blocking, 736
  - partially random, 739
  - random, 739
  - recommendations, 783
  - sequential, 739
  - specifying, 739
  - summary of options, 732–733
- optimal designs, model

- abbreviation operators, 771
- classification variables, 736, 770
- crossed effects, 771
- discussion, 770
- examples, 772
- factorial model, 772
- interactions, 771
- main effects, 771
- main effects model, 772
- no-intercept model, 732, 742
- nonstandard, 744
- polynomial effects, 770
- quadratic model, 772
- regressor effects, 770
- specifying, 732, 741
- summary of options, 732
- types of effects, 741, 770
- types of variables, 770
- optimal designs, optimal blocking
  - A-efficiency, 773
  - block specification, 736
  - classification variables, 737
  - covariance specification, 735
  - covariate designs, 758
  - D-efficiency, 773
  - data sets, 769
  - discussion, 782
  - evaluating an existing design, 782
  - examples, 755, 758, 760
  - initialization, 736
  - number of search tries, 736
  - specifying, 732, 735
  - summary of options, 732
  - suppressing exchange step, 736
  - treatment candidate points, 735, 760
  - tries to keep, 736
- optimal designs, optimality criteria
  - A-optimality, 738, 746, 777
  - computational limitations, 778–779
  - D-optimality, 738, 776
  - default, 738
  - definitions, 776–779
  - discussion, 776
  - distance-based, 776, 778
  - examples, 744, 762
  - G-optimality, 743, 777
  - I-optimality, 777
  - information-based, 776
  - S-optimality, 739, 779
  - specifying, 732, 738–739
  - summary of options, 732
  - types, 776
  - U-optimality, 738, 762, 778
- optimal designs, output
  - block variable name, 733, 743
  - design number, 743
  - options, 742
  - output data set, 742, 769
  - selecting design by efficiency, 743, 777
  - transfer variables, 733, 741
- optimal designs, search algorithms
  - comparing different algorithms, 747–748
  - default, 738
  - DETMAX, 740, 747–748, 781
  - discussion, 780
  - example, 747–748
  - exchange, 740, 781
  - excursion level for DETMAX, 740
  - Fedorov, 740, 782
  - k-exchange, 740, 781
  - modified Fedorov, 740, 782
  - rank-one updates, 780
  - sequential, 740, 747–748, 781
  - specifying, 733, 740
  - speed, 741, 747–748, 779
  - summary, 733
- optimal designs, space-filling designs
  - coding for, 776
  - criteria, 776
  - definitions, 778–779
  - distance from a point to a set, 778
  - efficiency measures, 773
  - examples, 762
  - S-optimality, 779
  - specifying, 738–739
  - U-optimality, 778
- optimality criteria
  - See optimal designs, optimality criteria
- options, Shewhart charts
  - dictionary, 1613
- orthogonal blocking
  - ADXPCC macro, 1891
- orthogonal confounding, 488–489
- orthogonal design
  - theory, 503
- orthogonal designs
  - ADXPCC macro, 1891
- orthogonal fractional factorial designs, macros for, 1883
- orthogonally confounded designs, 1883–1884
- outer array, 482, 495
- outgoing quality
  - See AOQ2 function
- output
  - ADXTRANS macro, 1882
- output data set, Pareto charts, 891–892
- output data sets
  - ADXALIAS macro, 1884–1885
  - ADXCCD macro, 1890–1891
  - ADXCDC macro, 1876
  - ADXFFD macro, 1886
  - ADXMAMD macro, 1893–1894
  - ADXQMOD macro, 1879–1880
  - ADXSCD macro, 1894–1895
  - ADXSLD macro, 1895
  - ADXTRANS macro, 1881–1882
  - ADXXVERT macro, 1896–1897
- output data sets, CAPABILITY procedure

- creating, 242
  - getting started, 234
  - naming, 237
  - percentile variable names, 238–239
  - percentiles, 238
  - saving capability indices and related statistics, 240
  - saving specification limits and related statistics, 240
  - saving summary statistics, 240–241
  - saving test statistics, 241
  - output data sets, Shewhart charts
    - See Shewhart charts, output data sets
  - output, FACTEX procedure
    - code design factor levels, 443, 452
    - decode block factor levels, 443, 453
    - decode design factor levels, 443, 452
    - details, 498
    - options, 452
    - output data set, 452, 498
    - rename block variable, 443, 453
  - output, OPTEX procedure
    - See optimal designs, output
- P**
- p* charts
    - central line, 1325
    - control limit equations, 1325
    - control limit parameters, 1326
    - control limits, revising, 1340–1342
    - examples, advanced, 1334
    - getting started, 1304
    - labeling axes, 1332
    - missing values, 1333
    - notation, 1324
    - OC curves, 1342–1344
    - ODS tables, 1329
    - options summarized by function, 1316–1321, 1323
    - overview, 1303
    - plotted points, 1324
    - plotting character, 1315
    - reading preestablished control limits, 1312–1313, 1330
    - reading raw data, 1304–1306, 1329
    - reading subgroup data, 1306–1308, 1330–1331
    - reading subgroup data and control limits, 1311, 1331–1332
    - saving control limits, 1309–1311, 1326–1327
    - saving subgroup data, 1308–1309, 1327
    - saving subgroup data and control limits, 1310–1311, 1328
    - standard average proportion, specifying, 1336–1337
    - syntax, 1314
    - tests for special causes, 1334–1335
    - unequal subgroup sample sizes, 1337–1339
  - P-P plots
    - annotating, 258
    - axes, color of, 259
    - axes, horizontal, 261
    - axes, vertical, 264–265
    - beta distribution, 258
    - compared to Q-Q plots, 269
    - distribution options, 255–256, 270
    - distribution reference line, 253, 255
    - exponential distribution, 259
    - frame, color of, 259
    - gamma distribution, 260
    - general plot layout, 256
    - getting started, 252
    - graphics device, options, 257, 271
    - interpreting, 267
    - line printer, options, 257, 264
    - line width, distribution reference line, 265, 271
    - lognormal distribution, 262
    - normal distribution, 263
    - normal distribution, example, 252
    - options summarized by function, 255–257
    - overview, 251
    - reference lines, options, 259, 261–262, 265
    - text, color of, 259
    - Weibull distribution, 265
  - Pareto charts
    - avoiding clutter, 892
    - axes, 814, 816, 830, 849–850, 855
    - axis options, 811, 846
    - bars, displaying, 812, 847
    - before-and-after, 895–898
    - classification variables, 888, 893
    - dictionary of options, 795
    - examples, advanced, 895
    - examples, introductory, 800, 836
    - graphics catalog, 795
    - grids, 810, 820, 845, 855
    - highlighting, 905–909
    - labeling chart features, 890
    - large data sets, 894
    - levels, 887
    - merging columns, example, 912
    - missing values, 824, 859, 893
    - options summarized by function, 794
    - output data set, 891–892
    - overview, 789
    - Pareto curve, 801, 837
    - Pareto, Vilfredo, 789
    - process variables, 801, 837, 887, 893
    - reading frequency data, 802–804, 838–839
    - reading raw data, 800–802, 836–838
    - reference lines, 809, 844
    - restricting number of categories, 805–806, 808, 840–841, 843
    - saving information, 891–892
    - scaling bars, 829, 864, 892
    - seven basic QC tools, 789
    - side-by-side, 789
    - stacked, 789
    - syntax, 794
    - tied categories, 805–806, 839, 841

- “trivial many”, 789, 905
- “useful many”, 789, 905
- using raw data, example, 800–802, 836–838
- vertical axis, 887
- visual clarity, 892
- “vital few”, 789, 905
- Pareto charts, categories, 801, 837, 887
  - legend, 802, 838
  - maximum number of, 894
  - restricting, 805–806, 840–841
  - restricting number of, 822–823, 858–859
  - ties, 805–806, 839, 841
  - unbalanced, 889
- Pareto charts, classification variables
  - examples, 895, 899
- Pareto charts, coloring
  - axes, 816, 850
  - bar outlines, 816, 851
  - bars, 816, 851
  - cumulative percent curve, 816, 851
  - grid lines, 817, 852
  - highest bars, 817, 852
  - labels, 817, 852
  - lowest bars, 819, 853
  - other* category, 819, 854
  - recommendations, 893
  - reference lines, 817, 820, 852, 855
  - secondary axis, 816, 851
  - tick marks, 816, 850
  - tiles, 820, 854
- Pareto charts, comparative, 789, 810, 845, 888
  - cells, 888
  - classification variables, 897
  - classification variables, examples, 895, 899
  - creating, 817, 852
  - frequency proportion bars, 819, 854
  - key cell, 818, 853, 889, 897, 904
  - merging columns, 912
  - one-way, 888
  - one-way, example, 902
  - ordering values, 826–827, 861–862
  - rows and columns, ordering, 826–827, 861–862
  - tiles, 889, 908
  - two-way, 888
  - two-way, examples, 899, 903, 905–906, 908, 910, 912
  - unbalanced categories, 827, 862, 889
  - weighted charts, 914
- Pareto charts, cumulative percent curve, 801, 825, 837, 860, 887
  - anchoring, 900–901
  - coloring, 816, 851
  - enhancing, 807, 842
  - scaling, 890
  - suppressing, 892, 902–903
- Pareto charts, grid lines
  - width, 831, 865
- Pareto charts, legends
  - bar legend labels, 815, 850
  - category legend labels, 815, 850
  - highest and lowest bars legend labels, 821, 856
  - sample size legend color, 817, 851
  - sample size legends, 811, 825, 846, 860
  - tile legend labels, 829, 864
  - tile legends, 829, 864
- Pareto charts, *other* category, 805–806, 827–828, 840–841, 862
  - coloring, 819, 854
  - labeling, 822, 857
  - pattern, 829, 864
- Pareto charts, restricted, 805–806, 823, 840–841, 858–859, 888, 894
  - large data sets, 894
- Pareto charts, weighted, 888
  - example, 914
- Pareto curve, 801, 837
- Pareto principle, 789
- Pareto, Vilfredo, 789
- partial confounding, example, 475
- pattern tests
  - See Shewhart charts, tests for special causes
- percent plots
  - See P-P plots
- percentiles
  - axes, Q-Q plots, 323–324, 334
  - confidence limits, 40
  - defining, 24, 39
  - empirical distribution function, 39
  - saving in output data set, 238
  - visual estimates, Q-Q plots, 334
  - weighted, 40
  - weighted average, 39
- Plackett-Burman designs, 1883, 1887
- PLAN procedure, 480
- plot statements, CAPABILITY procedure, 4
- plots of estimated effects, 1885
- power transformations
  - ADXTRANS macro, 1881
- prediction intervals
  - See intervals, CAPABILITY procedure
- printing
  - available designs, macros for, 1887–1888, 1891
  - factorial designs, macros for, 1883
- probability functions
  - binomial, 1854–1855
  - for median, 1858–1859
  - hypergeometric, 1856–1858
- probability limits, Shewhart charts, 1614, 1649, 1654–1655
- probability of exceeding specifications, 21
- probability plots
  - axes, color, 287
  - axes, horizontal, 290
  - axes, rotating, 294
  - axes, vertical, 296
  - beta distribution, 286
  - distribution reference lines, 295, 301



distribution reference lines, examples, 302–304  
distributions, 299  
exponential distribution, 288  
frame, color, 287  
gamma distribution, 289  
general plot layout, 284  
getting started, 276  
graphics device, options, 285  
graphics, options, 301  
legends, 290  
legends, suppressing, 292  
line printer, options, 285, 294–295  
location parameter, 300  
lognormal distribution, 291  
lognormal distribution, example, 278  
normal distribution, 281, 292–293  
normal distribution, example, 276  
options summarized by function, 282–285  
overview, 275  
percentile axis, 293  
reference lines, 288, 290–292, 296  
scale parameter, 300  
shape parameter, 294, 300  
syntax, 281  
text, color, 288  
threshold parameter, 296, 300  
Weibull distribution, 296–298

probability-probability plots  
  See P-P plots

PROC CAPABILITY statement, 7

process capability indices  
  confidence limits, 20

process distribution  
  See empirical distribution function

process potential  
   $P_{pk}$  versus  $C_{pk}$ , 45

process variables, Pareto charts, 801, 837, 887, 893

pseudo-factors, example, 468

## Q

Q-Q plots  
  axes, color, 317  
  axes, horizontal, 319  
  axes, options, 314  
  axes, percentile scale, 323–324, 334  
  axes, rotating, 324  
  axes, vertical, 326  
  beta distribution, 313, 315  
  capability indices, 317, 322, 334, 343  
  creating, 330  
  diagnostics, 331  
  distribution reference lines, 310, 333  
  distributions, 312, 332  
  estimating  $C_{pk}$ , 343  
  exponential distribution, 313, 318  
  frame, color, 317  
  gamma distribution, 313, 318  
  general plot layout, 314  
  getting started, 308

graphics device, options, 315, 335  
interpretation, 331  
legends, 320  
legends, suppressing, 310, 321–322  
line printer, options, 314, 324, 326  
line width, 335  
location parameter, 333  
lognormal distribution, 313, 320–321  
lognormal distribution, example, 337  
nonnormal data, example, 336  
normal distribution, 313, 322  
normal distribution, example, 308, 343  
options summarized by function, 312–313, 315  
overview, 307  
percentiles, estimates, 334  
reference lines, 313, 317–318, 320–321, 323, 326–327, 335  
sample estimates, 322  
scale parameter, 333  
syntax, 311  
text, color, 317  
threshold parameter, 333  
Weibull distribution, 313, 327–328  
Weibull distribution, example, 341

quadratic terms, adding to model, 1879

quantile-quantile plots  
  See Q-Q plots

quantiles  
  defining, 39  
  empirical distribution function, 39  
  weighted average, 39

## R

R charts  
  capability indices, computing, 1370  
  central line, 1368  
  control limit equations, 1368–1369  
  control limits, specifying, 1379–1380  
  examples, advanced, 1377  
  examples, introductory, 1348  
  labeling axes, 1376  
  missing values, 1376  
  notation, 1368  
  ODS tables, 1372  
  options summarized by function, 1359–1363, 1365–1366  
  overview, 1347  
  plotted points, 1368  
  plotting character, 1359  
  probability limits, 1377–1378  
  reading preestablished control limits, 1356–1357, 1373  
  reading raw measurements, 1348–1350, 1372  
  reading subgroup summary statistics, 1350–1353, 1374  
  reading summary statistics and control limits, 1356, 1374–1375  
  saving control limits, 1354–1355, 1369–1370

- saving subgroup summary statistics, 1353–1354, 1370–1371
- saving summary statistics and control limits, 1355–1356, 1371–1372
- standard deviation, estimating, 1375–1376
- syntax, 1358
- randomization, FACTEX procedure
  - blocking, 492
  - details, 492
  - example, 457, 463
  - prevent, 454, 493
  - seed, 454, 463
- randomized complete block, example, 463
- randomized treatments, example, 463
- randomizing designs, 1876, 1880
- range
  - saving in output data set, 240
- range chart
  - GAGE application, 1815
  - gage studies, 1809, 1824
- range charts
  - See *R* charts
- reference lines, Shewhart charts
  - See Shewhart charts, reference lines
- reliability analysis
  - analyzing accelerated life test data, 930–935
  - analyzing arbitrarily-censored data, 939
  - analyzing binomial data, 952, 954
  - analyzing groups of data, 928–930
  - analyzing interval-censored data, 935–938, 941
  - analyzing regression models, 943–946
  - analyzing repair data, 947, 949
  - analyzing right-censored data, 925–927
  - analyzing two groups of repair data, 949–951
  - arbitrarily censored data, 1000
  - binomial parameter estimation, 1013–1014
  - classification variables, 961
  - confidence intervals for parameters, 1009–1010
  - covariance matrix of parameters, 1008
  - creating life-stress relation plots, 984–986, 988–991
  - creating output data sets, 966, 1025
  - creating probability plots, 976, 978–979, 981–983
  - details, 992
  - estimating distribution parameters, 957–958, 960
  - examples, 925
  - fitting regression models, 972–975
  - frequency variables, 962
  - insets, 962–965
  - least squares estimation, 1016
  - maximum likelihood estimation, 1004
  - mean cumulative function plots, 966–968, 970, 972, 991
  - observation-wise percentiles, 1017–1019
  - observation-wise predicted values, 1017
  - observation-wise reliability function estimates, 1019
  - observation-wise statistics, 1017–1020, 1022
  - overview, 923–924
  - parameter estimation, 1004, 1006–1016
  - percentile estimation, 1011–1012
  - poisson parameter estimation, 1015–1016
  - probability distributions, 992–994
  - probability plots, 995–1000
  - readout data, 976
  - recurrence data, 1022–1024
  - regression model parameters, 1006–1007
  - reliability function estimation, 1012–1013
  - residuals, 1020, 1022
  - specifying failure modes, 962
  - specifying probability distributions, 961
  - syntax, 955
  - Turnbull algorithm, 1000
  - types of lifetime data, 992
  - Weibayes estimation, 1016
- renaming design factors, 1877–1878
- repeatability
  - average and range method, 1826
  - definition of, 1810
  - introduction to, 1809
  - range chart, 1815, 1824
  - variance components method, 1830
- repeatability and reproducibility
  - average and range method, 1827
  - introduction to, 1809
  - variance components method, 1830
- replication, FACTEX procedure
  - data set, 443, 454
  - design point, 454
  - design replication, 494–495
  - details, 494
  - entire design, 454
  - example, 464, 467
  - fixed number of times, 443, 494
  - inner array, 495
  - number of times, 454
  - outer array, 495
  - point replication, 494–495
- reproducibility
  - average and range method, 1826
  - average chart, 1817, 1824
  - definition of, 1810
  - introduction to, 1809
  - variance components method, 1830
- resolution of designs, 1883
- resolution, FACTEX procedure
  - comparison, 491
  - definition, 491
  - example, 435, 458, 472
  - minimum aberration, 497
  - number, 491
  - numbering scheme, 492
  - syntax, 451
- response surface designs
  - See central composite designs
- response, factorial design, 487–488
- restricted Pareto charts
  - See Pareto charts, restricted

- robust estimators
    - location, 42
    - scale, 42
    - trimmed means, 42
    - Winsorized means, 42
  - robust measures of scale, 24
    - $Q_n$ , 24
    - $S_n$ , 24
  - rotatable designs, 1891
  - rounding, 24
  - 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, 1405
    - central line, 1403
    - control limit equations, 1403–1404
    - examples, advanced, 1414
    - examples, introductory, 1384
    - labeling axes, 1413
    - missing values, 1413
    - notation, 1403
    - ODS tables, 1408
    - options summarized by function, 1394–1399, 1401–1402
    - overview, 1383
    - plotted points, 1403
    - plotting character, 1394
    - reading preestablished control limits, 1391–1392, 1409
    - reading raw measurements, 1384–1385, 1408
    - reading subgroup summary statistics, 1386–1388, 1409–1410
    - reading summary statistics and control limits, 1391, 1410–1411
    - saving control limits, 1389–1390, 1404, 1406
    - saving subgroup summary statistics, 1388–1389, 1406
    - saving summary statistics and control limits, 1390–1391, 1406–1407
    - standard deviation, estimating, 1412–1413
    - standard deviation, specifying, 1414–1415
    - syntax, 1393
  - S-optimal designs
    - See optimal designs, space-filling designs
  - sampling plans
    - See also acceptance sampling
    - double, 1863
    - single, 1861, 1863
    - types of, 1861
  - saturated designs, analysis of, 1846
  - saturated designs, OPTEX procedure, 726, 741
  - save design, FACTEX procedure
    - See output, FACTEX procedure
  - $S_B$  distribution
    - histograms, 144, 151
  - scale parameter
    - probability plots, 300
    - Q-Q plots, 325, 333
  - screening designs, 1883, 1887
  - search algorithms, optimal designs
    - See optimal designs, search algorithms
  - search design, FACTEX procedure
    - confounding rules, 506
    - limit, 442, 446
    - maximum time, 442, 446
    - speeding, 507
  - second-order designs
    - with ADXQMOD macro, 1876
  - semicurtailed inspection and ASN2 function, 1843
  - sequential algorithm
    - See optimal designs, search algorithms
  - seven basic QC tools, 789
  - shape parameter
    - probability plots, 294, 300
    - Q-Q plots, 325, 332
  - Shapiro-Wilk test, 24
  - Shewhart charts
    - annotating, 1615
    - average run lengths, example, 1415
    - between-subgroup variance, 1766
    - capability indices, computing, 1537–1538
    - challenging assumptions of, 1755
    - chart description, 1628
    - chart naming, 1639
    - computing capability indices, 1636, 1664, 1671
    - connecting points, 1624, 1640
    - control chart statistics, 1638
    - displaying points, 1614
    - estimating  $\mu$ , 1638
    - estimating  $\sigma$ , 1655, 1661
    - exceptions charts, 1628, 1663
    - fonts, 1628
    - grids, 1628–1629, 1635, 1675
    - horizontal axes, 1643
    - identifying unequal subgroup sample sizes, 1640
    - intervals between subgroups, 1633
    - missing values, 1539
    - options dictionary, 1613
    - plot margins, 1638, 1653
    - probability limits, 1614, 1649, 1654–1655
    - separating, 1654
    - separating subgroups, 1648
    - subgroup sample size, 1661
    - subgroup-variables*, 1534–1535
    - subgroups, 1639
    - vertical axes, 1675
  - Shewhart charts, axes
    - appearance, 1675
    - coloring, 1621
    - for multiple pages, 1653
    - horizontal, 1629, 1672
    - labeling, 1257–1259, 1719–1722

- offset length, 1629
- scaling on *p* charts, 1676
- scaling primary and secondary charts, 1676
- suppressing labels, 1641
- tick mark labels, 1655, 1670
- tick marks, 1629, 1672
- vertical axis truncation, 1644
- Shewhart charts, box charts
  - See box charts
- Shewhart charts, clipping points, 1622–1624, 1636
  - examples, 1715–1718
- Shewhart charts, coloring
  - axes, 1621
  - axis labels, 1627
  - connecting lines, 1622, 1624–1625
  - control limits, 1623
  - frames, 1622
  - HREF= lines, 1623
  - inside control limits, 1623
  - inside stars, 1626
  - label frames, 1623
  - outside control limits, 1625
  - phase labels, 1625
  - star outlines, 1626
  - STARCIRCLES= circles, 1625
  - TESTS= option, 1627–1628
  - tick marks, 1627
  - VREF= lines, 1628
- Shewhart charts, control limits
  - appearance, 1675
  - computing, 1614, 1642, 1654
  - for autocorrelated data, 1756–1762
  - for data with multiple components of variation, 1763–1769
  - for nonnormal processes, 1779–1782
  - for short-run processes, 1770–1778
  - labeling, 1634, 1671
  - line type, 1636
  - multiple sets, 1692–1700
  - observations used in computation, 1725
  - sample size, 1635–1636
- Shewhart charts, fonts
  - customizing, 1867–1869
- 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, 1649–1650
  - probability limits, 1649
  - specifying blocks, 1650
- Shewhart charts, labeling
  - axes, 1257–1259, 1719–1722
  - control limits, 1634, 1639–1640, 1671
  - fonts for, 1634, 1665
  - height for, 1629, 1634, 1665
  - horizontal axis, 1720–1722
  - points, 1614, 1670
  - points outside control limits, 1645–1646
  - reference lines, 1631, 1673–1674
  - splitting labels, 1656
  - stars, 1658
  - tests for special causes, 1665–1666
  - tick marks, 1655, 1670
  - vertical axis, 1644, 1720–1722
  - zone lines, 1676–1677
- Shewhart charts, labeling central line
  - c* chart, 1627
  - m* chart, 1675
  - np* chart, 1644
  - p* chart, 1648
  - r* chart, 1653
  - s* chart, 1656
  - u* chart, 1671
  - x* chart, 1675
  - decimal digits, number of, 1639–1640
- Shewhart charts, line types
  - reference lines, 1638
  - star outlines, 1637
  - STARCIRCLES= circles, 1637
  - TESTS= option, 1638
- Shewhart charts, nonnormal process data
  - example, 1588–1591
- Shewhart charts, output data sets
  - chart information, 1647
  - control limits, 1645–1646
  - indicating parameters as estimates or standard values, 1670
  - subgroup summary statistics, 1645–1646
- Shewhart charts, pages
  - maximum, 1638
  - numbering, 1647
  - splitting, 1615
- Shewhart charts, phase variables
  - control limits, 1648
  - delineating, 1648
  - labels, 1648
  - legends, 1648
- Shewhart charts, reference lines
  - applying to all BY groups, 1640
  - horizontal axis, 1630–1631
  - label position, 1631, 1674
  - labels, 1631, 1673–1674
  - line type, 1635, 1638
  - symbol, 1631, 1674
  - vertical axis, 1672–1673
- Shewhart charts, specifying parameters
  - $\mu_0$ , 1639
  - $\sigma_0$ , 1654
  - $p_0$ , 1647
  - $u_0$ , 1671

- Shewhart charts, star charts, 1701–1710
  - contrasted with multivariate control charts, 1702
- Shewhart charts, stars
  - circle outline width, 1675
  - creating, 1661
  - inner radius, 1657
  - labeling, 1658
  - legends, 1658–1659
  - outer radius, 1656, 1659
  - process variables, 1701
  - reference circles, 1656, 1703–1704
  - standardizing, 1659–1660, 1708–1710
  - star outline width, 1675
  - style, 1660, 1705–1707
  - vertex angle, 1660
  - vertex variables, 1701–1702
- Shewhart charts, stratification of data, 1682–1691
  - by *block-variables*, 1684–1689
  - by a *\_PHASE\_ variable*, 1689
  - by a *\_PHASE\_ variable*, 1690–1691
  - by a *symbol-variable*, 1683–1684
- Shewhart charts, subgroup selection
  - using switch variables, 1726–1727
  - using WHERE statement, 1723–1726
- Shewhart charts, suppressing features of
  - central lines, 1641
  - connecting line segments, 1641
  - control limit frames, 1642
  - control limit legends, 1642
  - control limits, 1642
  - entire chart, 1640–1641
  - frames, 1641
  - horizontal axis labels, 1641
  - labels, 1642
  - legends, 1641
  - line segments, 1644
  - lower control limits, 1641
  - phase legend frames, 1642
  - upper control limits, 1642, 1644
- Shewhart charts, tables, 1663
  - adding central line values, 1663
  - adding control limit exceedances, 1664
  - adding ID variables, 1663
  - adding legends, 1663
  - adding TESTS= results, 1664
  - box charts, 1663
- Shewhart charts, tests for special causes, 1665–1669, 1677
  - across phases, 1665
  - customizing tests, 1750–1752
  - definitions, 1732–1733
  - generalized patterns, 1747–1750
  - label fonts, 1634, 1665
  - label height, 1634, 1665
  - labeling signaled points, 1740, 1745
  - labels, 1665–1666
  - line segment character, 1665
  - M-patterns, 1747–1750
  - multiple phases, 1741
  - multiple sets of control limits, 1742–1744
  - nonstandard tests, 1746–1752
  - overlapping points, 1666
  - range and standard deviation charts, 1746–1747
  - run lengths, 1664
  - standard tests, 1731–1745
  - standard tests, interpreting, 1736
  - standard tests, modifying, 1737
  - standard tests, requesting, 1734–1735
  - suppressing 3-sigma check, 1640
  - T-patterns, 1747–1750
  - varying subgroup sample sizes, 1666, 1738–1739
  - zone line labels, 1676–1677
  - zone lines, 1677
  - zones, 1677
- Shewhart charts, trends
  - displaying, 1675, 1711–1714
  - modeling, 1713
  - recognizing, 1712
  - trend variables, 1669
- Shewhart charts, warning limits
  - vertical axis, 1672
- short run process control, 1770–1778
  - difference from nominal* approach, 1770–1776
  - standardization* approach, 1777–1778
  - testing for constant variances, 1776
- side-by-side Pareto charts, 789
- sign test, 23
- signal-to-noise ratio, 482
- signed rank statistic, computing, 36
- signed rank test, 23
- simplex-centroid designs, 1894
- simplex-lattice designs, 1892
- single-sampling plans
  - See acceptance sampling
- size specification, FACTEX procedure
  - See design size specification
- skewness
  - saving in output data set, 240
- $S_L$  distribution
  - histograms, 139
- smoothing data distribution
  - See kernel density estimation
- $S_N$  distribution
  - histograms, 142
- space-filling designs
  - See optimal designs, space-filling designs
- specialized capability indices, 24
- specification limits, 25
  - capability indices, confidence interval, 60
  - comparative histograms, 100
  - computing capability indices, example, 11
  - examples, 56
  - exceeding, 240
  - histograms, example, 118
  - identifying, 30
  - lower limit, specification of, 28
  - reading from data set, example, 56
  - reference lines, color of, 27–28

reference lines, example, 58  
 reference lines, filled areas, 28–29  
 reference lines, line type, 28  
 reference lines, width of, 29  
 summary information, 11  
 suppressing legend for, 78, 143  
 target line, color of, 28  
 target line, line type, 28  
 target value, specification of, 29  
 upper limit, specification of, 29

stacked Pareto charts, 789

standard deviation  
 boxcharts, 1649  
 CAPABILITY procedure, 25  
 for median of standard normal, 1859–1860  
 range of iid normal variables, 1851  
 saving in output data set, 240  
 specifying, 77

standard deviation charts  
 See *s* charts

star charts  
 See Shewhart charts, star charts

$S_U$  distribution  
 histograms, 145, 153

subgroup variables  
*dates or times*, 1534  
*indices*, 1534  
 character, 1535  
 numeric, 1535

sum  
 saving in output data set, 240

sum of weights  
 saving in output data set, 240

summary statistics, 19  
 printing, example, 9  
 saving, 24  
 tables, 19

supplementary rules  
 See Shewhart charts, tests for special causes

suppressing features of Shewhart charts  
 See Shewhart charts, suppressing features of

suspended histograms, 137

**T**

tables  
 modes, 23  
 sign test, 23  
 signed rank test, 23  
 trimmed means, 25  
 Winsorized means, 25

tables, CAPABILITY procedure  
 summary statistics, 19

tables, Shewhart charts  
 See Shewhart charts, tables

test statistics  
 saving in output data set, 241

tests for normality, 19

tests for special causes  
 data set, 1669

tests for special causes, Shewhart charts  
 See Shewhart charts, tests for special causes

tests of location  
 location parameter, 23

threshold parameter  
 probability plots, 296, 300  
 Q-Q plots, 326, 333

tolerance intervals  
 See intervals, CAPABILITY procedure

transformations  
 See ADXTRANS macro

trimmed means, 25, 42

two-level designs, 1873

two-way comparative Pareto charts  
 See Pareto charts, comparative

Type A sampling, 1861

Type B sampling, 1861

Type I sum of squares, 487

**U**

*u* charts  
 central line, 1441  
 compared with *c* charts, 1441  
 control limit equations, 1441–1442  
 control limit parameters, 1442  
 examples, advanced, 1449  
 examples, introductory, 1420  
 getting started, 1420  
 known number of nonconformities, specifying,  
 1451–1452  
 labeling axes, 1448  
 missing values, 1448  
 notation, 1440  
 ODS tables, 1445  
 options summarized by function, 1432, 1434–1437,  
 1439  
 overview, 1419  
 plotted points, 1440  
 plotting character, 1431  
 reading number of nonconformities, 1425–1427,  
 1446–1447  
 reading preestablished control limits, 1424–1425,  
 1446  
 reading raw data, 1420–1422, 1445  
 reading subgroup data and control limits, 1447–  
 1448  
 saving control limits, 1422–1424, 1442–1443  
 saving nonconformities per unit, 1428–1429  
 saving number of nonconformities, 1443  
 saving subgroup data and control limits, 1444  
 syntax, 1430  
 tests for special causes, 1449–1450  
 unequal subgroup sample sizes, 1452–1454

U-optimal designs  
 See optimal designs, space-filling designs

uniformly weighted moving average charts  
 adding features to, 703–705  
 annotating charts, 703–705  
 asymptotic control limits, displaying, 684

- axis labels, 701
  - central line, 687
  - control limit equations, 687–689
  - control limits, computing, 684
  - examples, advanced, 702
  - examples, introductory, 664
  - missing values, 701
  - notation, 687
  - ODS tables, 696
  - options summarized by function, 675–682
  - overview, 663
  - plotted points, 687
  - plotting character, 675
  - plotting subgroup means, 685
  - probability limits, 684
  - process mean, specifying, 685
  - process standard deviation, specifying, 686
  - reading preestablished control limit parameters, 672–673, 697
  - reading probability limits, 685
  - reading raw measurements, 664–666, 696
  - reading subgroup summary statistics, 667–669, 697–698
  - reading summary statistics and control limits, 672, 698–699
  - saving control limit parameters, 670–671, 693–694
  - saving subgroup summary statistics, 669–670, 694
  - saving summary statistics and control limits, 671–672, 694–695
  - span of moving average, choosing, 689
  - span parameter, specifying, 686
  - specifying parameters for, 702–703
  - standard deviation, estimating, 699–700
  - syntax, 674
- V**
- V-mask charts
    - See cumulative sum control charts
  - variance
    - divisors for, 25
    - saving in output data set, 240
  - variance components method
    - GAGE application, 1820
    - gage studies, 1809, 1828
  - variance of median
    - See STDMED function
  - variation, multiple components of, 1763–1769
    - determining components, 1766–1769
    - preliminary examination, 1763–1766
  - VBAR charts
    - options summarized by function, 807–812
    - syntax, 807
- W**
- Weibull distribution
    - cdf plots, 79
    - chi-square goodness-of-fit test, 159
    - deviation from empirical distribution, 159
    - EDF goodness-of-fit test, 159
    - histograms, 147, 155, 181
    - P-P plots, 265
    - probability plots, 296–297
    - Q-Q plots, 327–328
  - weighted Pareto charts, 888
  - Western Electric rules
    - See Shewhart charts, tests for special causes
  - Wilcoxon signed rank test, 36
  - Winsorized means, 25, 42
- X**
- $\bar{X}$  charts
    - axis labels, 1491
    - capability indices, computing, 1482
    - central line, 1480
    - control limit equations, 1480–1481
    - examples, advanced, 1492
    - examples, introductory, 1458
    - missing values, 1491
    - notation, 1480
    - OC curves, 1497–1498
    - ODS tables, 1485
    - options summarized by function, 1470–1475, 1477, 1479
    - overview, 1457
    - plotted points, 1480
    - plotting character, 1470
    - reading preestablished control limits, 1467–1468, 1486
    - reading raw measurements, 1458–1460, 1485
    - reading subgroup summary statistics, 1460–1463, 1486–1487
    - reading summary statistics and control limits, 1466, 1488
    - saving control limits, 1465, 1481–1483
    - saving subgroup summary statistics, 1463–1465, 1483
    - saving summary statistics and control limits, 1466, 1484
    - standard deviation, estimating, 1488–1490, 1494–1496
    - syntax, 1469
    - tests for special causes, 1492–1493
  - $\bar{X}$  and  $R$  charts
    - axis labels, 1538
    - capability indices, computing, 1528, 1537–1538
    - capability indices, saving, 1509
    - central line, 1525
    - control limit equations, 1526
    - examples, advanced, 1540
    - examples, introductory, 1502
    - missing values, 1539
    - notation, 1525
    - ODS tables, 1530
    - options summarized by function, 1515–1520, 1522, 1524
    - overview, 1501
    - plotted points, 1525

- plotting character, 1515
- reading preestablished control limits, 1512, 1531
- reading raw measurements, 1502, 1530
- reading subgroup summary statistics, 1505, 1531–1532
- reading summary statistics and control limits, 1511–1512, 1532–1533
- saving control limits, 1508, 1527–1528
- saving subgroup summary statistics, 1507, 1528
- saving summary statistics and control limits, 1510–1511, 1529
- specifying parameters for, 1543–1544
- standard deviation, estimating, 1536
- syntax, 1514
- tests for special causes, 1540–1542
- $\bar{X}$  and  $s$  charts
  - capability indices, computing, 1576
  - central line, 1573
  - control limit equations, 1574
  - examples, advanced, 1585
  - examples, introductory, 1552
  - labeling axes, 1583
  - missing values, 1584
  - notation, 1573
  - ODS tables, 1578
  - options summarized by function, 1563–1569, 1571
  - overview, 1551
  - plotted points, 1573
  - plotting character, 1563
  - reading preestablished control limits, 1561, 1579
  - reading raw measurements, 1552–1554, 1578
  - reading subgroup summary statistics, 1555–1557, 1579–1580
  - reading summary statistics and control limits, 1560, 1580–1581
  - saving control limits, 1558–1559, 1575–1576
  - saving subgroup summary statistics, 1557–1558, 1576
  - saving summary statistics and control limits, 1559–1560, 1577
  - specifying parameters for, 1574
  - standard deviation, estimating, 1582–1583
  - syntax, 1562



# Syntax Index

## A

ADXADCEN macro, 1889–1890  
ADXALIAS macro, 1884–1885  
    NOPRINT specification, 1884  
ADXCC file, 1889–1891  
ADXCCD macro, 1880, 1889–1891  
ADXCDC macro, 1876  
ADXCDCONF, from ADXTRANS macro, 1882  
ADXCDCODE macro, 1877–1878  
ADXDSD macro variable, 1878  
ADXEFF data set, 1884  
ADXFF file, 1883–1888  
ADXFFA macro, 1885–1886  
ADXFFD data set, 1886  
ADXFFD macro, 1878, 1885–1887, 1890  
ADXFILL macro, 1892–1893  
ADXFIT macro variable, 1878–1879, 1884  
ADXGEN file, 1876–1882  
ADXINIT macro, 1878–1880  
ADXLAM, from ADXTRANS macro, 1882  
ADXLIKE, from ADXTRANS macro, 1882  
ADXMAMD macro, 1893–1894  
ADXMIX file, 1892–1897  
ADXNB macro variable, 1878  
ADXNF macro variable, 1879  
ADXNFIT macro variable, 1879, 1884  
ADXPBD macro, 1887  
ADXPCC macro, 1891  
ADXPFF macro, 1887–1888  
ADXQMOD macro, 1879–1880  
    naming quadratic variables, 1879  
ADXREG data set, 1882  
ADXRES macro variable, 1879  
ADXRPR macro, 1880  
ADXSCD macro, 1894–1895  
ADXSLD macro, 1895  
ADXTRANS macro, 1881–1882  
    output, 1882  
    plots from, 1882  
ADXLVST macro variable, 1879  
ADXXVERT macro, 1896–1897  
ALLLABEL= option  
    CUSUM procedure, 1614  
    MACONTROL procedure, 1614  
    SHEWHART procedure, 1614  
ALLLABEL2= option  
    CUSUM procedure, 1614  
    MACONTROL procedure, 1614  
    SHEWHART procedure, 1614

ALLN option  
    CUSUM procedure, 1614  
    MACONTROL procedure, 1614  
    SHEWHART procedure, 1614, 1735  
ALPHA= option  
    CUSUM procedure, 385  
    MACONTROL procedure, 630  
    SHEWHART procedure, 1614  
ANCHOR= option  
    PARETO procedure, 813, 848  
ANGLE= option  
    PARETO procedure, 813, 848  
ANNOKEY option  
    PARETO procedure, 813, 848  
ANNOTATE= data set  
    PARETO procedure, 795  
ANNOTATE= option, 704  
    CUSUM procedure, 1615  
    MACONTROL procedure, 1615  
    SHEWHART procedure, 1615  
ANNOTATE2= data set  
    PARETO procedure, 795  
ANNOTATE2= option  
    CUSUM procedure, 1615  
    MACONTROL procedure, 1615  
    SHEWHART procedure, 1615  
AOQ2 function, 1842–1843, 1863  
ASN2 function, 1843–1844, 1863  
ASYMPTOTIC option  
    MACONTROL procedure, 630, 684  
ATI2 function, 1845–1846, 1863  
AXISFACTOR option  
    PARETO procedure, 814, 849

## B

BARLABEL= option  
    PARETO procedure, 814, 849  
BARLABPOS= option  
    PARETO procedure, 814, 849  
BARLEGEND= option  
    PARETO procedure, 815, 849  
BARLEGLABEL= option  
    PARETO procedure, 815, 850  
BARWIDTH= option  
    PARETO procedure, 815, 850  
BAYESACT call, 1846–1848  
BETA= option  
    CUSUM procedure, 385  
BILEVEL option

- CUSUM procedure, 1615
  - MACONTROL procedure, 1615
  - SHEWHART procedure, 1615
  - block-variables*, CUSUM procedure
    - XCHART statement, 376
  - block-variables*, MACONTROL procedure
    - EWMACHART statement, 621
    - MACHART statement, 675
  - block-variables*, SHEWHART procedure
    - BOXCHART statement, 1062
    - CCHART statement, 1116
    - displaying values, 1617
    - IRCHART statement, 1153
    - labels, 1616
    - legends, 1617, 1621
    - MCHART statement, 1195
    - MRCHART statement, 1231
    - NPCHART statement, 1274
    - PCHART statement, 1315
    - RCHART statement, 1358
    - SCHART statement, 1393
    - UCHART statement, 1431
    - XCHART statement, 1469
    - XRCHART statement, 1514
    - XSCHART statement, 1562
  - BLOCKLABELPOS= option
    - CUSUM procedure, 1616
    - MACONTROL procedure, 1616
    - SHEWHART procedure, 1616, 1688–1689, 1776
  - BLOCKLABTYPE= option
    - CUSUM procedure, 1616
    - MACONTROL procedure, 1616
    - SHEWHART procedure, 1616, 1776
  - BLOCKPOS= option
    - CUSUM procedure, 1617
    - MACONTROL procedure, 1617
    - SHEWHART procedure, 1617, 1686–1689
  - BLOCKREP option
    - CUSUM procedure, 1617
    - MACONTROL procedure, 1617
    - SHEWHART procedure, 1617
  - BLOCKS statement, FACTEX procedure
    - See FACTEX procedure, BLOCKS statement
    - options summarized by function, 442
    - syntax, 446
  - BLOCKS statement, OPTEX procedure
    - See OPTEX procedure, BLOCKS statement
    - syntax, 735
  - BOXCHART statement
    - See also SHEWHART procedure, BOXCHART statement
    - examples, advanced, 1086
    - examples, introductory, 1050
    - options summarized by function, 1063–1065, 1067–1069, 1071
    - overview, 1049
    - syntax, 1062
  - BOXCONNECT option
    - SHEWHART procedure, 1618
  - BOXSTYLE= option
    - SHEWHART procedure, 1099, 1618
  - BOXSTYLE= option, SHEWHART procedure, 1102
  - BOXWIDTH= option
    - SHEWHART procedure, 1620
  - BOXWIDTHSCALE= option
    - SHEWHART procedure, 1620
- C**
- C4 function, 1848–1849, 1863
  - CAPABILITY procedure
    - and PROC SHEWHART, 1780–1781
    - introduction, 3
  - CAPABILITY procedure, CDFPLOT statement
    - ALPHA= beta-option, 71
    - ALPHA= gamma-option, 71
    - ALPHADELTA= gamma-option, 71
    - ALPHAINITIAL= gamma-option, 71
    - ANNOTATE= option, 72
    - BETA beta-option, 72
    - BETA= option, 72
    - C= option, 73
    - CAXIS= option, 73
    - CDELTA= option, 73
    - CDFSMBOL= option, 73
    - CFRAME= option, 73
    - CHREF= option, 73
    - CINITIAL= option, 73
    - COLOR= option, 73
    - CTEXT= option, 73
    - CVREF= option, 74
    - DESCRIPTION= option, 74
    - EXPONENTIAL option, 74
    - FONT= option, 74
    - GAMMA option, 74
    - HAXIS= option, 75
    - HMINOR= option, 75
    - HREF= option, 75
    - HREFCHAR= option, 75
    - HREFLABELS= option, 75
    - LEGEND= option, 76
    - LHREF= option, 76
    - LOGNORMAL option, 76
    - LVREF= option, 76
    - MAXITER= option, 76
    - MU= option, 77
    - NAME= option, 77
    - NOCDFLEGEND option, 77
    - NOECDF option, 77
    - NOFRAME option, 77
    - NOLEGEND option, 77
    - NORMAL option, 77
    - NOSPECLEGEND option, 78
    - SCALE= option, 78
    - SHAPE= option, 78
    - SIGMA= option, 78
    - SYMBOL= option, 78
    - THETA= option, 78
    - THRESHOLD= option, 78

- VAXIS= option, 78
- VMINOR= option, 78
- VREF= option, 79
- VREFCHAR= option, 79
- VREFLABELS= option, 79
- VSCALE= option, 79
- W= option, 79
- WEIBULL Weibull-option, 79
- ZETA= option, 80
- CAPABILITY procedure, COMPHISTOGRAM statement
  - ANNOKEY option, 96
  - ANNOTATE= option, 96
  - BARWIDTH= option, 97
  - C= option, 97
  - CAXIS= option, 97
  - CBARLINE= option, 97
  - CFILL= option, 98
  - CFRAME= option, 98
  - CFRAMENLEG= option, 98
  - CFRAMESIDE= option, 98
  - CFRAMETOP= option, 98
  - CGRID= option, 98
  - CHREF= option, 98
  - CLASS= option, 92
  - CLASSKEY= option, 99
  - CLASSSPEC= option, 100
  - COLOR= option, 100
  - CPROP= option, 101
  - CTEXT= option, 101
  - CVREF= option, 101
  - DESCRIPTION= option, 101
  - FILL option, 101
  - FONT= option, 101
  - GRID option, 102
  - HEIGHT= option, 102
  - HOFFSET= option, 102
  - HREF= option, 102
  - HREFLABELS= option, 102
  - HREFLABPOS= option, 102
  - INFONT= option, 102
  - INHEIGHT= option, 102
  - INTERTILE= option, 102
  - K= option, 102
  - KERNEL kernel-option, 97, 103
  - L= option, 103
  - LGRID= option, 103
  - LHREF= option, 103
  - LVREF= option, 103
  - MAXNBIN= option, 103
  - MAXSIGMAS= option, 103
  - MIDPOINTS= option, 104
  - MISSING1 option, 104
  - MISSING2 option, 104
  - MU= option, 105
  - NAME= option, 105
  - NCOLS= option, 105
  - NLEGEND option, 98, 105
  - NLEGENDPOS option, 105
  - NOBARS option, 105
  - NOCHART option, 105
  - NOFRAME option, 105
  - NOHLABEL option, 105
  - NOKEYMOVE option, 106
  - NOPLOT option, 106
  - NORMAL normal-option, 106
  - NOVLABEL option, 106
  - NOVTICK option, 106
  - NROWS= option, 106
  - ORDER1= option, 107
  - ORDER2= option, 107
  - OUTHISTOGRAM= option, 108
  - PFILL= option, 108
  - RTINCLUDE option, 108
  - SIGMA= option, 108
  - TILELEGLABEL= option, 108
  - TURNVLABELS option, 108
  - VAXIS= option, 108
  - VAXISLABEL= option, 108
  - VOFFSET= option, 108
  - VREF= option, 108
  - VREFLABELS= option, 109
  - VREFLABPOS= option, 109
  - VSCALE= option, 109
  - W= option, 109
  - WAXIS= option, 109
- CAPABILITY procedure, HISTOGRAM statement
  - ALPHA= option, 130, 150
  - ALPHADELTA= gamma-option, 130
  - ALPHAINITIAL= gamma-option, 131
  - ANNOTATE= option, 131
  - BETA beta-option, 131, 149
  - BETA= option, 132, 150
  - C= option, 132, 156
  - CAXIS= option, 133
  - CBARLINE= option, 133
  - CDELTA= option, 133
  - CFILL= option, 133
  - CFRAME= option, 133
  - CHREF= option, 133
  - CINITIAL= Weibull-option, 133
  - COLOR= option, 133
  - CTEXT= option, 134
  - CURVELEGEND= option, 134
  - CVREF= option, 134
  - DELTA= option, 134, 151, 153
  - DESCRIPTION= option, 134
  - EXPONENTIAL exponential-option, 134, 150
  - FILL option, 135
  - FITINTERVAL= option, 135
  - FITMETHOD= option, 135
  - FITTOLERANCE= option, 135
  - FONT= option, 135
  - FORCEHIST option, 136
  - GAMMA gamma-option, 136, 151
  - GAMMA= option, 136, 151, 153
  - HANGING option, 137
  - HAXIS= option, 137

- HMINOR= option, 137
- HREF= option, 137
- HREFCHAR= option, 137
- HREFLABELS= option, 138
- INDICES option, 138, 162–163
- K= option, 138, 156
- KERNEL option, 138, 156
- L= option, 139
- LEGEND= option, 139
- LHREF= option, 139
- LOGNORMAL lognormal-option, 139, 154
- LVREF= option, 140
- MAXITER= option, 140
- MIDPERCENTS option, 140, 164
- MIDPOINTS= option, 141
- MIDPTAXIS= option, 141
- MU= option, 141, 155
- NAME= option, 141
- NOBARS option, 141
- NOCURVELEGEND option, 141
- NOFRAME option, 142
- NOLEGEND option, 142
- NOPLOT option, 142
- NOPRINT option, 142
- NORMAL normal-option, 142, 155
- NOSPECLEGEND option, 143
- OUTFIT= option, 143, 164
- OUTHISTOGRAM= option, 143, 164, 166
- PCTAXIS= option, 143
- PERCENTS= option, 143, 164
- PFILL= option, 143
- RTINCLUDE option, 143
- SB  $S_B$ -option, 144
- SB  $S_B$ -option, 151
- SB  $S_U$ -option, 153
- SCALE= option, 145, 150–151, 155
- SHAPE= option, 145, 154–155
- SIGMA= option, 145, 150–151, 153, 155, 161
- SPECLEGEND= option, 145
- SU  $S_U$ -option, 145
- SYMBOL= option, 146
- THETA= option, 146, 150, 161
- THRESHOLD= option, 146, 151, 153–155
- VAXIS= option, 146
- VMINOR= option, 146
- VREF= option, 147
- VREFCHAR= option, 147
- VREFLABELS= option, 147
- VSCALE= option, 147
- W= option, 147
- WEIBULL option, 147, 155
- ZETA= option, 148
- CAPABILITY procedure, INSET statement
  - CFILL= option, 205
  - CFILLH= option, 205
  - CFRAME= option, 205
  - CHEADER= option, 205
  - CSHADOW= option, 205
  - CTEXT= option, 205
  - DATA option, 205
  - displaying  $C_{pk}$ , 343
  - FONT= option, 205
  - FORMAT= option, 205
  - HEADER= option, 206
  - HEIGHT= option, 206
  - NOFRAME option, 206
  - POSITION= option, 206–208
  - REFPOINT= option, 206
- CAPABILITY procedure, INTERVALS statement
  - ALPHA= option, 223
  - K= option, 223
  - METHODS= option, 223, 225–227
  - NOPRINT option, 224
  - OUTINTERVALS= option, 224, 228
  - P= option, 224
  - TYPE= option, 224
- CAPABILITY procedure, OUTPUT statement
  - OUT= option, 237, 242
  - PCTLNAME= option, 239
  - PCTLPRE= option, 238
  - PCTLPTS= option, 238
- CAPABILITY procedure, PPLOT statement
  - ALPHA= option, 257, 261
  - ANNOTATE= option, 258
  - BETA option, 255, 258
  - BETA= option, 259
  - C= option, 259, 266
  - CAXIS= option, 259
  - CFRAME= option, 259
  - CHREF= option, 259
  - COLOR= option, 253, 259
  - CTEXT= option, 259
  - CVREF= option, 259
  - DESCRIPTION= option, 259
  - EXPONENTIAL option, 256, 259
  - FONT= option, 260
  - GAMMA option, 256, 260
  - HAXIS= option, 261
  - HMINOR= option, 261
  - HREF= option, 261
  - HREFCHAR= option, 261
  - HREFLABELS= option, 261
  - L= option, 262
  - LHREF= option, 262
  - LOGNORMAL option, 256, 262
  - LVREF= option, 263
  - MU= option, 255, 263–264
  - NAME= option, 263
  - NOFRAME option, 263
  - NOLINE option, 263
  - NOBSLEGEND option, 263
  - NORMAL option, 256, 263
  - PPSYMBOL= option, 264
  - SCALE= option, 261, 263–264
  - SHAPE= option, 261, 263–264
  - SIGMA= option, 255, 261–262, 264, 266
  - SQUARE option, 253, 264
  - SYMBOL= option, 264

- THETA= option, 261–262, 264, 266
- THRESHOLD= option, 261, 263–264
- VAXIS= option, 264, 267
- VMINOR= option, 265
- VREF= option, 265
- VREFCHAR= option, 265
- VREFLABELS= option, 265
- W= option, 265
- WEIBULL option, 256, 265
- ZETA= option, 262, 266
- CAPABILITY procedure, PROBPLOT statement
  - ALPHA= option, 285–286
  - ANNOTATE= option, 286
  - BETA option, 283, 286
  - BETA= option, 287
  - C= option, 287, 296, 298
  - CAXIS= option, 287
  - CFRAME= option, 287
  - CHREF= option, 288
  - COLOR= option, 288
  - CTEXT= option, 288
  - CVREF= option, 288
  - DESCRIPTION= option, 288
  - EXPONENTIAL option, 283, 288
  - FONT= option, 289
  - GAMMA option, 283, 289
  - GRID option, 290
  - GRIDCHAR= option, 290
  - HAXIS= option, 290
  - HMINOR= option, 290
  - HREF= option, 290, 304
  - HREFCHAR= option, 290
  - HREFLABELS= option, 290, 304
  - L= option, 290
  - LEGEND= option, 290
  - LGRID= option, 291
  - LHREF= option, 291, 304
  - LOGNORMAL option, 283, 291
  - LVREF= option, 292, 304
  - MU= option, 292–293
  - NADJ= option, 292, 297
  - NAME= option, 292
  - NOFRAME option, 292
  - NOLEGEND option, 292
  - NOLINELEGEND option, 292
  - NOOBSLEGEND option, 292
  - NORMAL option, 283, 292
  - NOSPECLEGEND option, 293
  - PCTLMINOR option, 293, 304
  - PCTLORDER= option, 293
  - PROBSYMBOL option, 294
  - RANKADJ= option, 294, 297
  - ROTATE option, 294
  - SCALE= option, 289–290, 294, 297
  - SHAPE= option, 294, 296
  - SIGMA= option, 287, 293–294, 298
  - SLOPE= option, 295
  - SQUARE option, 295, 304
  - SYMBOL= option, 295
  - THETA= option, 287, 291, 295
  - THRESHOLD= option, 289–290, 296–297
  - VAXIS= option, 296, 302
  - VMINOR= option, 296
  - VREF= option, 296
  - VREFCHAR= option, 296
  - VREFLABELS= option, 296
  - W= option, 296
  - WEIBULL option, 283, 296
  - WEIBULL2 option, 284, 297
  - ZETA= option, 291, 298
- CAPABILITY procedure, PROC CAPABILITY statement
  - ALL option, 19
  - ALPHA= option, 19–21, 25–26, 60, 1623
  - ANNOTATE= option, 19, 31
  - CHECKINDICES option, 19
  - CIBASIC= option, 20
  - CIINDICES= option, 20
  - CIPCTLDF= option, 20
  - CIPCTLNORMAL= option, 21
  - CIPROBEX option, 21
  - CIQUANTDF= option, 20
  - CIQUANTNORMAL= option, 21
  - CPMA= option, 21
  - DATA= option, 21, 30
  - DEF= option, 21, 24
  - EXCLNPWGT option, 21
  - FORMCHAR= option, 22
  - FREQ option, 23
  - GOUT= option, 23
  - LINEPRINTER option, 23
  - LOCATION= option, 23
  - LOCCOUNT option, 23
  - missing values, 53
  - MODE option, 23
  - MODES option, 23, 45
  - MUO= option, 23
  - NEXTROBS= option, 23
  - NEXTRVAL= option, 23
  - NOPRINT option, 23
  - NORMALTEST option, 24, 36
  - ODS tables, 54
  - OUTTABLE= option, 24, 32
  - PCTLDEF= option, 21, 24, 39
  - ROBUSTSCALE option, 24, 42
  - ROUND= option, 24
  - SPEC= option, 25, 30
  - SPECIALINDICES option, 24
  - TRIM option, 25
  - TRIMMED option, 25
  - TRIMMED= option, 42
  - TYPE= option, 20–21, 25–26, 1623
  - VARDEF= option, 25
  - WINSOR option, 25
  - WINSORIZED option, 25
  - WINSORIZED= option, 42
- CAPABILITY procedure, QQPLOT statement
  - ALPHA= option, 315, 318

- ANNOTATE= option, 315
- BETA option, 312–313, 315
- BETA= option, 317
- C= option, 317, 327–328
- CAXIS= option, 317
- CFRAME= option, 317
- CHREF= option, 317
- COLOR= option, 310, 312, 317
- CPKREF option, 317, 322, 343
- CPKSCALE option, 317, 322, 343
- CTEXT= option, 317
- CVREF= option, 318
- DESCRIPTION= option, 318
- EXPONENTIAL option, 312–313, 318
- FONT= option, 318
- GAMMA option, 312–313, 318
- GRID option, 323
- GRIDCHAR= option, 323
- HAXIS= option, 319
- HMINOR= option, 319
- HREF= option, 319
- HREFCHAR= option, 320
- HREFLABELS= option, 320
- L= option, 310, 320
- LABEL= option, 323
- LEGEND= option, 320
- LGRID= option, 323
- LHREF= option, 320
- LOGNORMAL option, 312–313, 320
- LVREF= option, 321
- MU= option, 310, 312, 321–322
- NADJ= option, 321, 330
- NAME= option, 321
- NOFRAME option, 321
- NOLEGEND option, 321
- NOLINELEGEND option, 322
- NOOBSLEGEND option, 322
- NORMAL option, 312–313, 322, 343
- NOSPECLEGEND option, 310, 322
- PCTLAXIS option, 323, 334
- PCTLMINOR option, 323
- PCTLSCALE option, 324, 334
- QSYMBOL= option, 324
- RANKADJ= option, 324, 330
- ROTATE option, 324
- SCALE= option, 316, 318–319, 321, 325, 328
- SHAPE= option, 318, 320, 325, 327
- SIGMA= option, 310, 312, 316, 318–320, 322, 325, 327–328
- SLOPE= option, 321, 325, 329
- SQUARE option, 310, 326
- SYMBOL= option, 326
- THETA= option, 316, 318–319, 321, 326–328
- THRESHOLD= option, 316, 318–319, 321, 326, 328
- VAXIS= option, 326
- VMINOR= option, 326
- VREF= option, 326
- VREFCHAR= option, 327
- VREFLABELS= option, 327
- W= option, 327
- WEIBULL option, 312–313, 327
- WEIBULL2 option, 312–313, 328
- ZETA= option, 321, 329
- CAPABILITY procedure, SPEC statement
  - CLEFT= option, 27
  - CLSL= option, 27
  - CRIGHT= option, 27
  - CTARGET= option, 28
  - CUSL= option, 28
  - LLSL= option, 28
  - LSL= option, 28
  - LSLSYMBOL= option, 28
  - LTARGET= option, 28
  - LUSL= option, 28
  - PLEFT= option, 28
  - PRIGHT= option, 29
  - TARGET= option, 29
  - TARGETSYMBOL= option, 29
  - USL= option, 29
  - USLSYMBOL= option, 29
  - WLSL= option, 29
  - WTARGET= option, 29
  - WUSL= option, 29
- CATLEGLABEL= option
  - PARETO procedure, 815, 850
- CAXIS= option
  - CUSUM procedure, 1621
  - MACONTROL procedure, 1621
  - PARETO procedure, 816, 850
  - SHEWHART procedure, 1621
- CAXIS2= option
  - PARETO procedure, 816, 851
- CBARLINE= option
  - PARETO procedure, 816, 851
- CBARS= option
  - PARETO procedure, 816, 851
- CBLOCKLAB= option
  - CUSUM procedure, 1621
  - MACONTROL procedure, 1621
  - SHEWHART procedure, 1621
- CBLOCKVAR= option
  - CUSUM procedure, 1621
  - MACONTROL procedure, 1621
  - SHEWHART procedure, 1621, 1687–1689
- CBOXES= option
  - SHEWHART procedure, 1621
- CBOXFILL= option
  - SHEWHART procedure, 1622
- CCHART statement, SHEWHART procedure
  - See also SHEWHART procedure, CCHART statement
  - examples, advanced, 1134
  - examples, introductory, 1106
  - options summarized by function, 1117–1121, 1123
  - overview, 1105
  - syntax, 1115

- CCLIP= option
  - MACONTROL procedure, 1622
  - SHEWHART procedure, 1622
- CCONNECT= option
  - CUSUM procedure, 1622
  - MACONTROL procedure, 1622
  - PARETO procedure, 816, 851
  - SHEWHART procedure, 1622
- CDFPLOT statement
  - See CAPABILITY procedure, CDFPLOT statement
  - examples, 81–82
  - getting started, 66
  - options summarized by function, 68–71
  - overview, 65
  - syntax, 67
- CFRAME= option
  - CUSUM procedure, 1622
  - MACONTROL procedure, 1622
  - PARETO procedure, 817, 851
  - SHEWHART procedure, 1622, 1690
- CFRAMELAB= option
  - CUSUM procedure, 1623
  - MACONTROL procedure, 1623
  - SHEWHART procedure, 1623
- CFRAMENLEG= option
  - PARETO procedure, 817, 851
- CFRAMESIDE= option
  - PARETO procedure, 817, 852
- CFRAMETOP= option
  - PARETO procedure, 817, 852
- CGRID= option
  - PARETO procedure, 817, 852
- CGRID2= option
  - PARETO procedure, 817, 852
- character subgroup variables
  - SHEWHART procedure, 1639
- CHIGH(*n*)= option
  - PARETO procedure, 817, 852
- CHREF= option
  - CUSUM procedure, 1623
  - MACONTROL procedure, 1623
  - PARETO procedure, 817, 852
  - SHEWHART procedure, 1623
- CINFILL= option
  - CUSUM procedure, 385
  - MACONTROL procedure, 1623
  - SHEWHART procedure, 1623
- CLASS statement, OPTEX procedure
  - See OPTEX procedure, CLASS statement
  - syntax, 736
- CLASS= option
  - PARETO procedure, 817, 852
- CLASSKEY= option
  - PARETO procedure, 818, 853
- CLIMITS= option
  - CUSUM procedure, 385
  - MACONTROL procedure, 1623
  - SHEWHART procedure, 1623
- CLIPCHAR= option
  - MACONTROL procedure, 1623
  - SHEWHART procedure, 1623
- CLIPFACTOR= option
  - MACONTROL procedure, 1623
  - SHEWHART procedure, 1623, 1716–1718
- CLIPLEGEND= option
  - MACONTROL procedure, 1623
  - SHEWHART procedure, 1623, 1718
- CLIPLEGPOS= option
  - MACONTROL procedure, 1624
  - SHEWHART procedure, 1624, 1718
- CLIPSUBCHAR= option
  - MACONTROL procedure, 1624
  - SHEWHART procedure, 1624, 1718
- CLIPSYMBOL= option
  - MACONTROL procedure, 1624
  - SHEWHART procedure, 1624, 1718
- CLIPSYMBOLHT= option
  - SHEWHART procedure, 1624
- CLOW(*n*)= option
  - PARETO procedure, 819, 853
- CMASK= option
  - CUSUM procedure, 385
- CMEANSYMBOL= option
  - MACONTROL procedure, 630, 684
- CMPCTLABEL option
  - PARETO procedure, 819, 853
- CNEEDLES= option
  - CUSUM procedure, 1624
  - MACONTROL procedure, 1624
  - SHEWHART procedure, 1624, 1714
- COMPHISTOGRAM statement
  - See CAPABILITY procedure, COMPHISTOGRAM statement
  - examples, 88, 90
  - getting started, 88
  - options summarized by function, 93–96
  - overview, 87
  - syntax, 91
- CONNECTCHAR= option
  - CUSUM procedure, 1624
  - MACONTROL procedure, 1624
  - PARETO procedure, 819
  - SHEWHART procedure, 1624
- CONTROLSTAT= option
  - SHEWHART procedure, 1624
- COTHER= option
  - PARETO procedure, 819, 854
- COUT= option
  - CUSUM procedure, 1625
  - MACONTROL procedure, 1625
  - SHEWHART procedure, 1625
- COUTFILL= option
  - CUSUM procedure, 1625
  - MACONTROL procedure, 1625
  - SHEWHART procedure, 1625
- CPHASEBOX= option
  - SHEWHART procedure, 1099, 1625

- CPHASEBOXCONNECT= option
    - SHEWHART procedure, 1625
  - CPHASEBOXFILL= option
    - SHEWHART procedure, 1099, 1625
  - CPHASELEG= option
    - CUSUM procedure, 1625
    - MACONTROL procedure, 1625
    - SHEWHART procedure, 1625, 1690
  - CPHASEMEANCONNECT= option
    - SHEWHART procedure, 1099, 1625
  - CPROP= option
    - PARETO procedure, 819, 854
  - CSTARCIRCLES= option
    - CUSUM procedure, 1625
    - MACONTROL procedure, 1625
    - SHEWHART procedure, 1625
  - CSTARFILL= option
    - CUSUM procedure, 1626
    - MACONTROL procedure, 1626
    - SHEWHART procedure, 1626
  - CSTAROUT= option
    - CUSUM procedure, 1626
    - MACONTROL procedure, 1626
    - SHEWHART procedure, 1626
  - CSTARS= option
    - CUSUM procedure, 1626
    - MACONTROL procedure, 1626
    - SHEWHART procedure, 1626
  - CSYMBOL= option
    - SHEWHART procedure, 1627
  - CTESTS= option
    - SHEWHART procedure, 1627, 1745
  - CTEXT= option
    - CUSUM procedure, 1627
    - MACONTROL procedure, 1627
    - PARETO procedure, 819, 854
    - SHEWHART procedure, 1627
  - CTEXTSIDE= option
    - PARETO procedure, 819, 854
  - CTEXTTOP= option
    - PARETO procedure, 819, 854
  - CTILES= option
    - PARETO procedure, 820, 854
  - CUSUM procedure
    - ANNOTATE= option, 356
    - ANNOTATE2= option, 356
    - DATA= data set, 356
    - FORMCHAR= option, 356–357
    - GOUT= option, 357
    - GRAPHICS option, 372
    - HISTORY= data set, 357
    - introduction, 351
    - LIMITS= data set, 358
    - LINEPRINTER option, 358
    - overview, 355
    - syntax, 356
  - CUSUM procedure, XCHART statement
    - ALLN option, 393
    - ALPHA= option, 363, 375, 385, 396
    - BETA= option, 385, 396
    - CINFILL= option, 385
    - CLIMITS= option, 385
    - CMASK= option, 385
    - DATA= data set, 362–364, 406–407
    - DATAUNITS option, 385, 393
    - DELTA= option, 363, 375, 386, 391
    - H= option, 369–370, 375, 386, 396
    - HEADSTART= option, 386, 392–393
    - HISTORY= data set, 365–366, 408–409
    - INTERVAL= option, 395
    - K= option, 369–370, 386, 396
    - LIMITN= option, 387, 391, 393
    - LIMITS= data set, 373–374, 407–408
    - LLIMITS= option, 387
    - LMASK= option, 387
    - missing values, 409
    - MU0= option, 363, 375, 387, 391
    - NOARL option, 387
    - NOMASK option, 387
    - NOREADLIMITS option, 387
    - ORIGIN= option, 388
    - OUTHISTORY= data set, 367–368, 405
    - OUTLIMITS= data set, 371–372, 404–405
    - OUTTABLE= data set, 405, 410, 413
    - READINDEX= option, 388
    - READLIMITS option, 388
    - READSIGMAS option, 388
    - SCHEME= option, 369–370, 375, 389
    - SHIFT= option, 389, 391
    - SIGMA0= option, 363, 389
    - SIGMAS= option, 389
    - SMETHOD= option, 389, 401–404
    - TABLEALL option, 369–370, 389
    - TABLECHART option, 390
    - TABLECOMP option, 390
    - TABLEID option, 390
    - TABLEOUT option, 390
    - TABLESUMMARY option, 390
    - TYPE= option, 390–391
    - VAXIS= option, 363
    - WLIMITS= option, 390
    - WMASK= option, 390
  - CUSUMARL function, 1849–1850
  - CVREF= option
    - CUSUM procedure, 1628
    - MACONTROL procedure, 1628
    - PARETO procedure, 820, 855
    - SHEWHART procedure, 1628
  - CZONES= option
    - SHEWHART procedure, 1628, 1745
- ## D
- D2 function, 1850, 1863
  - D3 function, 1851, 1863
  - DATA= data set
    - PARETO procedure, 795
  - DATAUNIT= option
    - SHEWHART procedure, 1628



- DATAUNITS option
    - CUSUM procedure, 385
  - DELTA= option
    - CUSUM procedure, 386
  - DESCRIPTION= option
    - CUSUM procedure, 1628
    - MACONTROL procedure, 1628
    - PARETO procedure, 820, 855
    - SHEWHART procedure, 1628
  - DESCRIPTION2= option
    - SHEWHART procedure, 1628
  - DIMEN variable
    - ADXXVERT output data set, 1895–1896
  - DIST variable
    - ADXXVERT output data set, 1896
- E**
- ENDGRID option
    - CUSUM procedure, 1628
    - MACONTROL procedure, 1628
    - SHEWHART procedure, 1628
  - EWMAARL function, 1852
  - EWMAHART statement
    - See also MACONTROL procedure, EW-
    - MACHART statement
    - examples, advanced, 649
    - examples, introductory, 610
    - overview, 609
    - syntax, 620
  - EXAMINE statement, FACTEX procedure
    - See FACTEX procedure, EXAMINE statement
    - options summarized by function, 443
    - syntax, 448
  - EXAMINE statement, OPTEX procedure
    - See OPTEX procedure, EXAMINE statement
    - syntax, 737
  - EXCHART option
    - CUSUM procedure, 1628
    - MACONTROL procedure, 1628
    - SHEWHART procedure, 1628
- F**
- FACTEX procedure
    - getting started, 431
    - learning about FACTEX, 430
    - overview, 429
    - summary of functions, 442
    - syntax, 441
  - FACTEX procedure, BLOCKS statement
    - NBLKFACS= option, 447
    - NBLKFACS=MAXIMUM option, 447
    - NBLOCKS= option, 447
    - NBLOCKS= option, examples, 433, 475
    - NBLOCKS=MAXIMUM option, 447
    - SIZE= option, 447
    - SIZE=MINIMUM option, 447
  - FACTEX procedure, EXAMINE statement
    - ALIASING option, 448
    - ALIASING option, example, 436
    - CONFOUNDING option, 449
    - DESIGN option, 449
    - DESIGN option, example, 431
  - FACTEX procedure, FACTORS statement
    - example, 431
    - NLEV= option, 450
  - FACTEX procedure, MODEL statement
    - ESTIMATE= option, 450
    - ESTIMATE= option, examples, 459, 475
    - MINABS option, 451, 497
    - MINABS option, example, 473
    - MINABS option, limitation, 474
    - NONNEGLEGIBLE= option, 450
    - RESOLUTION= option, 451
    - RESOLUTION= option, examples, 435, 458, 462
    - RESOLUTION=MAX option, 451
    - RESOLUTION=MAX option, examples, 433, 465–466
  - FACTEX procedure, OUTPUT statement
    - CVALS= option, 453, 490
    - CVALS= option, example, 463
    - decode design factors, 452
    - derived factors, 455
    - derived factors, examples, 468, 471
    - DESIGNREP= option, 454
    - DESIGNREP= option, examples, 464–465, 467–468
    - NOVALRAN option, 454
    - NVALS= option, 453, 490
    - NVALS= option, example, 463
    - OUT= option, 452
    - OUT= option, example, 463
    - POINTREP= option, 454
    - POINTREP= option, examples, 464–465, 467–468
    - RANDOMIZE= option, 454
    - RANDOMIZE= option, examples, 457, 463
    - RANDOMIZE= option, NOVALRAN option, 454
    - RANDOMIZE= option, seed, 454
    - recode block factor, 453
    - recode block factor levels, examples, 434, 463
    - recode design factor levels, examples, 432, 435, 463
  - FACTEX procedure, PROC FACTEX statement
    - example, 431
    - NAMELEN option, 446
    - NOCHECK option, 446, 474, 507
    - ODS tables, 499
    - SECONDS= option, 446
    - TIME= option, 446, 474
  - FACTEX procedure, SIZE statement
    - DESIGN= option, 456
    - DESIGN= option, examples, 435, 458
    - DESIGN=MINIMUM option, 456
    - FRACTION= option, 456
    - FRACTION=MAXIMUM option, 456
    - NRUNFACS= option, 456
    - NRUNFACS=MINIMUM option, 456
  - FACTORS statement, FACTEX procedure

- See FACTEX procedure, FACTORS statement
- options summarized by function, 442
- syntax, 449
- FONT= option
  - CUSUM procedure, 1628
  - MACONTROL procedure, 1628
  - PARETO procedure, 820, 855
  - SHEWHART procedure, 1628
- FORMCHAR= option
  - PARETO procedure, 795
- FREQ= option
  - PARETO procedure, 820, 855
- G**
- GAGE application
  - average and range method, 1818
  - average chart, 1817
  - data set format, 1831
  - entering data, 1813–1815, 1822
  - gage catalog, 1811
  - introduction to, 1809
  - invoking, 1811
  - missing data, 1819
  - range chart, 1815
  - reading data set, 1822
  - saving data, 1821
  - variance components method, 1820
- GENERATE statement, OPTEX procedure
  - See OPTEX procedure, GENERATE statement
  - default options, 738
  - syntax, 738
- GOUT= option
  - PARETO procedure, 795
- GRID option
  - CUSUM procedure, 1629
  - MACONTROL procedure, 1629
  - PARETO procedure, 820, 855
  - SHEWHART procedure, 1629
- GRID2 option
  - PARETO procedure, 820, 855
- H**
- H= option
  - CUSUM procedure, 386
- HAXIS= option
  - CUSUM procedure, 1629
  - MACONTROL procedure, 1629
  - PARETO procedure, 855
  - SHEWHART procedure, 1629
- HAXIS2= option
  - PARETO procedure, 855
- HAXIS2LABEL= option
  - PARETO procedure, 855
- HAXISLABEL= option
  - PARETO procedure, 855
- HEADSTART= option
  - CUSUM procedure, 386
- HEIGHT= option
  - CUSUM procedure, 1629
- MACONTROL procedure, 1629
- PARETO procedure, 821, 856
- SHEWHART procedure, 1629
- HISTOGRAM statement
  - See CAPABILITY procedure, HISTOGRAM statement
  - getting started, 118
  - options summarized by function, 125–127, 129–130
  - overview, 117
  - syntax, 124
- HLLEGLABEL= option
  - PARETO procedure, 821, 856
- HMINOR= option
  - CUSUM procedure, 1629
  - MACONTROL procedure, 1629
  - SHEWHART procedure, 1629
- HOFFSET= option
  - CUSUM procedure, 1629
  - MACONTROL procedure, 1629
  - PARETO procedure, 821, 856
  - SHEWHART procedure, 1629
- HREF= option
  - CUSUM procedure, 1630
  - MACONTROL procedure, 1630
  - PARETO procedure, 821, 856
  - SHEWHART procedure, 1630
- HREF2= option
  - CUSUM procedure, 1630
  - MACONTROL procedure, 1630
  - PARETO procedure, 856
  - SHEWHART procedure, 1630
- HREF2DATA= option
  - CUSUM procedure, 1630
  - MACONTROL procedure, 1630
  - SHEWHART procedure, 1630
- HREF2LABELS= option
  - CUSUM procedure, 1631
  - MACONTROL procedure, 1631
  - PARETO procedure, 856
  - SHEWHART procedure, 1631
- HREFCHAR= option
  - CUSUM procedure, 1631
  - MACONTROL procedure, 1631
  - PARETO procedure, 821
  - SHEWHART procedure, 1631
- HREFDATA= option
  - CUSUM procedure, 1631
  - MACONTROL procedure, 1631
  - SHEWHART procedure, 1631
- HREFLABELS= option
  - CUSUM procedure, 1631
  - MACONTROL procedure, 1631
  - PARETO procedure, 821, 856
  - SHEWHART procedure, 1631
- HREFLABPOS= option
  - CUSUM procedure, 1631
  - MACONTROL procedure, 1631
  - PARETO procedure, 821, 856

SHEWHART procedure, 1631  
 HTML= option  
   CUSUM procedure, 1632  
   MACONTROL procedure, 1632  
   PARETO procedure, 821, 856  
   SHEWHART procedure, 1632  
 HTML\_LEGEND= option  
   CUSUM procedure, 1632  
   MACONTROL procedure, 1632  
   SHEWHART procedure, 1632

**I**

ID statement, OPTEX procedure  
   See OPTEX procedure, ID statement  
   syntax, 741  
 IDCOLOR= option  
   SHEWHART procedure, 1632  
 IDCTEXT= option  
   SHEWHART procedure, 1632  
 IDFONT= option  
   SHEWHART procedure, 1633  
 IDHEIGHT= option  
   SHEWHART procedure, 1633  
 IDSYMBOL= option  
   SHEWHART procedure, 1633  
 INFONT= option  
   PARETO procedure, 821, 856  
 INHEIGHT= option  
   PARETO procedure, 821, 857  
 INSET and INSET2 statements  
   See CUSUM procedure, INSET statement  
   See MACONTROL procedure, INSET statement  
   See SHEWHART procedure, INSET and INSET2  
     statements  
   list of options, 1604  
   overview, 1595  
   syntax, 1601  
 INSET statement  
   See CAPABILITY procedure, INSET statement  
   See PARETO procedure, INSET statement  
   getting started, 192, 420, 710, 870, 1596  
   keywords summarized by function, 198–199, 201–  
     203, 876, 1602  
   list of options, 204, 877  
   overview, 191, 419, 709, 869  
   syntax, 196, 422, 712, 875  
 INTERBAR= option  
   PARETO procedure, 822, 857  
 INTERTILE= option  
   PARETO procedure, 822, 857  
 INTERVAL= option  
   CUSUM procedure, 1633  
   MACONTROL procedure, 1633  
   SHEWHART procedure, 1633  
 INTERVALS statement  
   See CAPABILITY procedure, INTERVALS state-  
     ment  
   getting started, 218  
   list of options, 222

  overview, 217  
   syntax, 222  
 INTSTART= option  
   CUSUM procedure, 1634  
   MACONTROL procedure, 1634  
   SHEWHART procedure, 1634  
 IRCHART statement  
   See also SHEWHART procedure, IRCHART state-  
     ment  
   examples, advanced, 1175  
   examples, introductory, 1144  
   options summarized by function, 1154–1156,  
     1158–1160, 1162–1163  
   overview, 1143  
   syntax, 1153  
 Ishikawa diagrams  
   adding arrows, 534–536  
   aligning arrows, 551–557  
   balancing arrows, 551–557  
   data collection, 557–558  
   data presentation, 557–558  
   deleting arrows, 544–546  
   detail, decreasing, 558–560  
   detail, increasing, 558–560  
   editing existing diagrams, 582–583  
   editing labels, 537–539  
   exporting diagrams, 568–569  
   fonts, modifying, 570  
   highlighting arrows, 572–577  
   isolating arrows, 562–563  
   labeling arrows, 537–539  
   managing complexity, 558–565  
   merging diagrams, 563–565  
   moving arrows, 540–544, 549–557  
   notepads, 557–558  
   output, bitmaps, 568–569  
   output, graphics, 566–567  
   output, SAS data set, 581, 586–587  
   overview, 515  
   printing, bitmaps, 568–569  
   printing, SAS/GRAPH output, 566–567  
   resizing arrows, 546–549  
   SAS data set, input, 582–583, 586–587  
   SAS data set, output, 581, 586–587  
   saving, bitmaps, 568–569  
   saving, clipboard graphics, 568–569  
   saving, graphics, 566–567  
   saving, SAS data set, 581  
   subsetting arrows, 546–549, 572–577  
   summary of operations, 529–533  
   swapping arrows, 549–551  
   tagging arrows, 546–549, 572–577  
   terminology, 517  
   text entry, 537–539  
   undo, 544–546  
   zooming arrows, 561, 580

**K**

K= option

CUSUM procedure, 386

**L**

LABELFONT= option  
 MACONTROL procedure, 1634  
 SHEWHART procedure, 1634, 1709–1710

LABELHEIGHT= option  
 MACONTROL procedure, 1634  
 SHEWHART procedure, 1634

LABOTHER= option  
 PARETO procedure, 822, 857

LAST= option  
 PARETO procedure, 822, 857

LBOXES= option  
 SHEWHART procedure, 1634

LCLLABEL= option  
 MACONTROL procedure, 1634  
 SHEWHART procedure, 1634

LCLLABEL2= option  
 SHEWHART procedure, 1634

LENDGRID= option  
 CUSUM procedure, 1635  
 MACONTROL procedure, 1635  
 SHEWHART procedure, 1635

LGRID= option  
 CUSUM procedure, 1635  
 MACONTROL procedure, 1635  
 PARETO procedure, 822, 857  
 SHEWHART procedure, 1635

LGRID2= option  
 PARETO procedure, 822, 857

LHREF= option  
 CUSUM procedure, 1635  
 MACONTROL procedure, 1635  
 PARETO procedure, 822, 857  
 SHEWHART procedure, 1635

LIMITN= option  
 CUSUM procedure, 387  
 MACONTROL procedure, 630, 684  
 SHEWHART procedure, 1635, 1735

LIMLABSUBCHAR= option  
 SHEWHART procedure, 1636

LINEPRINTER option  
 PARETO procedure, 795

LLIMITS= option  
 CUSUM procedure, 387  
 MACONTROL procedure, 1636  
 SHEWHART procedure, 1636

LMASK= option  
 CUSUM procedure, 387

LOTHER= option  
 PARETO procedure, 822, 857

LSL= option  
 SHEWHART procedure, 1636

LSTARCIRCLES= option  
 CUSUM procedure, 1637  
 MACONTROL procedure, 1637  
 SHEWHART procedure, 1637, 1703–1704, 1709–1710

LSTARS= option  
 CUSUM procedure, 1637  
 MACONTROL procedure, 1637  
 SHEWHART procedure, 1637

LTESTS= option  
 SHEWHART procedure, 1638, 1745

LTMARGIN= option  
 SHEWHART procedure, 1638, 1688–1689

LTMPLOT= option  
 SHEWHART procedure, 1638

LVREF= option  
 CUSUM procedure, 1638  
 MACONTROL procedure, 1638  
 PARETO procedure, 822, 857  
 SHEWHART procedure, 1638

LZONES= option  
 CUSUM procedure, 1638  
 MACONTROL procedure, 1638  
 SHEWHART procedure, 1638

**M**

MACHART statement  
 See also MACONTROL procedure, MACHART statement  
 examples, advanced, 702  
 examples, introductory, 664  
 overview, 663  
 syntax, 674

MACONTROL procedure  
 ANNOTATE= option, 602, 704  
 ANNOTATE2= option, 602  
 DATA= data set, 602  
 FORMCHAR= option, 602–603  
 GOUT= option, 603  
 HISTORY= data set, 603–604  
 introduction, 597  
 LIMITS= data set, 604  
 LINEPRINTER option, 604  
 overview, 601  
 syntax, 602  
 TABLE= data set, 604

MACONTROL procedure, EWMACHART statement  
 ALLN option, 654  
 ALPHA= option, 630  
 ASYMPTOTIC option, 630, 650  
 CMEANSYMBOL= option, 630  
 DATA= data set, 642  
 HISTORY= data set, 612–615, 643–644  
 LIMITN= option, 630, 653  
 LIMITS= data set, 618–619, 643, 650  
 MEANCHAR= option, 631  
 MEANSYMBOL= option, 631, 657  
 missing values, 648  
 MU0= option, 631, 649–650  
 NMARKERS option, 654  
 NOREADLIMITS option, 631  
 OUTHISTORY= data set, 615–616, 640  
 OUTLIMITS= data set, 616–617, 639–640  
 OUTTABLE= data set, 617–618, 640–641

- READALPHA option, 631
  - READINDEX= option, 631
  - READLIMITS option, 632
  - RESET option, 632
  - SIGMA0= option, 632, 649–650
  - SIGMAS= option, 632
  - SMETHOD= option, 646, 655
  - TABLE= data set, 618, 644–645
  - VREF= option, 657
  - WEIGHT= option, 611, 620, 632
  - XSYMBOL= option, 649
  - MACONTROL procedure, MACHART statement
    - ALPHA= option, 684
    - ASYMPTOTIC option, 684
    - CMEANSYMBOL= option, 684
    - DATA= data set, 696
    - HISTORY= data set, 667–669, 697–698
    - LIMITN= option, 684
    - LIMITS= data set, 650, 672–673, 697, 703
    - MEANCHAR= option, 685
    - MEANSYMBOL= option, 685
    - missing values, 701
    - MU0= option, 685, 702–703
    - NOREADLIMITS option, 685
    - OUTHISTORY= data set, 669–670, 694
    - OUTLIMITS= data set, 670–671, 693–694
    - OUTTABLE= data set, 671–672, 694–695
    - READALPHA option, 685
    - READINDEX= option, 686
    - READLIMITS option, 686
    - SIGMA0= option, 686, 702–703
    - SIGMAS= option, 686
    - SMETHOD= option, 700
    - SPAN= option, 665, 674, 686
    - TABLE= data set, 672, 698–699
    - XSYMBOL= option, 702
  - MAXCMPCT= option
    - PARETO procedure, 822, 858
  - MAXNCAT= option
    - PARETO procedure, 823, 858
  - MAXPANELS= option
    - CUSUM procedure, 1638
    - MACONTROL procedure, 1638
    - SHEWHART procedure, 1638
  - MCHART statement
    - See also SHEWHART procedure, MCHART statement
    - examples, introductory, 1184
    - options summarized by function, 1196–1198, 1200–1201, 1203–1204
    - overview, 1183
    - syntax, 1195
  - MEANCHAR= option
    - MACONTROL procedure, 631, 685
  - MEANSYMBOL= option
    - MACONTROL procedure, 631, 685
  - MEDCENTRAL= option
    - SHEWHART procedure, 1638
  - MINPCT= option
    - PARETO procedure, 823, 859
  - MISSBREAK option
    - CUSUM procedure, 1639
    - MACONTROL procedure, 1639
    - SHEWHART procedure, 1639
  - MISSING option
    - PARETO procedure, 824, 859
  - missing subgroup variable values
    - SHEWHART procedure, 1639
  - MISSING1 option
    - PARETO procedure, 824, 859
  - MISSING2 option
    - PARETO procedure, 824, 859
  - MODEL statement, FACTEX procedure
    - See FACTEX procedure, MODEL statement
    - options summarized by function, 442
    - syntax, 450
  - MODEL statement, OPTEX procedure
    - See OPTEX procedure, MODEL statement
    - syntax, 741
  - MRCHART statement
    - See also SHEWHART procedure, MRCHART statement
    - examples, advanced, 1253
    - examples, introductory, 1220
    - options summarized by function, 1232–1233, 1235–1238, 1240
    - overview, 1219
    - syntax, 1231
  - MU0= option
    - CUSUM procedure, 387
    - MACONTROL procedure, 631, 685
    - SHEWHART procedure, 1639, 1735, 1778
- ## N
- NAME= option
    - CUSUM procedure, 1639
    - MACONTROL procedure, 1639
    - PARETO procedure, 824, 859
    - SHEWHART procedure, 1639
  - NAME2= option
    - SHEWHART procedure, 1639
  - NCOLS= option
    - PARETO procedure, 825, 860
  - NDECIMAL= option
    - MACONTROL procedure, 1639
    - SHEWHART procedure, 1639
  - NDECIMAL2= option
    - SHEWHART procedure, 1640
  - NEEDLES option
    - CUSUM procedure, 1640
    - MACONTROL procedure, 1640
    - SHEWHART procedure, 1640
  - NLEGEND= option
    - PARETO procedure, 825, 860
  - NMARKERS option
    - CUSUM procedure, 1640
    - MACONTROL procedure, 1640
    - SHEWHART procedure, 1640

- NO3SIGMACHECK option
  - SHEWHART procedure, 1640
- NOARL option
  - CUSUM procedure, 387
- NOBYREF option
  - CUSUM procedure, 1640
  - MACONTROL procedure, 1640
  - SHEWHART procedure, 1640
- NOCHART option
  - CUSUM procedure, 1640
  - MACONTROL procedure, 1640
  - PARETO procedure, 825, 860
  - SHEWHART procedure, 1640
- NOCHART2 option
  - SHEWHART procedure, 1641
- NOCONNECT option
  - CUSUM procedure, 1641
  - MACONTROL procedure, 1641
  - SHEWHART procedure, 1641
- NOCTL option
  - MACONTROL procedure, 1641
  - SHEWHART procedure, 1641
- NOCTL2 option
  - SHEWHART procedure, 1641
- NOCURVE option
  - PARETO procedure, 825, 860
- NOFRAME option
  - CUSUM procedure, 1641
  - MACONTROL procedure, 1641
  - PARETO procedure, 825, 860
  - SHEWHART procedure, 1641
- NOHLABEL option
  - CUSUM procedure, 1641
  - MACONTROL procedure, 1641
  - PARETO procedure, 826, 860
  - SHEWHART procedure, 1641
- NOHLABEL2 option
  - PARETO procedure, 861
- NOHLLEG option
  - PARETO procedure, 826, 861
- NOHTICK option
  - PARETO procedure, 861
- NOHTICK2 option
  - PARETO procedure, 861
- NOKEYMOVE option
  - PARETO procedure, 826, 861
- NOLCL option
  - MACONTROL procedure, 1641
  - SHEWHART procedure, 1641
- NOLCL2 option
  - SHEWHART procedure, 1641
- NOLEGEND option
  - CUSUM procedure, 1641
  - MACONTROL procedure, 1641
  - SHEWHART procedure, 1641, 1686–1690, 1764–1765
- NOLIMIT0 option
  - SHEWHART procedure, 1641
- NOLIMIT1 option
  - SHEWHART procedure, 1642
- NOLIMITLABEL option
  - MACONTROL procedure, 1642
  - SHEWHART procedure, 1642
- NOLIMITS option
  - MACONTROL procedure, 1642
  - SHEWHART procedure, 1642, 1764
- NOLIMITSFRAME option
  - SHEWHART procedure, 1642
- NOLIMITSLEGEND option
  - MACONTROL procedure, 1642
  - SHEWHART procedure, 1642
- NOMASK option
  - CUSUM procedure, 387
- NOPHASEFRAME option
  - SHEWHART procedure, 1642
- NOPRINT specification
  - ADXALIAS macro, 1884
- NOREADLIMITS option
  - CUSUM procedure, 387
  - MACONTROL procedure, 631, 685
  - SHEWHART procedure, 1642
- NOTCHES option
  - SHEWHART procedure, 1643
- NOTICKREP option
  - SHEWHART procedure, 1643
- NOTRENDCONNECT option
  - CUSUM procedure, 1644
  - MACONTROL procedure, 1644
  - SHEWHART procedure, 1644
- NOTRUNC option
  - SHEWHART procedure, 1644
- NOUCL option
  - MACONTROL procedure, 1644
  - SHEWHART procedure, 1644
- NOUCL2 option
  - SHEWHART procedure, 1644
- NOVANGLE option
  - CUSUM procedure, 1644
  - MACONTROL procedure, 1644
  - SHEWHART procedure, 1644
- NOVLABEL option
  - PARETO procedure, 826, 861
- NOVLABEL2 option
  - PARETO procedure, 826
- NOVTICK option
  - PARETO procedure, 826
- NOVTICK2 option
  - PARETO procedure, 826
- NPANELPOS= option
  - CUSUM procedure, 1644
  - MACONTROL procedure, 1644
  - SHEWHART procedure, 1644
- NPCHART statement, SHEWHART procedure
  - See also SHEWHART procedure, NPCHART statement
  - examples, advanced, 1292
  - examples, introductory, 1264

- options summarized by function, 1275–1276, 1278–1282
  - overview, 1263
  - syntax, 1273
  - NPSYMBOL= option
    - SHEWHART procedure, 1644
  - NROWS= option
    - PARETO procedure, 826, 861
- O**
- OPTEX procedure
    - getting started, 721
    - learning about OPTEX, 720
    - order of statements, 731, 737, 742, 759
    - overview, 719
    - summary of functions, 732
    - syntax, 731
  - OPTEX procedure, BLOCKS statement
    - COVAR= option, 735, 762
    - DESIGN= option, 735, 758
    - INIT= option, 736
    - ITER= option, 736
    - KEEP= option, 736
    - NOEXCHANGE option, 736
    - options summarized by function, 732
    - STRUCTURE= option, 736, 756
    - VAR= option, 762
  - OPTEX procedure, CLASS statement
    - example, 722
    - syntax, 736
  - OPTEX procedure, EXAMINE statement
    - DESIGN option, 737
    - INFORMATION option, 737
    - NUMBER= option, 737
    - options summarized by function, 733
    - VARIANCE option, 737
  - OPTEX procedure, GENERATE statement
    - AUGMENT= option, 738, 751
    - CRITERION= option, 738, 765
    - INITDESIGN= option, 739, 749
    - ITER= option, 740
    - KEEP= option, 740
    - METHOD= option, 740, 748
    - N= option, 726, 741, 749
    - options summarized by function, 732–733
  - OPTEX procedure, ID statement, 741
  - OPTEX procedure, MODEL statement
    - example, 722
    - NOINT option, 742, 764
    - options summarized by function, 732
    - PRIOR= option, 742, 754
  - OPTEX procedure, OUTPUT statement
    - BLOCKNAME= option, 743
    - NUMBER= option, 743, 745
    - options summarized by function, 733
    - OUT= option, 742
  - OPTEX procedure, PROC OPTEX statement
    - CODING= option, 734, 758
    - DATA= option, 734
    - EPSILON= option, 734
    - example, 722
    - NAMELEN option, 734
    - NOCODE option, 734, 764
    - NOPRINT option, 734
    - options summarized by function, 732–733
    - SEED= option, 735
    - STATUS= option, 735
  - OPTTEX procedure, PROC OPTTEX statement
    - ODS tables, 784
  - ORDER1= option
    - PARETO procedure, 826, 861
  - ORDER2 specification
    - ADXQMOD macro, 1879
  - ORDER2= option
    - PARETO procedure, 827, 862
  - ORIGIN= option
    - CUSUM procedure, 388
  - OTHER= option
    - PARETO procedure, 827, 862
  - OTHERCVAL= option
    - PARETO procedure, 827, 862
  - OTHERNVAL= option
    - PARETO procedure, 828, 862
  - OUT= data set
    - PARETO procedure, 828, 863
  - OUTHISTORY= option
    - CUSUM procedure, 1645
    - MACONTROL procedure, 1645
    - SHEWHART procedure, 1645
  - OUTINDEX= option
    - CUSUM procedure, 1645
    - MACONTROL procedure, 1645
    - SHEWHART procedure, 1645
  - OUTLABEL= option
    - CUSUM procedure, 1645
    - MACONTROL procedure, 1645
    - SHEWHART procedure, 1645
  - OUTLABEL2= option
    - SHEWHART procedure, 1646
  - OUTLIMITS= option
    - CUSUM procedure, 1646
    - MACONTROL procedure, 1646
    - SHEWHART procedure, 1646
  - OUTPHASE= option
    - CUSUM procedure, 1646
    - MACONTROL procedure, 1646
    - SHEWHART procedure, 1646
  - OUTPUT statement, CAPABILITY procedure
    - See CAPABILITY procedure, OUTPUT statement
    - getting started, 234
    - keywords summarized by function, 240–241
    - overview, 233
    - syntax, 237
  - OUTPUT statement, FACTEX procedure
    - See FACTEX procedure, OUTPUT statement
    - options summarized by function, 443
    - syntax, 452

OUTPUT statement, OPTEX procedure  
 See OPTEX procedure, OUTPUT statement  
 syntax, 742

OUTTABLE= option  
 CUSUM procedure, 1647  
 MACONTROL procedure, 1647  
 SHEWHART procedure, 1647

## P

P0= option  
 SHEWHART procedure, 1647

PAGENUM= option  
 CUSUM procedure, 1647  
 MACONTROL procedure, 1647  
 SHEWHART procedure, 1647

PAGENUMPOS= option  
 CUSUM procedure, 1647  
 MACONTROL procedure, 1647  
 SHEWHART procedure, 1647

PARETO procedure  
 examples, advanced, 895  
 examples, introductory, 800, 836  
 options summarized by function, 794  
 overview, 789  
 syntax, 794

PARETO procedure, BY statement, 895–896

PARETO procedure, HBAR statement

ANCHOR= option, 848  
 ANGLE= option, 848  
 ANNOKEY option, 848  
 ANNOTATE= data set, 848  
 ANNOTATE2= data set, 848  
 AXISFACTOR= option, 849  
 BARLABEL= option, 849  
 BARLABPOS= option, 849  
 BARLEGEND= option, 849  
 BARLEGLABEL= option, 850  
 BARWIDTH= option, 850  
 CATLEGLABEL= option, 850  
 CAXIS= option, 850  
 CAXIS2= option, 851  
 CBARLINE= option, 851  
 CBARS= option, 851  
 CCONNECT= option, 851  
 CFRAME= option, 851  
 CFRAMENLEG= option, 839, 851  
 CFRAMESIDE= option, 852  
 CFRAMETOP= option, 852  
 CGRID= option, 852  
 CGRID2= option, 852  
 CHIGH(*n*)= option, 852  
 CHREF= option, 852  
 CLASS= option, 852  
 CLASSKEY= option, 853  
 CLOW(*n*)= option, 853  
 CMPCTLABEL option, 849, 853  
 COTHER= option, 854  
 CPROP= option, 854  
 CTEXT= option, 854

CTEXTSIDE= option, 854  
 CTEXTTOP= option, 854  
 CTILES= option, 854  
 CVREF= option, 855  
 DESCRIPTION= option, 855  
 FONT= option, 855  
 FREQ= option, 839, 855  
 GRID option, 855  
 GRID2 option, 855  
 HAXIS= option, 855  
 HAXIS2= option, 855  
 HAXIS2LABEL= option, 855  
 HAXISLABEL= option, 855  
 HEIGHT= option, 856  
 HLEGLABEL= option, 856  
 HOFFSET= option, 856  
 HREF= option, 856  
 HREF2= option, 856  
 HREF2LABELS= option, 856  
 HREFLABELS= option, 856  
 HREFLABPOS= option, 856  
 INFONT= option, 856  
 INHEIGHT= option, 857  
 INTERBAR= option, 839, 857  
 INTERTILE= option, 857  
 LABOTHER= option, 857  
 LAST= option, 839, 857  
 LGRID= option, 857  
 LGRID2= option, 857  
 LHREF= option, 857  
 LOTHER= option, 857  
 LVREF= option, 857  
 MAXCMPCT= option, 858  
 MAXNCAT= option, 840–841, 858  
 MINPCT= option, 859  
 MISSING option, 859  
 MISSING1 option, 859  
 MISSING2 option, 859  
 NAME= option, 859  
 NCOLS= option, 860  
 NLEGEND option, 860  
 NLEGEND= option, 839, 860  
 NOCHART option, 860  
 NOCURVE option, 860  
 NOFRAME option, 860  
 NOHLABEL option, 860  
 NOHLABEL2 option, 861  
 NOHTICK option, 861  
 NOHTICK2 option, 861  
 NOKEYMOVE option, 861  
 NOVLABEL option, 861  
 NROWS= option, 861  
 options summarized by function, 842–847  
 ORDER1= option, 861  
 ORDER2= option, 862  
 OTHER= option, 840–841, 858–859, 862  
 OTHERCVAL= option, 862  
 OTHERNVAL= option, 862  
 OUT= option, 863



- PBARS= option, 863
- PHIGH(*n*)= option, 863
- PLOW(*n*)= option, 863
- POTHER= option, 864
- SCALE= option, 839, 864
- syntax, 842
- TILELEGEND= option, 864
- TILELEGLABEL= option, 864
- VOFFSET= option, 864
- VREF= option, 864
- VREFLABELS= option, 865
- VREFLABPOS= option, 865
- WAXIS= option, 865
- WBARLINE= option, 865
- WEIGHT= option, 865
- WGRID= option, 865
- WGRID2= option, 865
- PARETO procedure, INSET statement
  - CFILL= option, 878
  - CFILLH= option, 878
  - CFRAME= option, 878
  - CHEADER= option, 878
  - CSHADOW= option, 878
  - CTEXT= option, 878
  - DATA option, 878
  - FONT= option, 878
  - FORMAT= option, 878
  - HEADER= option, 879
  - HEIGHT= option, 879
  - NOFRAME option, 879
  - POSITION= option, 879–881
  - REFPOINT= option, 879
- PARETO procedure, PROC PARETO statement
  - ANNOTATE= data set, 795
  - ANNOTATE2= data set, 795
  - DATA= data set, 795
  - FORMCHAR= option, 795
  - GOUT= option, 795
  - LINEPRINTER option, 795
- PARETO procedure, VBAR statement
  - ANCHOR= option, 813, 890, 900–901
  - ANGLE= option, 813
  - ANNOKEY option, 813
  - ANNOTATE= data set, 813
  - ANNOTATE2= data set, 814
  - AXISFACTOR= option, 814, 891
  - BARLABEL= option, 814
  - BARLABPOS= option, 814
  - BARLEGEND= option, 815, 907–908
  - BARLEGLABEL= option, 815
  - BARWIDTH= option, 815
  - CATLEGLABEL= option, 815, 901–902
  - CAXIS= option, 816
  - CAXIS2= option, 816
  - CBARLINE= option, 816
  - CBARS= option, 816, 900–901, 907–908
  - CCONNECT= option, 816
  - CFRAME= option, 817
  - CFRAMENLEG= option, 803–804, 817, 898
  - CFRAMESIDE= option, 817
  - CFRAMETOP= option, 817
  - CGRID= option, 817
  - CGRID2= option, 817
  - CHIGH(*n*)= option, 817, 905–906
  - CHREF= option, 817
  - CLASS= option, 817, 893, 897, 901–904
  - CLASSKEY= option, 818, 897
  - CLOW(*n*)= option, 819, 905
  - CMPCTLABEL option, 814, 819
  - CONNECTCHAR= option, 819
  - COTHER= option, 819
  - CPROP= option, 819, 898
  - CTEXT= option, 819
  - CTEXTSIDE= option, 819
  - CTEXTTOP= option, 819
  - CTILES= option, 820, 908–909
  - CVREF= option, 820
  - DESCRIPTION= option, 820
  - FONT= option, 820
  - FREQ= option, 803–804, 820
  - GRID option, 820
  - GRID2 option, 820
  - HEIGHT= option, 821
  - HLLEGLABEL= option, 821
  - HOFFSET= option, 821
  - HREF= option, 821
  - HREFCHAR= option, 821
  - HREFLABELS= option, 821
  - HREFLABPOS= option, 821
  - INFONT= option, 821
  - INHEIGHT= option, 821
  - INTERBAR= option, 803–804, 822
  - INTERTILE= option, 822, 898
  - LABOTHER= option, 822
  - LAST= option, 803–804, 822
  - LGRID= option, 822
  - LGRID2= option, 822
  - LHREF= option, 822
  - LOTHER= option, 822
  - LVREF= option, 822, 903
  - MAXCMPCT= option, 822
  - MAXNCAT= option, 805–806, 823
  - MINPCT= option, 823
  - MISSING option, 824, 893
  - MISSING1 option, 824, 893
  - MISSING2 option, 824, 893
  - NAME= option, 824
  - NCOLS= option, 825, 889, 903–904
  - NLEGEND option, 825, 900–901
  - NLEGEND= option, 803–804, 825, 898
  - NOCHART option, 825
  - NOCURVE option, 825, 892, 901–902
  - NOFRAME option, 825
  - NOHLABEL option, 826, 901–902
  - NOKEYMOVE option, 826
  - NOVLABEL option, 826
  - NOVLABEL2 option, 826
  - NOVTICK option, 826

- NOVTICK2 option, 826
- NROWS= option, 826, 889, 902–904
- options summarized by function, 807–812
- ORDER1= option, 826, 893
- ORDER2= option, 827, 893
- OTHER= option, 805–806, 823–824, 827
- OTHERCVAL= option, 827, 892
- OTHERNVAL= option, 828, 892
- OUT= data set, 891–892
- OUT= option, 828
- PBARS= option, 828, 900–901, 907–908
- PHIGH(*n*)= option, 828, 905–906
- PLOW(*n*)= option, 829, 905
- POTHER= option, 829
- SCALE= option, 803–804, 829, 892, 898
- SYMBOLCHAR= option, 829
- syntax, 807
- TILELEGEND= option, 829, 908–909
- TILELEGLABEL= option, 829
- TURNVLABEL option, 830
- VAXIS= option, 830
- VAXIS2= option, 830
- VAXIS2LABEL= option, 830
- VAXISLABEL= option, 830
- VOFFSET= option, 830
- VREF= option, 830, 903
- VREF2= option, 830
- VREF2LABELS= option, 830
- VREFCHAR= option, 830
- VREFLABELS= option, 830
- VREFLABPOS= option, 831
- WAXIS= option, 831
- WBARLINE= option, 831
- WEIGHT= option, 831, 914–915
- WGRID= option, 831
- WGRID2= option, 831
- PATTERN statement, 168
- PBARS= option
  - PARETO procedure, 828, 863
- PCHART statement, SHEWHART procedure
  - See also SHEWHART procedure, PCHART statement
  - examples, advanced, 1334
  - examples, introductory, 1304
  - options summarized by function, 1316–1321, 1323
  - overview, 1303
  - syntax, 1314
- PCTLDEF= option
  - SHEWHART procedure, 1648
- \_PHASE\_ variables
  - SHEWHART procedure, 1689
- PHASEBREAK option
  - CUSUM procedure, 1648
  - MACONTROL procedure, 1648
  - SHEWHART procedure, 1648, 1742–1743, 1774
- PHASELABTYPE= option
  - CUSUM procedure, 1648
  - MACONTROL procedure, 1648
- SHEWHART procedure, 1648
- PHASELEGEND option
  - CUSUM procedure, 1648
  - MACONTROL procedure, 1648
  - SHEWHART procedure, 1648, 1690, 1694–1699
- PHASELIMITS option
  - CUSUM procedure, 1648
  - MACONTROL procedure, 1648
  - SHEWHART procedure, 1648
- PHASEMEANSYMBOL= option
  - SHEWHART procedure, 1099, 1648
- PHASEREF option
  - CUSUM procedure, 1648
  - MACONTROL procedure, 1648
  - SHEWHART procedure, 1648, 1690, 1694–1699
- phases of subgroups
  - SHEWHART procedure, 1625
- PHIGH(*n*)= option
  - PARETO procedure, 828, 863
- PLOW(*n*)= option
  - PARETO procedure, 829, 863
- POTHER= option
  - PARETO procedure, 829, 864
- PPLOT statement
  - See CAPABILITY procedure, PPLOT statement
  - getting started, 252
  - options dictionary, 257
  - options summarized by function, 255–257
  - overview, 251
  - syntax, 254
- PROBACC2 function, 1853–1854, 1863
- PROBBNML function, 1854–1855, 1861, 1863
- PROBHYPF function, 1856–1858, 1861
- PROBMED function, 1858–1859
- PROBPLOT statement
  - See CAPABILITY procedure, PROBPLOT statement
  - getting started, 276
  - options summarized by function, 282–285
  - overview, 275
  - syntax, 281
- PROC CAPABILITY statement
  - See CAPABILITY procedure, PROC CAPABILITY statement
  - examples, 56
  - getting started, 9
  - options summarized by function, 16
  - overview, 7
  - syntax, 16
- PROC FACTEX statement
  - See FACTEX procedure, PROC FACTEX statement
  - options summarized by function, 442
  - syntax, 446
- PROC OPTEX statement
  - See OPTEX procedure, PROC OPTEX statement
  - syntax, 734
- PROC SHEWHART statement
  - options summarized by function, 1042

- processes*, CUSUM procedure
    - XCHART statement, 375
  - processes*, MACONTROL procedure
    - EWMACHART statement, 620
    - MACHART statement, 674
  - processes*, SHEWHART procedure
    - BOXCHART statement, 1062
    - CCHART statement, 1115
    - IRCHART statement, 1153
    - MCHART statement, 1195
    - MRCHART statement, 1231
    - NPCHART statement, 1273
    - PCHART statement, 1314
    - RCHART statement, 1358
    - SCHART statement, 1393
    - UCHAR statement, 1430
    - XCHART statement, 1469
    - XRCHART statement, 1514
    - XSCHART statement, 1562
  - PSYMBOL= option
    - SHEWHART procedure, 1648
- Q**
- QQPLOT statement
    - See CAPABILITY procedure, QQPLOT statement getting started, 308
    - options summarized by function, 312–313, 315
    - overview, 307
    - syntax, 311
- R**
- RANGES option
    - SHEWHART procedure, 1649
  - RCHART statement
    - See also SHEWHART procedure, RCHART statement
    - examples, advanced, 1377
    - examples, introductory, 1348
    - options summarized by function, 1359–1363, 1365–1366
    - overview, 1347
    - syntax, 1358
  - READALPHA option
    - MACONTROL procedure, 631, 685
    - SHEWHART procedure, 1649
  - READINDEX= option
    - CUSUM procedure, 388
    - MACONTROL procedure, 631, 686
    - SHEWHART procedure, 1649, 1692–1700, 1742–1744
  - READLIMITS option
    - CUSUM procedure, 388
    - MACONTROL procedure, 632, 686
    - SHEWHART procedure, 1650
  - READPHASES= option
    - CUSUM procedure, 1650
    - MACONTROL procedure, 1650
    - SHEWHART procedure, 1650, 1689–1700, 1741–1744
  - READSIGMAS option
    - CUSUM procedure, 388
  - RELIABILITY procedure
    - details, 992
    - examples, 925
    - overview, 923
    - syntax, 955
  - RELIABILITY procedure, ANALYZE statement, 952, 957–958, 960
    - CONVERGE= option, 1006
    - PPOS= option, 996–998
    - PREDICT option, 952
    - summary of options, 958, 960
    - TOLERANCE option, 952
  - RELIABILITY procedure, BY statement, 955–956
  - RELIABILITY procedure, CLASS statement, 955–956, 961
  - RELIABILITY procedure, DISTRIBUTION statement, 925–926, 932–933, 936–937, 944, 952, 955–956, 961
  - RELIABILITY procedure, FMODE statement, 955–956, 962
  - RELIABILITY procedure, FREQ statement, 932–933, 936–937, 955–956, 962
  - RELIABILITY procedure, INSET statement, 955–956, 962–965
    - keywords, 963–964
    - summary of options, 965
  - RELIABILITY procedure, MAKE statement, 944, 955–956, 966
    - NOPRINT option, 966
    - table keywords, 966
  - RELIABILITY procedure, MCFPLOT statement, 947, 949–950, 955, 966–968, 970, 972
    - MCFDIFF option, 950
    - summary of options, 967–968, 970, 972
  - RELIABILITY procedure, MODEL statement, 932–933, 944, 955, 972–975
    - CONVERGE= option, 1006
    - CORRB option, 944
    - COVB option, 944
    - NOINT option, 1007
    - OBSTATS option, 932–933, 944, 975
    - RELATION= option, 932–933
    - summary of options, 974–975
  - RELIABILITY procedure, NENTER statement, 936–937, 955–956, 976
  - RELIABILITY procedure, ODS
    - table keywords, 1025
  - RELIABILITY procedure, ODS table names, 1025
  - RELIABILITY procedure, PLOT statement
    - see RELIABILITY procedure, PROBLOT statement
  - RELIABILITY procedure, PROBLOT statement, 925–926, 929, 936–937, 955, 976, 978–979, 981–983
    - CONVERGE= option, 1006
    - COVB option, 925–926
    - NOCONF option, 929, 936–937

- OVERLAY option, 929
  - PCONFPLT option, 936–937
  - PPOS= option, 996–998
  - READOUT option, 936–937
  - summary of options, 978–979, 981–983
  - RELIABILITY procedure, RELATIONPLOT statement, 932–933, 955, 984–986, 988–991
    - CONVERGE= option, 1006
    - FIT= option, 932–933
    - LUPPER= option, 932–933
    - NOCONF option, 932–933
    - PLOTDATA option, 932–933
    - PLOTFIT option, 932–933
    - PPLOT option, 932–933
    - PPOS= option, 996–998
    - RELATION= option, 932–933
    - SLOWER= option, 932–933
    - summary of options, 985–986, 988–991
  - RELIABILITY procedure, RPLOT statement
    - see RELIABILITY procedure, RELATIONPLOT statement
  - RELIABILITY procedure, UNITID statement, 947, 950, 955–956, 991
  - REPEAT option
    - CUSUM procedure, 1653
    - MACONTROL procedure, 1653
    - SHEWHART procedure, 1653
  - RESET option
    - MACONTROL procedure, 632
    - \_RMSE\_ variable, ADXTRANS macro, 1882
  - RSYMBOL= option
    - SHEWHART procedure, 1653
  - RTMARGIN= option
    - SHEWHART procedure, 1653
  - RTMPLOT= option
    - SHEWHART procedure, 1653, 1779
- S**
- SCALE= option
    - PARETO procedure, 829, 864
  - SCHART statement
    - See also SHEWHART procedure, SCHART statement
    - examples, advanced, 1414
    - examples, introductory, 1384
    - options summarized by function, 1394–1399, 1401–1402
    - overview, 1383
    - syntax, 1393
  - SCHEME= option
    - CUSUM procedure, 389
  - SEPARATE option
    - SHEWHART procedure, 1654
  - SERIFS option
    - SHEWHART procedure, 1654
  - SHEWHART procedure
    - and PROC ARIMA, 1757–1762
    - and PROC CAPABILITY, 1780–1781
    - and PROC MACONTROL, 1760
    - and PROC MIXED, 1767–1768
    - and PROC PRINCOMP, 1784
  - SHEWHART procedure, all chart statements
    - ALLLABEL= option, 1614
    - ALPHA= option, 1614
    - ANNOTATE= option, 1615
    - BILEVEL option, 1615
    - BLOCKLABELPOS= option, 1616
    - BLOCKLABTYPE= option, 1616
    - BLOCKPOS= option, 1617
    - BLOCKREP option, 1617
    - CAXIS= option, 1621
    - CBLOCKLAB= option, 1621
    - CBLOCKVAR= option, 1621
    - CCONNECT= option, 1622
    - CFRAME= option, 1622
    - CFRAMELAB= option, 1623
    - CHREF= option, 1623
    - CINFILL= option, 1623
    - CLIMITS= option, 1623
    - CONNECTCHAR= option, 1624
    - COUT= option, 1625
    - COUTFILL= option, 1625
    - CPHASELEG= option, 1625
    - CTESTS= option, 1627
    - CTEXT= option, 1627
    - CVREF= option, 1628
    - CZONES= option, 1628
    - DESCRIPTION= option, 1628
    - ENDGRID option, 1628
    - EXCHART option, 1628
    - FONT= option, 1628
    - GRID option, 1629
    - HAXIS= option, 1629
    - HEIGHT= option, 1629
    - HMINOR= option, 1629
    - HOFFSET= option, 1629
    - HREF= option, 1630
    - HREF2DATA= option, 1630
    - HREFCHAR= option, 1631
    - HREFDATA= option, 1631
    - HREFLABELS= option, 1631
    - HREFLABPOS= option, 1631
    - HTML= option, 1632
    - HTML\_LEGEND= option, 1632
    - INTERVAL= option, 1633
    - INTSTART= option, 1634
    - LABELFONT= option, 1634
    - LABELHEIGHT= option, 1634
    - LCLLABEL= option, 1634
    - LENDGRID= option, 1635
    - LGRID= option, 1635
    - LHREF= option, 1635
    - LIMITN= option, 1635
    - LLIMITS= option, 1636
    - LTESTS= option, 1638
    - LVREF= option, 1638
    - LZONES= option, 1638
    - MAXPANELS= option, 1638

- NAME= option, 1639
- NDECIMAL= option, 1639
- NO3SIGMACHECK option, 1640
- NOBYREF option, 1640
- NOCHART option, 1640
- NOCONNECT option, 1641
- NOCTL option, 1641
- NOFRAME option, 1641
- NOHLABEL option, 1641
- NOLCL option, 1641
- NOLEGEND option, 1641
- NOLIMITLABEL option, 1642
- NOLIMITS option, 1642
- NOLIMITSFRAME option, 1642
- NOLIMITSLEGEND option, 1642
- NOPHASEFRAME option, 1642
- NOREADLIMITS option, 1642
- NOUCL option, 1644
- NOVANGLE option, 1644
- NPANELPOS= option, 1644
- OUTHISTORY= option, 1645
- OUTINDEX= option, 1645
- OUTLABEL= option, 1645
- OUTLIMITS= option, 1646
- OUTPHASE= option, 1646
- OUTTABLE= option, 1647
- PAGENUM= option, 1647
- PAGENUMPOS= option, 1647
- PHASEBREAK option, 1648
- PHASELABTYPE= option, 1648
- PHASELEGEND option, 1648
- PHASELIMITS option, 1648
- PHASEREF option, 1648
- READALPHA option, 1649
- READINDEX= option, 1649
- READLIMITS option, 1650
- READPHASES= option, 1650
- REPEAT option, 1653
- SIGMAS= option, 1654
- SKIPHLABELS= option, 1655
- SYMBOLCHARS= option, 1662
- SYMBOLLEGEND= option, 1662
- SYMBOLORDER= option, 1662
- TABLE option, 1663
- TABLEALL option, 1663
- TABLECENTRAL option, 1663
- TABLEID option, 1663
- TABLELEGEND option, 1663
- TABLEOUTLIM option, 1664
- TABLETESTS option, 1664
- TEST2RUN= option, 1664
- TEST3RUN= option, 1664
- TESTACROSS option, 1665
- TESTCHAR= option, 1665
- TESTFONT= option, 1665
- TESTHEIGHT= option, 1665
- TESTLABEL $n$ = option, 1666
- TESTLABEL= option, 1665
- TESTNMETHOD= option, 1666
- TESTOVERLAP option, 1666
- TESTS= option, 1667
- TOTPANELS= option, 1669
- TURNALL option, 1670
- TURNHLABELS option, 1670
- TYPE= option, 1670
- UCLLABEL= option, 1671
- VAXIS= option, 1672
- VMINOR= option, 1672
- VOFFSET= option, 1672
- VREF= option, 1672
- VREFCHAR= option, 1674
- VREFLABELS= option, 1674
- VREFLABPOS= option, 1674
- WAXIS= option, 1675
- WEBOUT= option, 1675
- WGRID= option, 1675
- WLIMITS= option, 1675
- ZEROSTD= option, 1676
- ZONECHAR= option, 1677
- ZONEVALPOS= option, 1677
- SHEWHART procedure, BOXCHART statement, 1102
- See also SHEWHART procedure, all chart statements
- ALPHA= option, 1074
- BOXSTYLE= option, 1089–1092
- BOXWIDTHSCALE= option, 1093–1094
- CONTROLSTAT= option, 1052, 1073–1074
- DATA= data set, 1079–1080
- HISTORY= data set, 1053–1056, 1080–1082
- LBOXES= option, 1095–1096
- LIMITN= option, 1074
- LIMITS= data set, 1061, 1080
- LSL= option, 1076
- MEDCENTRAL= option, 1074
- missing values, 1085
- MU0= option, 1074
- NOCHART option, 1056
- NOHLABEL option, 1589–1591
- NOLEGEND option, 1589–1591, 1764
- NOLIMITS option, 1764
- NOTCHES option, 1092–1093
- OUTHISTORY= data set, 1056–1058, 1076–1077
- OUTLIMITS= data set, 1058–1059, 1075–1076
- OUTTABLE= data set, 1059–1060, 1077–1078
- RANGES option, 1649
- SERIFS option, 1089
- SIGMA0= option, 1074
- SIGMAS= option, 1074
- SMETHOD= option, 1083
- STDDEVIATIONS option, 1057, 1764
- TABLE= data set, 1060, 1082–1083
- TARGET= option, 1076
- TESTS= option, 1731
- USL= option, 1076
- SHEWHART procedure, CCHART statement
- See also SHEWHART procedure, all chart statements

- ALPHA= option, 1127
- CSYMBOL= option, 1136–1137
- DATA= data set, 1130
- HISTORY= data set, 1111–1113, 1131–1132
- LIMITN= option, 1127
- LIMITS= data set, 1110–1111, 1130–1131
- LTESTS= option, 1134–1136
- missing values, 1133
- NOCHART option, 1108
- NOLEGEND option, 1136–1137
- OUTHISTORY= data set, 1113–1114, 1128–1129
- OUTLIMITS= data set, 1108, 1127–1128
- OUTTABLE= data set, 1109, 1129
- SIGMAS= option, 1127
- SUBGROUPN= option, 1113–1114
- TABLE= data set, 1109, 1132–1133
- TABLELEGEND option, 1134–1136
- TABLETESTS option, 1134–1136
- TESTS= option, 1134–1136, 1731
- U0= option, 1127, 1136–1137
- ZONELABELS option, 1134–1136
- SHEWHART procedure, INSET statement
  - CFILL= option, 1605
  - CFILLH= option, 1605
  - CFRAME= option, 1605
  - CHEADER= option, 1605
  - CSHADOW= option, 1605
  - CTEXT= option, 1606
  - DATA option, 1606
  - FONT= option, 1606
  - FORMAT= option, 1606
  - HEADER= option, 1606
  - HEIGHT= option, 1606
  - NOFRAME option, 1606
  - POSITION= option, 1606–1608
  - REFPOINT= option, 1606
- SHEWHART procedure, IRCHART statement
  - See also SHEWHART procedure, all chart statements
  - ALPHA= option, 1165
  - DATA= data set, 1169
  - HISTORY= data set, 1147–1148, 1170–1171
  - LIMITN= option, 1151–1152, 1165
  - LIMITS= data set, 1150–1151, 1169–1170
  - LSL= option, 1167
  - LTESTS= option, 1175–1177
  - LTMARGIN= option, 1180
  - LTMPLOT= option, 1180
  - missing values, 1174
  - MU0= option, 1165, 1177, 1778
  - NOCHART option, 1146
  - OUTHISTORY= data set, 1146, 1167
  - OUTLIMITS= data set, 1148, 1166–1167
  - OUTTABLE= data set, 1149, 1168
  - PHASEBREAK option, 1774
  - RTMPLOT= option, 1179–1180, 1779
  - SIGMA0= option, 1165, 1177, 1778
  - SIGMAS= option, 1165
  - TABLE= data set, 1150, 1171–1172
  - TABLETESTS option, 1175–1176
  - TARGET= option, 1167
  - TEST2RUN= option, 1175–1177
  - TESTS= option, 1175–1177, 1731
  - USL= option, 1167
  - XSYPBOL= option, 1177
  - ZONELABELS option, 1175–1177
- SHEWHART procedure, MCHART statement
  - See also SHEWHART procedure, all chart statements
  - ALPHA= option, 1207
  - DATA= data set, 1211–1212
  - HISTORY= data set, 1186–1189, 1213–1214
  - LIMITN= option, 1207
  - LIMITS= data set, 1193–1194, 1212
  - LSL= option, 1209
  - MEDCENTRAL= option, 1207
  - missing values, 1215
  - MU0= option, 1207
  - NOCHART option, 1189–1190
  - OUTHISTORY= data set, 1189–1191, 1209–1210
  - OUTLIMITS= data set, 1191–1192, 1208–1209
  - OUTTABLE= data set, 1192–1193, 1210–1211
  - SIGMA0= option, 1207
  - SIGMAS= option, 1207
  - STDDEVIATIONS option, 1190–1191
  - TABLE= data set, 1192–1193, 1214–1215
  - TARGET= option, 1209
  - TESTS= option, 1731
  - USL= option, 1209
- SHEWHART procedure, MRCHART statement
  - See also SHEWHART procedure, all chart statements
  - ALLN option, 1255–1256
  - ALPHA= option, 1244
  - DATA= data set, 1248
  - HISTORY= data set, 1222–1225, 1249–1250
  - LIMITN= option, 1244, 1254–1256
  - LIMITS= data set, 1229–1230, 1248–1249
  - MEDCENTRAL= option, 1243
  - missing values, 1252
  - MU0= option, 1244
  - NMARKERS option, 1255–1256
  - NOCHART option, 1225–1226
  - OUTHISTORY= data set, 1225–1226, 1245–1246
  - OUTLIMITS= data set, 1226–1227, 1244–1245
  - OUTTABLE= data set, 1227–1228, 1246–1247
  - SIGMA0= option, 1244
  - SIGMAS= option, 1244
  - SMETHOD= option, 1251–1252, 1256–1257
  - TABLE= data set, 1228, 1250–1251
  - TESTS= option, 1731
  - TESTS2= option, 1746
- SHEWHART procedure, NPCHART statement
  - See also SHEWHART procedure, all chart statements
  - ALLN option, 1297
  - ALPHA= option, 1285
  - DATA= data set, 1288

- DATAUNIT= option, 1266–1267  
 HISTORY= data set, 1267–1268, 1289–1290  
 LIMITN= option, 1285, 1297  
 LIMITS= data set, 1271, 1289, 1294–1295, 1298–1300  
 LTESTS= option, 1292–1293  
 missing values, 1291  
 NEEDLES option, 1294–1295  
 NOLEGEND option, 1294–1295  
 NPSYMBOL= option, 1294–1295  
 OUTHISTORY= data set, 1268, 1286  
 OUTLIMITS= data set, 1269, 1285–1286, 1295–1297  
 OUTTABLE= data set, 1270, 1286–1287  
 P0= option, 1285, 1294–1295  
 SIGMAS= option, 1285  
 SUBGROUPN= option, 1265, 1295–1297  
 TABLE= data set, 1270–1271, 1290–1291  
 TABLELEGEND option, 1292–1293  
 TABLETESTS option, 1292–1293  
 TESTS= option, 1292–1293, 1731  
 ZONELABELS option, 1292–1293  
 SHEWHART procedure, PCHART statement  
 See also SHEWHART procedure, all chart statements  
 ALLN option, 1339  
 ALPHA= option, 1326  
 DATA= data set, 1329  
 DATAUNIT= option, 1307  
 HISTORY= data set, 1307–1308, 1330–1331  
 LIMITN= option, 1326, 1339  
 LIMITS= data set, 1312, 1330, 1336–1337  
 LTESTS= option, 1334–1335  
 missing values, 1333  
 NEEDLES option, 1336–1337  
 NOLEGEND option, 1336–1337  
 OUTHISTORY= data set, 1309, 1327  
 OUTLIMITS= data set, 1309–1310, 1326–1327, 1337–1339  
 OUTTABLE= data set, 1310–1311, 1328  
 P0= option, 1326, 1336–1337  
 PSYMBOL= option, 1336–1337  
 READINDEX= option, 1341–1342  
 SIGMAS= option, 1326  
 SUBGROUPN= option, 1305, 1337–1339  
 TABLE= data set, 1311, 1331–1332  
 TABLELEGEND option, 1334–1335  
 TABLETESTS option, 1334–1335  
 TESTS= option, 1334–1335, 1731  
 VREF= option, 1341–1342  
 VREFLABELS= option, 1341–1342  
 VREFLABPOS= option, 1341–1342  
 YSCALE= option, 1339  
 ZONELABELS option, 1334–1335  
 SHEWHART procedure, PROC SHEWHART statement  
 CIINDICES= option, 1623  
 TESTURLS= option, 1669  
 SHEWHART procedure, RCHART statement  
 See also SHEWHART procedure, all chart statements  
 ALPHA= option, 1369, 1377–1378  
 DATA= data set, 1372  
 HISTORY= data set, 1350–1353, 1374  
 LIMITN= option, 1369  
 LIMITS= data set, 1356–1357, 1373, 1378–1380  
 LSL= option, 1370  
 missing values, 1376  
 NOCHART option, 1353–1354  
 NOLIMIT0 option, 1380  
 OUTHISTORY= data set, 1353–1354, 1370–1371  
 OUTLIMITS= data set, 1354–1355, 1369–1370, 1377–1378  
 OUTTABLE= data set, 1355–1356, 1371–1372  
 READALPHA option, 1378  
 SIGMA0= option, 1369, 1380  
 SIGMAS= option, 1369  
 SMETHOD= option, 1375–1376  
 TABLE= data set, 1356, 1374–1375  
 TARGET= option, 1370  
 TESTS2= option, 1746  
 USL= option, 1370  
 SHEWHART procedure, SCHART statement  
 See also SHEWHART procedure, all chart statements  
 ALPHA= option, 1404  
 DATA= data set, 1408  
 HISTORY= data set, 1386–1388, 1409–1410  
 LIMITN= option, 1404  
 LIMITS= data set, 1391–1392, 1409  
 LSL= option, 1405  
 missing values, 1413  
 OUTHISTORY= data set, 1388–1389, 1406  
 OUTLIMITS= data set, 1389–1390, 1404, 1406  
 OUTTABLE= data set, 1390–1391, 1406–1407  
 SIGMA0= option, 1404, 1414–1415  
 SIGMAS= option, 1404  
 SMETHOD= option, 1412–1413  
 SSYMBOL= option, 1414–1415  
 TABLE= data set, 1391, 1410–1411  
 TARGET= option, 1405  
 TESTS2= option, 1746  
 USL= option, 1405  
 SHEWHART procedure, UCHART statement  
 See also SHEWHART procedure, all chart statements  
 ALPHA= option, 1442  
 DATA= data set, 1445  
 HISTORY= data set, 1425–1427, 1446–1447  
 LIMITN= option, 1442  
 LIMITS= data set, 1424–1425, 1446  
 LTESTS= option, 1449–1450  
 missing values, 1448  
 NOCHART option, 1422–1423  
 OUTHISTORY= data set, 1428–1429, 1443  
 OUTLIMITS= data set, 1422, 1442–1443, 1452–1454  
 OUTTABLE= data set, 1423–1424, 1444

- SIGMAS= option, 1442  
 SUBGROUPN= option, 1420–1421, 1429, 1453–1454  
 TABLE= data set, 1424, 1447–1448  
 TABLETESTS option, 1449–1450  
 TESTS= option, 1449–1450, 1731  
 U0= option, 1442, 1451–1452  
 USYMBOL= option, 1451–1452  
 ZONELABELS option, 1449–1450  
 SHEWHART procedure, XCHART statement  
 See also SHEWHART procedure, all chart statements  
 ALPHA= option, 1481  
 BLOCKLABELPOS= option, 1688–1689, 1775–1776  
 BLOCKLABTYPE= option, 1775–1776  
 BLOCKPOS= option, 1686–1689  
 CBLOCKVAR= option, 1687–1689  
 CFRAME= option, 1690  
 CNEEDLES= option, 1714  
 CPHASELEG= option, 1690  
 DATA= data set, 1485  
 HISTORY= data set, 1460–1463, 1486–1487  
 LABELFONT= option, 1709–1710  
 LIMITN= option, 1481  
 LIMITS= data set, 1467–1468, 1486  
 LSL= option, 1482  
 LSTARCIRCLES= option, 1703–1704, 1709–1710  
 LTESTS= option, 1492–1493  
 LTMARGIN= option, 1688–1689  
 missing values, 1491  
 MU0= option, 1481  
 NOCHART option, 1463–1464  
 NOLEGEND option, 1492–1493, 1686–1690  
 OUTHISTORY= data set, 1463–1465, 1483  
 OUTINDEX= option, 1496  
 OUTLIMITS= data set, 1465, 1481–1483  
 OUTTABLE= data set, 1466, 1484  
 PHASELEGEND option, 1690, 1694–1699  
 PHASEREF option, 1690, 1694–1699  
 READINDEXES= option, 1692–1700  
 READPHASES= option, 1689–1700  
 SIGMA0= option, 1481  
 SIGMAS= option, 1481  
 SMETHOD= option, 1488–1490, 1495–1496  
 STARBDRADIUS= option, 1710  
 STARCIRCLES= option, 1703–1704  
 STARINRADIUS= option, 1704  
 STARLABEL= option, 1709–1710  
 STARLEGEND= option, 1709–1710  
 STAROUTRADIUS= option, 1704  
 STARSPECS= option, 1708–1710  
 STARSTART= option, 1703–1707, 1709–1710  
 STARTYPE= option, 1705–1707  
 STARVERTICES= option, 1702–1707, 1709–1710  
 STDDEVIATIONS option, 1495–1496  
 SYMBOLCHARS= option, 1684  
 SYMBOLLEGEND= option, 1683–1684  
 TABLE= data set, 1466, 1488  
 TABLECENTRAL option, 1492–1493  
 TABLELEGEND option, 1492–1493  
 TABLETESTS option, 1492–1493  
 TARGET= option, 1482  
 TESTS= option, 1492–1493, 1731  
 TRENDVAR= option, 1714, 1775  
 USL= option, 1482  
 WSTARCIRCLES= option, 1704  
 ZONELABELS option, 1492–1493  
 SHEWHART procedure, XRCHART statement  
 See also SHEWHART procedure, all chart statements  
 ALLN option, 1546, 1735  
 ALPHA= option, 1526  
 CLIPFACTOR= option, 1716–1718  
 CLIPLEGEND= option, 1718  
 CLIPLEGPOS= option, 1718  
 CLIPSUBCHAR= option, 1718  
 CLIPSYMBOL= option, 1718  
 CTESTS= option, 1745  
 CZONES= option, 1745  
 DATA= data set, 1530  
 HISTORY= data set, 1505–1506, 1531–1532  
 LIMITN= option, 1526, 1546, 1735  
 LIMITS= data set, 1512–1513, 1531, 1544  
 LSL= option, 1527  
 LTESTS= option, 1541, 1745  
 missing values, 1539  
 MU0= option, 1526, 1543–1544, 1735  
 NMARKERS option, 1546  
 NOCHART option, 1507–1508  
 OUTHISTORY= data set, 1507–1508, 1528  
 OUTLIMITS= data set, 1508–1510, 1527–1528  
 OUTTABLE= data set, 1510–1511, 1529  
 PHASEBREAK option, 1742–1743  
 READINDEXES= option, 1742  
 READPHASES= option, 1741–1742  
 SIGMA0= option, 1526, 1543–1544, 1735  
 SIGMAS= option, 1526  
 SMETHOD= option, 1536, 1547, 1739  
*subgroup-variable*, 1534–1535  
 TABLE= data set, 1512, 1532–1533  
 TABLETESTS option, 1541  
 TARGET= option, 1528, 1538  
 TESTACROSS option, 1743–1744  
 TESTCHAR= option, 1745  
 TESTLABEL $n$ = option, 1745  
 TESTLABEL= option, 1740, 1745  
 TESTNMETHOD= option, 1738, 1743–1744  
 TESTS= option, 1731, 1734–1735  
 TESTS2= option, 1746  
 USL= option, 1527  
 XSYMBOL= option, 1543  
 ZONECHAR= option, 1745  
 ZONELABELS option, 1541, 1745  
 ZONES option, 1745  
 SHEWHART procedure, XSCHART statement



- See also SHEWHART procedure, all chart statements
- ALPHA= option, 1574, 1585
  - DATA= data set, 1578
  - HISTORY= data set, 1579–1580
  - LIMITN= option, 1574
  - LIMITS= data set, 1579
  - LSL= option, 1576
  - missing values, 1584
  - MU0= option, 1574
  - OUTHISTORY= data set, 1557–1558, 1576
  - OUTLIMITS= data set, 1558–1559, 1575–1576, 1585
  - OUTTABLE= data set, 1559–1560, 1577
  - SIGMA0= option, 1574
  - SIGMAS= option, 1574
  - SPLIT= option, 1721
  - TABLE= data set, 1560, 1580–1581
  - TARGET= option, 1576
  - TESTS= option, 1731
  - TESTS2= option, 1746
  - USL= option, 1576
  - SHIFT= option
    - CUSUM procedure, 389
  - SIGMA0= option
    - CUSUM procedure, 389
    - MACONTROL procedure, 632, 686
    - SHEWHART procedure, 1654, 1735, 1778
  - SIGMAS= option
    - CUSUM procedure, 389
    - MACONTROL procedure, 632, 686
    - SHEWHART procedure, 1654
  - SIZE statement, FACTEX procedure
    - See FACTEX procedure, SIZE statement
    - options summarized by function, 442
    - syntax, 455–456
  - SKIPHLABELS= option
    - CUSUM procedure, 1655
    - MACONTROL procedure, 1655
    - SHEWHART procedure, 1655
  - SMETHOD= option
    - CUSUM procedure, 389
    - MACONTROL procedure, 1655
    - SHEWHART procedure, 1655, 1739
  - SPAN= option
    - MACONTROL procedure, 686
  - SPEC statement
    - options summarized by function, 26–27
    - syntax, 26
  - SPLIT= option
    - CUSUM procedure, 1656
    - MACONTROL procedure, 1656
    - SHEWHART procedure, 1656, 1721
  - SSYMBOL= option
    - SHEWHART procedure, 1656
  - STARBDRADIUS= option
    - CUSUM procedure, 1656
    - MACONTROL procedure, 1656
    - SHEWHART procedure, 1656, 1710
  - STARCIRCLES= option
    - CUSUM procedure, 1656
    - MACONTROL procedure, 1656
    - SHEWHART procedure, 1656, 1703–1704
  - STARINRADIUS= option
    - CUSUM procedure, 1657
    - MACONTROL procedure, 1657
    - SHEWHART procedure, 1657, 1704
  - STARLABEL= option
    - CUSUM procedure, 1658
    - MACONTROL procedure, 1658
    - SHEWHART procedure, 1658, 1709–1710
  - STARLEGEND= option
    - CUSUM procedure, 1658
    - MACONTROL procedure, 1658
    - SHEWHART procedure, 1658, 1709–1710
  - STARLEGENDLAB= option
    - CUSUM procedure, 1659
    - MACONTROL procedure, 1659
    - SHEWHART procedure, 1659
  - STAROUTRADIUS= option
    - CUSUM procedure, 1659
    - MACONTROL procedure, 1659
    - SHEWHART procedure, 1659, 1704
  - STARSPecs= option
    - CUSUM procedure, 1659
    - MACONTROL procedure, 1659
    - SHEWHART procedure, 1659, 1708–1710
  - STARSTART= option
    - CUSUM procedure, 1660
    - MACONTROL procedure, 1660
    - SHEWHART procedure, 1660, 1703–1707, 1709–1710
  - STARTYPE= option
    - CUSUM procedure, 1660
    - MACONTROL procedure, 1660
    - SHEWHART procedure, 1660, 1705–1707
  - STARVERTICES= option
    - CUSUM procedure, 1661
    - MACONTROL procedure, 1661
    - SHEWHART procedure, 1661, 1702–1707, 1709–1710
  - STDDEVIATIONS option
    - SHEWHART procedure, 1655, 1661, 1764
  - STDMED function, 1859–1860
    - subgroup-variable*, CUSUM procedure
      - XCHART statement, 376
    - subgroup-variable*, MACONTROL procedure
      - EWMACHART statement, 620
      - MACHART statement, 674
    - subgroup-variable*, SHEWHART procedure
      - BOXCHART statement, 1062
      - CCHART statement, 1115
      - IRCHART statement, 1153
      - MCHART statement, 1195
      - MRCHART statement, 1231
      - NPCHART statement, 1273
      - PCHART statement, 1314
      - RCHART statement, 1358

- SCHART statement, 1393
- UCHAR statement, 1431
- XCHART statement, 1469
- XRCHART statement, 1514
- XSCHART statement, 1562
- SUBGROUPN= option
  - SHEWHART procedure, 1661
- SYMBOL statement, 168–169
- symbol-variable*, CUSUM procedure
  - XCHART statement, 376
- symbol-variable*, MACONTROL procedure
  - EWMACHART statement, 621
  - MACHART statement, 675
- symbol-variable*, SHEWHART procedure
  - BOXCHART statement, 1062
  - CCHART statement, 1116
  - displaying, 1662
  - IRCHART statement, 1154
  - MCHART statement, 1196
  - MRCHART statement, 1232
  - NPCHART statement, 1274
  - PCHART statement, 1315
  - RCHART statement, 1359
  - SCHART statement, 1394
  - UCHAR statement, 1431
  - XCHART statement, 1470
  - XRCHART statement, 1515
  - XSCHART statement, 1563
- SYMBOLCHAR= option
  - PARETO procedure, 829
- SYMBOLCHARS= option
  - CUSUM procedure, 1662
  - MACONTROL procedure, 1662
  - SHEWHART procedure, 1662, 1684
- SYMBOLLEGEND= option
  - CUSUM procedure, 1662
  - MACONTROL procedure, 1662
  - SHEWHART procedure, 1662, 1683–1684
- SYMBOLORDER= option
  - CUSUM procedure, 1662
  - MACONTROL procedure, 1662
  - SHEWHART procedure, 1662
- T**
- TABLE option
  - MACONTROL procedure, 1663
  - SHEWHART procedure, 1663
- TABLEALL option
  - CUSUM procedure, 389
  - MACONTROL procedure, 1663
  - SHEWHART procedure, 1663
- TABLEBOX= option
  - SHEWHART procedure, 1663
- TABLECENTRAL option
  - MACONTROL procedure, 1663
  - SHEWHART procedure, 1663
- TABLECHART option
  - CUSUM procedure, 390
- TABLECOMP option
  - CUSUM procedure, 390
- TABLEID option
  - CUSUM procedure, 390
  - MACONTROL procedure, 1663
  - SHEWHART procedure, 1663
- TABLELEGEND option
  - SHEWHART procedure, 1663
- TABLEOUT option
  - CUSUM procedure, 390
- TABLEOUTLIM option
  - MACONTROL procedure, 1664
  - SHEWHART procedure, 1664
- tables
  - extreme observations, number, 23
  - extreme values, number, 23
  - robust estimates of scale, 24
  - specialized capability indices, 24
- TABLESUMMARY option
  - CUSUM procedure, 390
- TABLETESTS option
  - SHEWHART procedure, 1664
- TARGET= option
  - SHEWHART procedure, 1664
- TEST2RUN= option
  - SHEWHART procedure, 1664, 1737
- TEST3RUN= option
  - SHEWHART procedure, 1664, 1737
- TESTACROSS option
  - SHEWHART procedure, 1665, 1743–1744
- TESTCHAR= option
  - SHEWHART procedure, 1665, 1745
- TESTFONT= option
  - SHEWHART procedure, 1665
- TESTHEIGHT= option
  - SHEWHART procedure, 1665
- TESTLABEL $n$ = option
  - SHEWHART procedure, 1666, 1745
- TESTLABEL= option
  - SHEWHART procedure, 1665, 1740, 1745
- TESTNMETHOD= option
  - SHEWHART procedure, 1666, 1738, 1743–1744
- TESTOVERLAP option
  - SHEWHART procedure, 1666
- TESTS= option
  - SHEWHART procedure, 1667, 1734–1735
- TESTS2= option
  - SHEWHART procedure, 1669, 1746
- TESTURLS= option
  - SHEWHART procedure, 1669
- TILELEGEND= option
  - PARETO procedure, 829, 864
- TILELEGLABEL= option
  - PARETO procedure, 829, 864
- TOTPANELS= option
  - CUSUM procedure, 1669
  - MACONTROL procedure, 1669
  - SHEWHART procedure, 1669
- TRENDVAR= option
  - CUSUM procedure, 1669

MACONTROL procedure, 1669  
 SHEWHART procedure, 1669, 1714, 1775  
 TURNALL option  
   CUSUM procedure, 1670  
   MACONTROL procedure, 1670  
   SHEWHART procedure, 1670  
 TURNHLABELS option  
   CUSUM procedure, 1670  
   MACONTROL procedure, 1670  
   SHEWHART procedure, 1670  
 TURNVLABEL option  
   PARETO procedure, 830  
 TYPE= option  
   CUSUM procedure, 390  
   MACONTROL procedure, 1670  
   SHEWHART procedure, 1670

## U

U0= option  
   SHEWHART procedure, 1671  
 UCHART statement, SHEWHART procedure  
   See also SHEWHART procedure, UCHART state-  
   ment  
   examples, advanced, 1449  
   examples, introductory, 1420  
   options summarized by function, 1432, 1434–1437,  
   1439  
   overview, 1419  
   syntax, 1430  
 UCLLABEL= option  
   MACONTROL procedure, 1671  
   SHEWHART procedure, 1671  
 UCLLABEL2= option  
   SHEWHART procedure, 1671  
 USL= option  
   SHEWHART procedure, 1671  
 USYMBOL= option  
   SHEWHART procedure, 1671

## V

VAXIS= option  
   CUSUM procedure, 1672  
   MACONTROL procedure, 1672  
   PARETO procedure, 830  
   SHEWHART procedure, 1672  
 VAXIS2= option  
   PARETO procedure, 830  
   SHEWHART procedure, 1672  
 VAXIS2LABEL= option  
   PARETO procedure, 830  
 VAXISLABEL= option  
   PARETO procedure, 830  
 VMINOR= option  
   CUSUM procedure, 1672  
   MACONTROL procedure, 1672  
   SHEWHART procedure, 1672  
 VOFFSET= option  
   CUSUM procedure, 1672  
   MACONTROL procedure, 1672

PARETO procedure, 830, 864  
 SHEWHART procedure, 1672  
 VREF= option  
   CUSUM procedure, 1672  
   MACONTROL procedure, 1672  
   PARETO procedure, 830, 864  
   SHEWHART procedure, 1672  
 VREF2= option  
   CUSUM procedure, 1673  
   MACONTROL procedure, 1673  
   PARETO procedure, 830  
   SHEWHART procedure, 1673  
 VREF2LABELS= option  
   CUSUM procedure, 1673  
   MACONTROL procedure, 1673  
   PARETO procedure, 830  
   SHEWHART procedure, 1673  
 VREFCHAR= option  
   CUSUM procedure, 1674  
   MACONTROL procedure, 1674  
   PARETO procedure, 830  
   SHEWHART procedure, 1674  
 VREFLABELS= option  
   CUSUM procedure, 1674  
   MACONTROL procedure, 1674  
   PARETO procedure, 830, 865  
   SHEWHART procedure, 1674  
 VREFLABPOS= option  
   CUSUM procedure, 1674  
   MACONTROL procedure, 1674  
   PARETO procedure, 831, 865  
   SHEWHART procedure, 1674  
 VZERO option  
   SHEWHART procedure, 1675  
 VZERO2 option  
   SHEWHART procedure, 1675

## W

WAXIS= option  
   CUSUM procedure, 1675  
   MACONTROL procedure, 1675  
   PARETO procedure, 831, 865  
   SHEWHART procedure, 1675  
 WBARLINE= option  
   PARETO procedure, 831, 865  
 WEBOUT= option  
   CUSUM procedure, 1675  
   MACONTROL procedure, 1675  
   SHEWHART procedure, 1675  
 WEIGHT= option  
   MACONTROL procedure, 632  
   PARETO procedure, 831, 865  
 WGRID= option  
   CUSUM procedure, 1675  
   MACONTROL procedure, 1675  
   PARETO procedure, 831, 865  
   SHEWHART procedure, 1675  
 WGRID2= option  
   PARETO procedure, 831, 865

- WHERE statement  
 SHEWHART procedure, 1723–1726
- WLIMITS= option  
 CUSUM procedure, 390  
 MACONTROL procedure, 1675  
 SHEWHART procedure, 1675
- WMASK= option  
 CUSUM procedure, 390
- WSTARCIRCLES= option  
 CUSUM procedure, 1675  
 MACONTROL procedure, 1675  
 SHEWHART procedure, 1675, 1704
- WSTARS= option  
 CUSUM procedure, 1675  
 MACONTROL procedure, 1675  
 SHEWHART procedure, 1675
- WTREND= option  
 CUSUM procedure, 1675  
 MACONTROL procedure, 1675  
 SHEWHART procedure, 1675
- X**
- XCHART statement, CUSUM procedure  
 See also CUSUM procedure, XCHART statement  
 examples, advanced, 410  
 examples, introductory, 362  
 notation, 391  
 overview, 361  
 syntax, 375
- XCHART statement, SHEWHART procedure  
 See also SHEWHART procedure, XCHART statement  
 examples, advanced, 1492  
 examples, introductory, 1458  
 options summarized by function, 1470–1475, 1477, 1479  
 overview, 1457  
 syntax, 1469
- XRCHART statement  
 See SHEWHART procedure, XRCHART statement  
 examples, advanced, 1540  
 examples, introductory, 1502  
 options summarized by function, 1515–1520, 1522, 1524  
 overview, 1501  
 syntax, 1514
- XSCHART statement  
 See SHEWHART procedure, XSCHART statement  
 examples, advanced, 1585  
 examples, introductory, 1552  
 options summarized by function, 1563–1569, 1571  
 overview, 1551  
 syntax, 1562
- XSYMBOL= option  
 MACONTROL procedure, 649, 702, 1675  
 SHEWHART procedure, 1543, 1675
- XVERT algorithm, 1896–1897
- Y**
- YPCT1= option  
 CUSUM procedure, 1676  
 MACONTROL procedure, 1676  
 SHEWHART procedure, 1676
- YSCALE= option  
 SHEWHART procedure, 1676
- Z**
- ZEROSTD option  
 SHEWHART procedure, 1676
- ZONE2LABELS option  
 SHEWHART procedure, 1676
- ZONE2VALUES option  
 SHEWHART procedure, 1676
- ZONECHAR= option  
 SHEWHART procedure, 1677, 1745
- ZONELABELS option  
 SHEWHART procedure, 1677, 1745
- ZONES option  
 SHEWHART procedure, 1677, 1745
- ZONES2 option  
 SHEWHART procedure, 1677
- ZONEVALPOS= option  
 CUSUM procedure, 1677  
 SHEWHART procedure, 1677
- ZONEVALUES option  
 SHEWHART procedure, 1677