



# Software Product Description

PRODUCT NAME: **SSP-11**, Version 1.1, PDP-11 Scientific Subroutine Package

SPD 15.45.4

## DESCRIPTION:

The Scientific Subroutine Package is a collection of over 100 mathematical and statistical routines commonly required in scientific programming. The subroutines are written in FORTRAN and contain no I/O statements.

The algorithm used in each routine was selected on the basis of (1) minimum storage, (2) accuracy of the implementation (which was determined by its past history, among other factors), and (3) speed of execution. In certain cases, these criteria were conflicting and speed of execution was considered important. Many of the larger statistical routines are provided as a collection of several smaller routines. This enables easier incorporation in larger programs requiring overlays.

Among the SSP-11 subroutines are the following:

ABSNT	detection of missing data	CSUM	sum the columns of a matrix
ARRAY	vector storage double dimensioned storage conversion	CTAB	tabulate the columns of a matrix
AUTO	autocovariances	CTIE	adjoin two matrices column-wise
AVCAL	AND operation	DCLA	replace diagonal with scalar
AVDAT	data storage allocation	DCPY	copy diagonal of matrix into vector
BESI	I Bessel function	DISCR	discriminant functions
BESJ	J Bessel function	DMATX	means and dispersion matrix
BESK	K Bessel function	EIGEN	eigenvalues and eigenvectors of a real, symmetric matrix
BESY	Y Bessel function	EXPI	exponential integral
BOUND	selections of observations within bounds	EXSMO	triple exponential smoothing
CADD	add column of one matrix to column of another matrix	FORIF	Fourier analysis of a given function
CANOR	canonical correlation	FORIT	Fourier analysis of a tabulated function
CCPY	copy column of matrix into vector	GAMMA	gamma function
CCUT	partition column-wise	GAUSS	normal random numbers
CEL1	elliptic integrals of the first kind	GDATA	data generation
CEL2	elliptic integrals of the second kind	GMADD	add two general matrices
CHISQ	CHI square test for a contingency table	GMPRD	product of two general matrices
CINT	interchange two columns	GMSUB	subtract two general matrices
CORRE	means, standard deviations, and correlations	GMTRA	transpose of a general matrix
CROSS	cross covariances	GTPRD	transpose product of two general matrices
CS	Fresnel integrals	KRANK	Kendall rank correlation
CSRT	sort matrix columns	LEP	Legendre polynomial
		LOAD	factor loading
		LOC	location in compressed-stored matrix
		MADD	add two matrices
		MATA	transpose product of matrix by itself
		MCPY	matrix copy
		MEANQ	mean square operation
		MFUN	matrix transformation by function
		MOMEN	first four moments
		MPRD	matrix product (row into column)
		MSTR	storage conversion
		MSUB	subtract two matrices
		MTRA	transpose a matrix
		MULTR	multiple regression and correlation
		NROOT	eigenvalues and eigenvectors of a special nonsymmetric matrix

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ORDER	rearrangement of integer correlations	RTNI	refine estimate of root by Newton's iteration
PADD	add two polynomials	SCLA	matrix clear and add scalar
PADDM	multiply polynomial by constant and add to another polynomial	SADD	add scalar to matrix
PCLA	replace one polynomial by another	SDIV	matrix divided by a scalar
PLCD	complete linear synthetic division	SCMA	scalar multiply column and add to another column
PDER	derivative of a polynomial	SICI	sine/cosine integral
PDIV	divide one polynomial by another	SIMQ	solution of simultaneous linear algebraic equations
PILD	evaluate polynomial and its first derivative	SMO	application of filter coefficients (weights)
PINT	integral of a polynomial	SMPY	matrix multiplied by a scalar
PGCD	greatest common divisor of two polynomials	S ANK	Spearman rank correlation
PMPY	multiply two polynomials	SRMA	multiply a row by a scalar and add to another row
PNORM	normalize coefficient vector of polynomial	SSUB	subtract scalar from matrix
POLRT	real and complex roots of a real polynomial	SUBMX	build subset matrix
PSUB	subtract one polynomial from another	SUBST	subset selection from observation matrix
PQSD	quadratic synthetic division of a polynomial	TAB1	tabulation of data (one variable)
PVAL	value of a polynomial	TAB2	tabulation of data (two variables)
PVSUB	substitute variable of polynomial by another polynomial	TALLY	totals, means, standard deviations, minimums, and maximums
QATR	integral of a given function by trapezoidal rule using Romberg's extrapolation method	TPRD	transpose product
QSF	integral of equidistantly tabulated function by Simpson's Rule	TRACE	cumulative percentage of eigenvalues
QTEST	Cochran Q-test	TTSTT	tests on population means
RADD	add row of one matrix to row of another matrix	TWOAV	Friedman 2-way analysis of variance
RCPY	copy row of matrix into vector	UTEST	Mann-Whitney U-test
RANK	rank observations	VARMX	varimax rotation
RECP	reciprocal function for MFUN	WTEST	Kendall coefficient of concordance
RCUT	partition by row	XCPY	copy submatrix from given matrix
RKGS	solution of a system of first order differential equations with given initial values by the Runge-Kutta method		
RINT	interchanges two rows		
RK2	tabulated integral of first order differential equation by Runge-Kutta method		
RK1	integral of first-order differential equation by Runge-Kutta method		
RSUM	sum the rows of a matrix		
RTAB	tabulate the rows of a matrix		
RSRT	sort matrix rows		
RTMI	determine root within a range by Mueller's iteration		
RTIE	adjoin two matrices row-wise		
RTWI	refine estimate of root by Wegstein's iteration		

**MINIMUM HARDWARE REQUIRED:**

- Any valid RT-11 operating system configuration supporting FORTRAN IV/RT-11
- Any valid RSX-11M operating system configuration supporting either FORTRAN IV/IAS-RSX or FORTRAN IV-PLUS

**OPTIONAL HARDWARE:**

None

**PREREQUISITE SOFTWARE:**

- RSX-11M, Version 3.1, and either FORTRAN IV/IAS-RSX, Version 2, or FORTRAN IV-PLUS, Version 2.5
- RT-11, Version 3 and FORTRAN IV/RT-11, Version 2

**OPTIONAL SOFTWARE:**

None

**TRAINING CREDITS:**

None

**SUPPORT CATEGORY:**

B — Software Support will be provided as stated in the Software Support Categories Addendum to this SPD.

**UPDATE POLICY:**

Software Updates, if any, released by DIGITAL during the one (1) year period following installation, will be provided to the customer for a media charge (includes no installation). After the first year, updates, if any, will be made available according to then prevailing DIGITAL policies.

**ORDERING INFORMATION:**

All binary licensed software, including any subsequent updates, is furnished under the licensing provisions of DIGITAL's Standard Terms and Conditions of Sale, which provide in part that the software and any part thereof may be used on only the single CPU on which the software is first installed, and may be copied, in whole or in part (with the proper inclusion of the DIGITAL copyright notice and any DIGITAL proprietary notices on the software) only for use on such CPU. All source licensed software is furnished only under the terms and conditions of a separate Software Program Sources Agreement between Purchaser and DIGITAL.

A single-use license only option is a license to copy the software previously obtained under license, and use such software in accordance with DIGITAL's Standard Terms and Conditions of Sale. The category of support applicable to such copied software is Category C.

The following key (D, E, Q, T, Y, Z) represents the distribution media for the product and must be specified at the end of the order number, e.g., QJ960-AD = binaries on 9-track magnetic tape.

- D = 9-track Magnetic Tape
- E = RK05 Disk Cartridge
- Q = RL01 Disk Cartridge
- T = RK06 Disk Cartridge
- Y = RX01 Floppy Diskette
- Z = No hardware dependency

*Standard Options*

*For RT-11 Systems:*

- QJ960 -A— Single-use license, binaries, documentation, support services (media: D, E, Q, T, Y)
- QJ960 -D— Single-use license only, no binaries, no documentation, no support services (media: Z)

*For RSX-11M Systems:*

- QJ962 -A— Single-use license, binaries, documentation, support services (media: D, E, Q, T, Y)
- QJ962 -D— Single-use license only, no binaries, no documentation, no support services (media: Z)

*Update Options*

Users of SSP-11 whose specified Support Category warranty has expired may order the following software update at the then current charge for such update, for use under the existing license. Except where the medium is designated as Z, the update is distributed in source or binary form on the appropriate medium. A software update where the medium is designated as Z grants the user of SSP-11 the right to copy the previously ordered QJ960-H or QJ960-W software update for use on an additional single CPU for which an SSP-11 license has been obtained. No installation or support services are included unless specifically stated otherwise.

- QJ960 -H— Binaries, documentation (media: D, E, Y)
- QJ960 -H— Right to copy for single use (under existing license), no binaries, no documentation, no support services (media: Z)

Users of SSP-11 whose specified Support Category warranty has not expired may order under license the following software update for the then current media charge. The update is distributed in binary form on the appropriate medium and includes no installation or other services unless specifically stated otherwise.

- QJ960 -W— Binaries, documentation (media: D, E, Y)

**ADDITIONAL SERVICES:**

None

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ADDENDUM  
SOFTWARE SUPPORT CATEGORIES

Each software product (hereinafter 'SOFTWARE') with a designated Support Category A or B in the applicable Software Product Description (SPD) existing at the time of order will be the current release at the time of delivery and will conform to the SPD. DIGITAL's sole obligation shall be to correct defects (nonconformance of the SOFTWARE to the SPD) as described below. Any SOFTWARE with a designated Support Category C will be furnished on an 'as is' basis.

For SOFTWARE with a designated Support Category A or B, DIGITAL will provide the services set forth below without additional charge.

**CATEGORY A**

1. Upon notification by customer to the nearest DIGITAL office that the computer system, including all required prerequisite hardware and software, is ready for the installation of the SOFTWARE, DIGITAL will install such SOFTWARE in any location within the contiguous forty-eight (48) United States, the District of Columbia, or a country in which DIGITAL or a subsidiary of DIGITAL has a software service facility. The notification must be received by DIGITAL and the system must be ready for installation within thirty (30) days after the delivery of the SOFTWARE to customer or DIGITAL will have no obligation to install. Installation will consist of: (1) verification that all components of the SOFTWARE have been received by customer, (2) loading the SOFTWARE, and (3) executing a DIGITAL sample procedure.
2. During the ninety (90) day period after installation, if the customer encounters a problem with the current, unaltered release of the SOFTWARE which DIGITAL determines to be a defect in the SOFTWARE, DIGITAL will provide the following remedial service (on site where necessary): (1) if the SOFTWARE is inoperable, apply a temporary correction (TC) or make a reasonable attempt to develop an emergency by-pass, and (2) assist the customer to prepare a Software Performance Report (SPR) and submit it to DIGITAL.
3. During the one (1) year period following installation, if the customer encounters a problem with the SOFTWARE which his diagnosis indicates is caused by a SOFTWARE defect, the customer may submit an SPR to DIGITAL. DIGITAL will respond to problems reported in SPRs which are caused by defects in the current unaltered release of the SOFTWARE via the Maintenance Periodical for the SOFTWARE, which reports SPRs received, code corrections, temporary corrections, generally useful emergency by-passes and/or notice of the availability of corrected code. Software Updates, if any, released by DIGITAL during the one (1) year period, will be provided to the customer on DIGITAL's standard distribution media as specified in the applicable SPD. The customer will be charged only for the media on which such updates are provided, unless otherwise stated in the applicable SPD, at DIGITAL's then current media prices.

**CATEGORY B**

During the one (1) year period following delivery, the services provided to the customer will be the same as set forth in 3 above.

**CATEGORY C**

SOFTWARE is provided on an 'as is' basis. Any software services, if available, will be provided at the then current charges.

DIGITAL shall have the right to make additional charges for any additional effort required to provide services resulting from customer use of other than current unaltered release of the SOFTWARE operated in accordance with the SPD.