

AS/400e™



ILE RPG for AS/400® Reference Summary

Version 4

AS/400e™



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Version 4

Note!

Before using this information and the product it supports, be sure to read the general information under "Notices" on page iii.

Second Edition (May 1999)

This edition applies to Version 4, Release 4, Modification 0, of IBM Application System/400 Integrated Language Environment® RPG for AS/400 (Program 5769-RG1), RPG/400 (Program 5716-RG1), and to all subsequent releases and modifications until otherwise indicated in new editions. This edition applies only to reduced instruction set computer (RISC) systems.

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This publication is intended to help you create programs using RPG source. This publication documents General-Use Programming Interface and Associated Guidance Information provided by the ILE RPG for AS/400 compiler.

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How to Identify Different Implementations

This document is intended as a summary of RPG language information for RPG/400® and ILE RPG for AS/400® (ILE RPG). RPG/400 and ILE RPG are implementations of the RPG III and RPG IV languages respectively. The following rule is used to distinguish implementation unique function:

Implementation	Code
All	No shading (unless indicated otherwise)
RPG/400 (RPG III)	DARK SHADING
ILE RPG (RPG IV)	LIGHT SHADING

In the following tables, words are coded to reflect implementation availability. The code should be read from left to right. In each table, code to the left controls data to the right. For example, in the operation code table, the section of the table with ADDDUR (e) is lightly shaded, signifying that the entire operation code is implementation specific. Some operation codes have been expanded from 5 characters to 6 characters in RPG IV. In those cases, the RPG III version will be in parenthesis next to the expanded version. For example, EXCEPT has the code (EXCPT) next to it. This signifies that EXCEPT is the ILE RPG version of EXCPT. This logic, highlighting the highest level of differentiation, is followed throughout this document.

The tables listing the fields on the RPG specifications are provided in two formats, one for RPG III and another for RPG IV. The RPG III tables list positions for RPG III under the positions column and the corresponding RPG IV position or keyword under the RPG IV column. This is reversed for the RPG IV tables.

SEU PROMPTS

In the chapters describing the RPG specifications, SEU prompts are given in the caption for each table.

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Error Handling

<i>Table 1 (Page 1 of 2). File Error Codes</i>	
Normal Conditions	
Codes	Meaning
00000	No exception/error occurred.
00002	Function key used to end display.
00011	End of file on input.
00012	Record not found.
Exception-Error Conditions	
Codes	Meaning
00100	Value out of range for string operation.
00013	Subfile is full on a write operation.
01011	Undefined record type (input record does not match record-identifying indicator).
01021	Tried to write a record that already exists (file being used has unique keys and key is duplicate, or attempted to use duplicate relative record number to a subfile).
01022	Referential constraint error detected on file member.
01023	Error in trigger program before file operation performed.
01024	Error in trigger program after file operation performed.
01031	Match field out of sequence.
01041	Array/table load sequence error.
01042	Array/table load sequence error. Alternate collating sequence used.
01051	Excess entries in array/table file.
01071	Record out of sequence in file.
01121	No indicator on the DDS keyword for Print Key.
01122	No indicator on the DDS keyword for Roll Up Key.
01123	No indicator on the DDS keyword for Roll Down Key.
01124	No indicator on the DDS keyword for Clear Key.
01125	No indicator on the DDS keyword for Help Key.
01126	No indicator on the DDS keyword for Home Key.
01201	Record mismatch detected on input.
01211	I/O operation to a closed file.
01215	OPEN issued to a file already open.
01216	Error on an implicit OPEN/CLOSE operation.
01217	Error on an explicit OPEN/CLOSE operation.
01218	Unable to allocate a record in the file.
01221	Update or delete operation attempted without a prior read.
01222	Unable to allocate record due to referential constraint error.
01231	Error on SPECIAL file.
01235	Error in PRTCTL space or skip entries.

Table 1 (Page 2 of 2). File Error Codes

01241	Record number not found. (Record number specified in record address file is not found in controlled file.)
01251	Permanent I/O error occurred.
01255	Session or device error occurred. Recovery may be possible.
01261	Attempt to exceed maximum number of devices defined for file.
01271	Attempt to acquire unavailable device.
01281	Operation to unacquired or undefined device.
01282	Job ending with controlled option.
01284	Unable to acquire second device for single device file
01285	Attempt to acquire an allocated device.
01286	Attempt to open shared file with SAVDS or SAVIND options.
01287	Response indicators overlap SAVIND indicators.
01299	I/O error detected.
01331	Wait time exceeded for input operations to WORKSTN file.

Table 2 (Page 1 of 2). Program Status Codes

Normal Conditions	
Codes	Meaning
00000	No exception/error occurred.
00001	Called program returned with the LR indicator on.
00050	Conversion resulted in substitution.
Exception-Error Conditions	
Codes	Meaning
00100	Value out of range for string operation.
00101	Negative square root.
00102	Divide by zero.
00103	An intermediate result is not large enough to contain the result.
00104	Float underflow. An intermediate value is too small to be to contained in the intermediate result field.
00112	Invalid Date, Time or Timestamp value.
00113	Date overflow or underflow. (For example, when the result of a Date calculation results in a number greater than *Hival or less than *Loval.)
00114	Date mapping errors, where a Date is mapped from a 4 character year to a 2 character year and the date range is not 1940-2039.
00115	Variable length character or graphic field has a current length that is not valid.
00120	Table or array out of sequence.
00121	Invalid array index.
00122	OCCUR value is out of range.
00123	RESET attempted during initialization.
00202	Call to program or procedure ended in error.
00211	Error occurred while calling program or procedure.
00221	Called program tried to use a parameter not passed to it.
00222	Pointer or parameter error.
00231	Called program returned with halt indicator on.
00232	Halt indicator on in this program.
00233	Halt indicator on when RETURN operation run.
00299	RPG dump failed.
00333	Error on DSPLY operation.
00401	Data area not found.
00402	*PDA not valid for non-prestart job.
00411	Data area types or lengths do not match.
00412	Data area not allocated for output.
00413	An I/O error occurred while processing data area.
00414	User not authorized to use data area.
00415	User not authorized to change data area.
00421	Error while unlocking data area.
00425	Length requested for storage allocation is out of range.
00426	Error encountered during storage management operation.

Table 2 (Page 2 of 2). Program Status Codes

00431	Data area previously allocated to another process.
00432	*LOCK for data area not granted.
00450	Character field not entirely enclosed by SO and SI.
00501	Failure to retrieve sort sequence.
00502	Failure to convert sort sequence.
00802	Commitment control not active.
00803	Rollback operation failed.
00804	Error occurred on COMMIT operation.
00805	Error occurred on ROLBK operation.
00907	Decimal data error (invalid digit or sign).
00970	The level numbers of the generating compiler and the run-time subroutines do not match.
09998	Internal failure in RPG compiler or in run-time subroutines.
09999	Program exception in system routine.

RPG Character Set

The valid character set for the RPG language consists of:

- The letters A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
- The letters a b c d e f g h i j k l m n o p q r s t u v w x y z (RPG IV only)
- The numbers 0 1 2 3 4 5 6 7 8 9
- The characters + - * , . ' & / \$ # : @
- The characters _ > < = () % (RPG IV only)
- The blank character

Note: The \$, #, and @ may appear as different symbols on some codepages. For more information, see the *National Language Support*, SC41-5101.

Control Specifications

<i>Table 3. RPG III Control Specification Summary Chart (H)</i>			
Positions	Name	Entry	RPG IV
6	Form type	H	6
7-14		Blank	n/a
15	Debug	Blank 1	DEBUG
16-17		Blank	n/a
18	Currency symbol	Blank Currency symbol	CURSYM
19	Date format	Blank M D Y	DATEDIT
20	Date edit (Y edit code)	Blank Any character	DATEDIT
21	Decimal Notation	Blank I J D	DECEDIT DATEDIT
22-25		Blank	n/a
26	Alternate collating sequence	Blank S	ALTSEQ
27-40		Blank	n/a
41	Forms alignment	Blank 1	FORMSALIGN
42		Blank	n/a
43	File translation	Blank F	FTRANS
44-56		Blank	n/a
57	Transparency check	Blank 1	n/a
58-74		Blank	n/a
75-80	Program identification		DFTNAME

<i>Table 4 (Page 1 of 3). RPG IV Control Specification Summary Chart (H)</i>			
Positions or Keyword	Name	Entry	RPG III
6	Form type	H	6
7-80	Keywords		n/a
ACTGRP	Activation group	*NEW *CALLER 'activation- group-name'	n/a
ALTSEQ	Alternate collating sequence	{*NONE *SRC *EXT}	26
ALWNULL	Allow null-capable fields	*NO *INPUTONLY *USRCTL	n/a
AUT	Authority	*LIBRCRTAUT *ALL *CHANGE *USE *EXCLUDE 'authorization- list-name'	n/a
BNDDIR	Binding directories	'binding-directory -name' {'binding- directory-name'...}	n/a
CCSID	Default graphic CCSID	*GRAPH: *IGNORE *SRC number	n/a
CCSID	Default UCS-2 CCSID	*UCS2: number	n/a
COPYNEST	Maximum nesting level	1-2048	n/a
COPYRIGHT	Copyright string	'string'	n/a
CURSYM	Currency symbol	'symbol'	18
CVTOPT	Convert options	*{NO}DATETIME *{NO}GRAPHIC *{NO}VARCHAR *{NO}VARGRAPHIC	n/a
DATEDIT	Date edit (Y edit code)	fmt{separator}	19,20,21
DATFMT	Date format	fmt{separator}	n/a
DEBUG	Debug	{*NO *YES}	15
DECEDIT	Decimal notation	*JOB RUN 'value'	21
DFACTGRP	Default activation group	*YES *NO	n/a
DFTNAME	Default name	rpg_name	75-80

Table 4 (Page 2 of 3). RPG IV Control Specification Summary Chart (H)

Positions or Keyword	Name	Entry	RPG III
ENBPFCOL	Enable performance collection	*PEP *ENTRYEXIT *FULL	n/a
EXPROPTS	Expression options	*MAXDIGITS *RESDECPOS	n/a
EXTBININT	Integer format for externally-described binary fields	{*NO *YES}	n/a
FIXNBR	Fix decimal data	*{NO}ZONED *{NO}INPUTPACKED	n/a
FLTDIV	Floating point division	{*NO *YES}	n/a
FORMSALIGN	Forms alignment	{*NO *YES}	41
FTRANS	File Translation	{*NONE *SRC}	43
GENLVL	Generation level	0-20	n/a
INDENT	Indent in source listing	*NONE 'character-value'	n/a
INTPREC	Integer precision	10 20	n/a
LANGID	Language identifier	*JOB RUN *JOB 'language-identifier'	n/a
NOMAIN	Module without main procedure		n/a
OPTIMIZE	Optimization level	*NONE *BASIC *FULL	n/a
OPTION	Options	*{NO}XREF *{NO}GEN *{NO}SECLVL *{NO}SHOWCOPY *{NO}EXPDDS *{NO}EXT *{NO}SHOWSKP *{NO}SRCSTMT *{NO}DEBUGIO	n/a
OPENOPT	Open printer file option	*{NO}INZOFL	n/a
PRFDATA	Profiling data	*NOCOL *COL	n/a

Table 4 (Page 3 of 3). RPG IV Control Specification Summary Chart (H)

Positions or Keyword	Name	Entry	RPG III
SRTSEQ	Sort sequence table	*HEX *JOB *JOBRUN *LANGIDUNQ *LANGIDSHR 'sort-table-name'	n/a
TEXT	Program information text	*SRCMBRTXT *BLANK 'description'	n/a
THREAD	Multi-thread environment	*SERIALIZE	n/a
TIMFMT	Time format	fmt{separator}	n/a
TRUNCNBR	Move truncated value	*YES *NO	n/a
USRPRF	User profile	*USER *OWNER	n/a

File Description Specifications

Main File Description Line Summary Chart

Table 5 (Page 1 of 2). RPG III Main File Description Line Summary Chart (F, FK)

Positions	Name	Entry	RPG IV
6	Form type	F	6
7-14	File name	Valid file name	7-16
15	File type	I O U C	17
16	File designation	Blank P S R T F	18
17	End of file	E Blank	19
18	Sequence	A or Blank D	21
19	File format	F E	22
20-23		Blank	n/a
24-27	Record length	1-9999	23-27
28	Limits processing	L Blank	28
29-30	Length of key field or record address field	1-99 Blank	29-33
31	Record address type	Blank A P K	34
32	Type of file organization	Blank I T	35

Table 5 (Page 2 of 2). RPG III Main File Description Line Summary Chart (F, FK)

Positions	Name	Entry	RPG IV
33-34	Overflow indicators	Blank OA-OG, OV 01-99	OFLIND
35-38	Key field starting location	Blank 1-9999	KEYLOC
39	Extension code	Blank E L	n/a
40-46	Device	PRINTER DISK WORKSTN SPECIAL SEQ	36-42
47-52		Blank	n/a
53	Continuation lines	Blank K	n/a
54-59	Name of routine	Name of user-supplied routine	SPECIAL
60-65		Blank	n/a
66	File addition/unordered	Blank A	20
67-70		Blank	
71-72	File condition	Blank U1-U8 UC	EXTIND USROPN
73-74		Blank	n/a
75-80	Comments	Optional	81-100

Table 6 (Page 1 of 3). RPG IV File Description Fixed Form Summary Chart (F)

Positions or Keyword	Name	Entry	RPG III
6	Form type	F	6
7-16	File name	Valid file name	7-14

Table 6 (Page 2 of 3). RPG IV File Description Fixed Form Summary Chart (F)

Positions or Keyword	Name	Entry	RPG III
17	File type	I O U C	15
18	File designation	Blank P S R T F	16
19	End of file	E Blank	17
20	File addition/unordered	Blank A	66
21	Sequence	A or Blank D	18
22	File format	F E	19
23-27	Record length	1-32766	24-27
28	Limits processing	L Blank	28
29-33	Length of key field or record address field	1-2000 Blank	29-30
34	Record address type	Blank A P K G D T Z F	31
35	Type of file organization	Blank I T	32

Table 6 (Page 3 of 3). RPG IV File Description Fixed Form Summary Chart (F)

Positions or Keyword	Name	Entry	RPG III
36-42	Device	PRINTER DISK WORKSTN SPECIAL SEQ	40-46
43	Reserved	Blank	n/a
44-80	Keywords		n/a
81-100	Comments	Optional	75-80

Continuation Line Summary Chart

Table 7. RPG III Continuation Line Summary Chart (FC)

Positions	Name	Entry	RPG IV
6	Form type	F	6
7-18		Blank	n/a
19-28		External name of record format	RENAME IGNORE
29-46		Blank	n/a
47-52	Record number field for SFILE.	Numeric field name	SFILE
53	Continuation line	K	n/a
54-59, 60-67 ²			n/a
68-74		Blank	n/a
75-80	Comments	Optional	81-100
Notes:			
1. These positions are used together. Positions 54 through 59 specify the option, while positions 60 through 67 provide further explanation of the option.			

Continuation Line Options Summary Chart

The valid entries for positions 54 through 67 are:

<i>Table 8 (Page 1 of 3). RPG III Continuation Line Options</i>			
Option (54-59)	Entry (60-67)	Explanation	RPG IV
COMIT	Blank	This file is specified for commitment control.	COMMIT
ID	Field name	Positions 60-65 contain the left-justified name of a 10-character alphanumeric field which does not need to be further defined. This field contains the name of the program device that supplied the record being processed in the file.	DEVID
IGNORE	Blank	This option lets you ignore a record format from an externally-described file.	IGNORE
IND	Indicator number	Indicators from 01 to the number specified are saved and restored for each device attached to a mixed or multiple device file.	SAVEIND
INFDS	Data structure name	This entry lets you define and name a data structure to contain the exception/error information. The data structure name is entered in positions 60 through 65 and left-justified. If INFDS is specified for more than one file, each associated data structure must have a unique name.	INFDS
INFSR	Subroutine name	The file exception/error subroutine named (left-justified) in positions 60 through 65 may receive control following file exceptions/errors. The subroutine name may be *PSSR, which indicates the user-defined program exception/error subroutine is to be given control for errors on this file.	INFSR
NUM	Maximum number of devices	The number specified must be greater than zero and right-justified in positions 60 through 65.	MAXDEV

Table 8 (Page 2 of 3). RPG III Continuation Line Options

Option (54-59)	Entry (60-67)	Explanation	RPG IV
PASS	*NOIND	Specify PASS *NOIND on the file-description specification continuation line for a program described WORKSTN file if you are taking responsibility for passing indicators on input and output.	PASS
PLIST	Parameter list name	This entry is valid only when the device specified in positions 40 through 46 of the main file description line is SPECIAL. Positions 60 through 65 give the left-justified name of the parameter list that is to be passed to the special routine.	PLIST
PRTCTL	Data structure name	The dynamic printer control option is being used. The data structure specified left-justified in positions 60 through 65 refers to the forms control information and line count value.	PRTCTL
RECNO	Field name	This entry is optional for disk files to be processed by relative record number. A RECNO field must be specified for output files processed by relative record number, output files that are referenced by a random WRITE calculation operation, or output files that are used with ADD on the output specifications.	RECNO
RENAME	Record format name	This entry, which is optional, allows you to rename record formats in an externally described file. Positions 19 through 28 of the continuation line specify the external name of the record format that is to be renamed. Positions 60 through 67 specify the left-justified name of the record as it is used in the program.	RENAME
SAVDS	Data structure name	Positions 60-65 contain the left-justified name of the data structure that is saved and restored for each device.	SAVEDS

Option (54-59)	Entry (60-67)	Explanation	RPG IV
SFILE	Record format name	Positions 60 through 67 must specify, left-justified, the RPG name of the record format to be processed as a subfile. Positions 47 through 52 must specify the name of the relative record number field for this subfile.	SFILE
SLN	Field name	Positions 60-65 contain the left-justified name of a start line number (SLN) field. The SLN field determines where a record format will be written to a display file.	SLN

RPG IV Keyword	Name	Entry	RPG III
BLOCK	Record blocking	*YES *NO	n/a
COMMIT	Commitment control	{rpg_name}	COMIT
DATFMT	Date format	fmt{separator}	n/a
DEVID	Program device	fieldname	ID
EXTIND	External indicator	*INU1-*INU8	71-72
FORMLEN	Form length of printer file	number	(L) 15-17, 18-19
FORMOFL	Overflow line number	number	(L) 20-22, 23-24
IGNORE	Ignore record format	recformat	IGNORE
INCLUDE	Include record format	recformat	n/a
INDDS	Name an indicator data structure	data structure name	n/a
INFDS	Name a feedback data structure	data structure name	INFDS
INFSR	File exception/error subroutine	subroutine name	INFSR
KEYLOC	Key field location	number	35-38

<i>Table 9 (Page 2 of 2). RPG IV File Description Specification Keywords (F)</i>			
RPG IV Keyword	Name	Entry	RPG III
MAXDEV	Maximum number of devices for WORKSTN file	*ONLY *FILE	NUM
OFLIND	Overflow indicator	*INOA-*INOG, *INOV, *IN01-*IN99	33-34
PASS	Do not pass indicators	*NOIND	PASS
PGMNAME	SPECIAL device	program name	54-59
PLIST	Name of parameter list to be passed to program for SPECIAL file	plist name	PLIST
PREFIX	Prefix, partial rename	prefix string{:number}	n/a
PRTCTL	Dynamic printer control	PRTCTL	
RAFDATA	Name of raf data file	filename	(E) 11-18
RECNO	Processed by relative record number	fieldname	RECNO
RENAME	Rename record format from externally described file	external_format_name : internal_format_name	RENAME
SAVEDS	Save data structure	data structure name	SAVDS
SAVEIND	Save indicators	number	IND
SFILE	Subfiles	recformat : rrnfield	SFILE
SLN	Start line number	number	SLN
TIMFMT	Time format	fmt{separator}	n/a
USROPN	User controlled open		71-72

Extension Specifications

<i>Table 10 (Page 1 of 2). RPG III Extension Specification Summary Chart (E)</i>			
Positions	Name	Entry	RPG IV
6	Form type	E	n/a
7-10		Blank	n/a
11-18	From file name	Blank Record-address file name Array or table file name	(F) RAFDATA (D) FROMFILE
19-26	To file name	Blank Name of an input or update file containing data records Name of an output or combined file	(D) TOFILE
27-32	Table or array name	Table or array name	(D) 7-21
33-35	Number of entries per record	Blank 1-999	(D) PERRCD
36-39	Number of entries per array or table	1-9999	(D) DIM
40-42	Length of entry	1-256	(D) 33-39
43	Data Format	Blank P B L R	(D) EXTFMT
44	Decimal positions	Blank 0-9	(D) 41-42
45	Sequence	Blank A D	(D) ASCEND DESCEND
46-51	Table or array name (alternating format)	Table or array name (alternating format)	(D) ALT (D) 7-21

Table 10 (Page 2 of 2). RPG III Extension Specification Summary Chart (E)

Positions	Name	Entry	RPG IV
52-54	Length of entry	1-256	(D) 33-39
55	Data Format	Blank P B L R	(D) EXTFMT
56	Decimal positions	Blank 0-9	(D) 41-42
57	Sequence	Blank A D	(D) ASCEND DESCEND
58-80	Comments	Optional	(D) 81-100

Line Counter Specifications

Positions	Name	Entry	RPG IV
6	Form type	L	n/a
7-14	File name	Valid file name	(F) 7-16
15-17	Number of lines per page	2-112	(F) FORMLEN
18-19	Form length	FL	(F) FORMLEN
20-22	Overflow line number	2-112	(F) FORMOFL
23-24	Overflow line	OL	(F) FORMOFL
25-74		Blank	n/a
75-80	Comments	Optional	(F) 81-100

Definition Specifications

<i>Table 12 (Page 1 of 4). RPG IV Definition Specification (D)</i>			
Positions or Keyword	Name	Entry	RPG III
6	Form type	D	n/a
7-21	Name	Symbolic name	(I) 7-12, 53-58 (E) 27-32, 46-51
22	External Description	Blank E	(I) 17
23	Type of Data Structure	Blank S U	(I) 18
24-25	Type of Definition	Blank C DS PI PR S	(I) 19-20, 43
26-32	From Position	Blank nnnnn	(I) 44-47
33-39	To Position / Length	Blank nnnnn + -nnnnn	(I) 48-51 (E) 40-42, 52-54
40	Internal Data Type	Blank A B C D F G I N P S T U Z *	(I) 43

<i>Table 12 (Page 2 of 4). RPG IV Definition Specification (D)</i>			
Positions or Keyword	Name	Entry	RPG III
41-42	Decimal Positions	Blank 0-30	(I) 52 (E) 44, 56
43	Reserved		n/a
44-80	Keywords		n/a
ALIGN	Align integer, unsigned and float subfields		n/a
ALT	Alternating array	main array_name	(E) 27-32
ALTSEQ	Alternate sequence options for field	*NONE	n/a
ASCEND	Sort sequence		(E) 45, 57
BASED	Basing pointer	basing_pointer_name	n/a
CCSID	Graphic and UCS-2 CCSID	number *DFT	n/a
CONST	Constant name	constant value	(I) 21-42, 43
CONST	Read-only parameter		n/a
CTDATA	Compile time data		n/a
DATFMT	Date format	format{separator}	n/a
DESCEND	Sort sequence		(E) 45, 57
DIM	Number of elements in array	numeric constant	(E) 36-39
DTAARA	Data area name	{data area name}	n/a
EXPORT	Field can be exported	{external name}	n/a
EXTFLD	Rename an externally described subfield	field name	(I) 21-30

<i>Table 12 (Page 3 of 4). RPG IV Definition Specification (D)</i>			
Positions or Keyword	Name	Entry	RPG III
EXTFMT	External data type	B C F I L P R S U	(E) 43, 55
EXTNAME	External file with field descriptions	file_name {:format_name}	(I) 21-30
EXTPGM	External prototyped program name	program name	n/a
EXTPROC	External prototyped procedure name	procedure name	n/a
FROMFILE	File pre-run time array is loaded from	file_name	(E) 11-18
IMPORT	Field can be imported	{external name}	n/a
INZ	Initialize data	{constant}*EXTDFT *USER *JOB *SYS}	(I) 21-42
LIKE	Define a field like another	rpg_name	n/a
NOOPT	No optimization		n/a
OCCURS	Number of occurrences in multiple occurrence data structure	numeric_constant	(I) 44-47
OPDESC	Operational descriptor		n/a
OPTIONS	Parameter passing options for prototyped parameters	*NOPASS *OMIT *VARSIZE *STRING *RIGHTADJ	n/a
OVERLAY	Overlay data structure subfield	name{:pos}*NEXT}	n/a
PACKEVEN	Packed field has an even number of digits		n/a
PERRCD	Number of elements per record	numeric constant	(E) 33-35

<i>Table 12 (Page 4 of 4). RPG IV Definition Specification (D)</i>			
Positions or Keyword	Name	Entry	RPG III
PREFIX	Add, replace a prefix to externally described fields	prefix string{:number}	n/a
PROCPTR	Field is a procedure pointer		n/a
STATIC	Data item uses static storage		n/a
TIMFMT	Time format	format{separator}	n/a
TOFILE	File to write array or table data to	file_name	(E) 19-26
VALUE	Pass prototyped parameter by value		n/a
VARYING	Varying length character or graphic field		n/a

Input Specifications

Table 13. RPG III Externally Described Files, Record Identification Entries (IX)

Positions	Name	Entry	RPG IV
6	Form type	I	6
7-14	Record name	Record format name	7-16
15-18		Blank	17-20
19-20	Record identifying indicators	Blank 01-99 L1-L9, LR H1-H9 U1-U8 RT	21-22
21-74		Blank	23-80
75-80	Comments	Optional	81-100

Table 14. RPG III Externally Described Files, Field Entries (JX)

Positions	Name	Entry	RPG IV
7-20		Blank	7-20
21-30	External field name	Field name	21-30
31-52		Blank	31-48
53-58	RPG field name	Field name	49-62
59-60	Control level	Blank L1-L9	63-64
61-62	Match fields	Blank M1-M9	65-66
63-64		Blank	67-68
65-70	Field indicators	Blank 01-99 H1-H9 U1-U8 RT	69-74
71-74		Blank	75-80
75-80	Comments	Optional	81-100

<i>Table 15. RPG III Program Described Files, Record Identification Entries (I)</i>			
Positions	Name	Entry	RPG IV
6	Form type	I	6
7-14	File name	Valid file name	7-16
14-16	Logical relationship	AND or OR	16-18
15-16	Sequence	Any two alphabetic characters Any two-digit number	17-18
17	Number	Blank 1 N	19
18	Option	Blank O	20
19-20	Record identifying indicators	01-99 L1-L9, or LR H1-H9 U1-U8 RT * *	21-22
21-24, 28-31, 35-38	Position	Blank 1-9999	23-27, 31-35, 39-43,
25, 32, 39	Logical relationship	Blank N	28, 36, 44
26, 33, 40	Code part	C Z D	29, 37, 45
Character	Any character	30, 38, 46	
42-74		Blank	47-80
75-80	Comments	Optional	81-100

<i>Table 16. RPG III Program Described Files, Field Description Entries (J)</i>			
Positions	Name	Entry	RPG IV
7-42		Blank	7-30
43	Data format	Blank B L P R	36
44-47	From	1-9999	37-41
48-51	To	1-9999	42-46
52	Decimal positions	Blank 0-9	47-48
53-58	Field name	Symbolic name	49-62
59-60	Control Level	Blank L1-L9	63-64
61-62	Match fields	Blank M1-M9	65-66
63-64	Field record relation	Blank 01-99 L1-L9 MR U1-U8 H1-H9 RT	67-68
65-70	Field indicators	Blank 01-99 H1-H9 U1-U8 RT	69-74
71-74		Blank	75-80
75-80	Comments	Optional	81-100

Table 17. RPG III Data Structure Statement Specifications (DS)

Positions	Name	Entry	RPG IV
6	Form Type	I	(D) 6
7-12	Data structure name	Blank Data structure name	(D) 7-21
13-16		Blank	n/a
17	External description	Blank E	(D) 22
18	Option	Blank I S U	(D) 23
19-20	Record identifying indicators	DS	(D) 24-25
21-30	External file name	External name of data structure	(D) EXTNAME
31-43		Blank	n/a
44-47	Occurrences	Blank 1-9999	(D) OCCURS
48-51	Data structure length	Blank 1-9999	(D) 33-39
52-74		Blank	n/a
75-80	Comments	Optional	81-100

Table 18 (Page 1 of 2). RPG III Data Structure Subfield Specifications (SS)

Positions	Name	Entry	RPG IV
7		Blank	n/a
8	Initialization option	Blank I	(D) INZ
9-20		Blank	n/a
21-30	External field name	External name of subfield	(D) EXTFLD
21-42	Initialization value	Initial value	(D) INZ
31-42		Blank	n/a
43	Data format	Blank P B	(D) 40

Table 18 (Page 2 of 2). RPG III Data Structure Subfield Specifications (SS)

Positions	Name	Entry	RPG IV
44-47	From	1-9999	(D) 26-32
48-51	To	1-9999	(D) 33-39
52	Decimal position	Blank 0-9	(D) 41-42
53-58	Subfield name	Subfield name	(D) 7-21
59-74		Blank	n/a
75-80	Comments	Optional	81-100

Table 19. RPG III Named Constant Specifications (N)

Positions	Name	Entry	RPG IV
6	Form type	I	(D) 6
7-20		Blank	n/a
21-42	Constant	Constant value	(D) CONST
43	Data type	C Blank	(D) 24
44-52		Blank	n/a
53-58	Constant name	Name	(D) 7-21
59-74		Blank	n/a

Table 20. RPG IV Externally Described Files, Record Identification Entries (IX)

Positions	Name	Entry	RPG III
6	Form type	I	6
7-16	Record name	Record format name	7-14
17-20		Blank	15-18
21-22	Record identifying indicators	Blank 01-99 L1-L9, LR H1-H9 U1-U8 RT	19-20
23-80		Blank	21-74
81-100	Comments	Optional	75-80

<i>Table 21. RPG IV Externally Described Files, Field Entries (JX)</i>			
Positions	Name	Entry	RPG III
6	Form type	I	6
7-20		Blank	7-20
21-30	External field name	Field name	21-30
31-48		Blank	31-52
49-62	RPG field name	Field name	53-58
63-64	Control level	Blank L1-L9	59-60
65-66	Match fields	Blank M1-M9	61-62
67-68		Blank	63-64
69-74	Field indicators	Blank 01-99 H1-H9 U1-U8 RT	65-70
75-80		Blank	71-75
81-100	Comments	Optional	75-80

<i>Table 22 (Page 1 of 2). RPG IV Program Described Files, Record Identification Entries (I)</i>			
Positions	Name	Entry	RPG III
6	Form type	I	6
7-16	File name	Valid file name	7-14
16-18	Logical relationship	AND or OR	14-16
17-18	Sequence	Any two alphabetic characters Any two-digit number	15-16
19	Number	Blank 1 N	17
20	Option	Blank O	18

Table 22 (Page 2 of 2). RPG IV Program Described Files, Record Identification Entries (I)

Positions	Name	Entry	RPG III
21-22	Record identifying indicators	Blank 01-99 L1-L9, or LR H1-H9 U1-U8 RT * *	19-20
23-27, 31-35, 39-43,	Position	Blank 1-32766	21-24, 28-31, 35-38
28, 36, 44	Logical relationship	Blank N	25, 32, 39
29, 37, 45	Code part	C Z D	26, 33, 40
30, 38, 46	Character	Any character	27, 34, 41
47-80		Blank	42-74
81-100	Comments	Optional	75-80

Table 23 (Page 1 of 2). RPG IV Program Described Files, Field Description Entries (J)

Positions	Name	Entry	RPG III
6	Form type	I	6
7-30		Blank	7-42
31-34	Data attributes	*VAR or Date/Time external format	n/a
35	Date/Time separator	Any Character	n/a

Table 23 (Page 2 of 2). RPG IV Program Described Files, Field Description Entries (J)

Positions	Name	Entry	RPG III
36	Data format	Blank A B C D F G I L N P R S T U Z	43
37-41	From	1-32766	44-47
42-46	To	1-32766	48-51
47-48	Decimal positions	Blank 0-30	52
49-62	Field name	Symbolic name	53-58
63-64	Control Level	Blank L1-L9	59-60
65-66	Match fields	Blank M1-M9	61-62
67-68	Field record relation	Blank 01-99 L1-L9 MR U1-U8 H1-H9 RT	63-64
69-74	Field indicators	Blank 01-99 H1-H9 U1-U8 RT	65-70
75-80		Blank	71-74
81-100	Comments	Optional	75-80

Calculation Specifications

Table 24 (Page 1 of 2). RPG III Calculation Specifications Summary Chart (C)

Positions	Name	Entry	RPG IV
6	Form type	C	6
7-8	Control level	Blank L0 L1-L9 LR SR AN, OR	7-8
9-17	Conditioning indicators	Blank 01-99 KA-KN, KP-KY L1-L9 LR MR H1-H9 RT U1-U8 OA-OG, OV	9-11
18-27	Factor 1	Symbolic name or literal	12-25
28-32	Operation	Operation code	26-35
33-42	Factor 2	Symbolic name or literal	36-49
43-48	Result field	Field name	50-63
49-51	Field length	Blank 1-30 1-256 1-32767	64-68
52	Decimal positions	Blank 0-9 0-30	69-70
53	Operation Extender	Blank P H N	26-35

Table 24 (Page 2 of 2). RPG III Calculation Specifications Summary Chart (C)

Positions	Name	Entry	RPG IV
54-59	Resulting indicators	Blank 01-99 KA-KN, KP-KY H1-H9 L1-L9 LR OA-OG, OV U1-U8 RT	71-76
60-80	Comments	Comments	81-100

Table 25 (Page 1 of 2). RPG IV Calculation Specifications Summary Chart (C)

Positions	Name	Entry	RPG III
6	Form type	C	6
7-8	Control level	Blank L0 L1-L9 LR SR AN, OR	7-8
9-11	Conditioning indicators	Blank 01-99 KA-KN, KP-KY L1-L9 LR MR H1-H9 RT U1-U8 OA-OG, OV	9-17
12-25	Factor 1	Symbolic name or literal	18-27
26-35	Operation and extender	Operation code and extender	28-32, 53
36-49	Factor 2	Symbolic name or literal	33-42
50-63	Result field	Field name	43-48

Table 25 (Page 2 of 2). RPG IV Calculation Specifications Summary Chart (C)

Positions	Name	Entry	RPG III
64-68	Field length	Blank 1-30 1-256 1-32767	49-51
69-70	Decimal positions	Blank 0-9 0-30	52
71-76	Resulting indicators	Blank 01-99 KA-KN, KP-KY H1-H9 L1-L9 LR OA-OG, OV U1-U8 RT	54-59
77-80	Reserved	Blank	n/a
81-100	Comments	Comments	60-80

Table 26 (Page 1 of 2). RPG IV Calculation Specifications Extended Factor 2 Summary Chart (CX)

Positions	Name	Entry	RPG III
6	Form type	C	n/a
7-8	Control level	Blank L0 L1-L9 LR SR AN, OR	n/a
9-11	Conditioning indicators	Blank 01-99 KA-KN, KP-KY L1-L9 LR MR H1-H9 RT U1-U8 OA-OG, OV	n/a
12-25	Factor 1	Reserved	n/a

Table 26 (Page 2 of 2). RPG IV Calculation Specifications Extended Factor 2 Summary Chart (CX)

Positions	Name	Entry	RPG III
26-35	Operation	Operation code and extender	n/a
36-80	Extended Factor 2	Expression	n/a

Output Specifications

<i>Table 27. RPG III Externally Described Files, Record Identification and Control Entries (O)</i>			
Positions	Name	Entry	RPG IV
6	Form type	O	6
7-14	Record name	Valid record-format name	7-16
14-16	Logical relationship	AND or OR	16-18
15	Type	H or D T E	17
16	Release	R	18
16-18	Record addition field	ADD DEL	18-20
16-22	Space/Skip, Fetch Overflow	Blank	40-51
23-31	Output indicators	Blank 01-99 KA-KN, KP-KY L1-L9 H1-H9 U1-U8 MR LR RT 1P	21-29
32-37	EXCPT name	Record group name	30-39
38-74	Reserved	Blank	40-80
75-80	Comments	Optional	81-100

<i>Table 28 (Page 1 of 2). RPG III Externally Described Files, Field Description and Control Entries (P)</i>			
Positions	Name	Entry	RPG IV
7-22	Reserved	Blank	7-20
23-31	Field output indicators	See output indicators	21-29

Table 28 (Page 2 of 2). RPG III Externally Described Files, Field Description and Control Entries (P)

Positions	Name	Entry	RPG IV
32-37	Field name	Valid field name *ALL	30-43
38	Reserved	Blank	38
39	Blank after	Blank B	45
40-74	Reserved	Blank	46-80
75-80	Comments	Optional	81-100

Table 29 (Page 1 of 2). RPG III Program Described Files, Record Identification and Control Entries (Record Line) (OD)

Positions	Name	Entry	RPG IV
6	Form type	O	6
7-14	File name	Valid file name	7-16
14-16	Logical relationship	AND or OR	16-18
15	Type	H or D T E	17
16-18	Addition/Deletion	ADD DEL	18-20
16	Fetch overflow F Release	Blank F R	18
17	Space before	0 or blank 1 2 3	40-42
18	Space after	0 or blank 1 2 3	43-45
19-20	Skip before	01-99 A0-A9 B0-B2	46-48

Table 29 (Page 2 of 2). RPG III Program Described Files, Record Identification and Control Entries (Record Line) (OD)

Positions	Name	Entry	RPG IV
21-22	Skip after	01-99 A0-A9 B0-B2	49-51
23-31	Output indicators	Blank 01-99 KA-KN, KP-KY L1-L9 H1-H9 U1-U8 OA-OG, OV MR LR RT 1P	21-29
32-37	EXCPT name	Record group name	30-39
38-74	Reserved	Blank	40-80
75-80	Comments	Optional	81-100

Table 30 (Page 1 of 2). RPG III Program Described Files, Field Description and Control Entries (Field Line) (P)

Positions	Name	Entry	RPG IV
7-22	Reserved	Blank	7-21
23-31	Field output indicators	See output indicators	21-29
32-37	Field name	Valid field name PAGE, PAGE1-PAGE7 UPDATE, UDAY, UMONTH, UYEAR, *DATE, *DAY, *MONTH, *YEAR *PLACE	30-43

Table 30 (Page 2 of 2). RPG III Program Described Files, Field Description and Control Entries (Field Line) (P)

Positions	Name	Entry	RPG IV
38	Edit code	Blank 1-4 5-9 A-D, J-Q, X, Y, Z	44
39	Blank after	Blank B	45
40-43	End position in output record	Blanks, +nnn, -nnn, nnnn K1-K8	47-51
44	Data Format	Blank B L P R	52
45-70	Constant or edit word	Constant or edit word Format name	53-80
71-74	Reserved	Blank	n/a
75-80	Comments	Optional	81-100

Table 31 (Page 1 of 2). RPG IV Externally Described Files, Record Identification and Control Entries (O)

Positions	Name	Entry	RPG III
6	Form type	O	6
7-16	Record name	Valid record-format name	7-14
16-18	Logical relationship	AND or OR	14-16
17	Type	H or D T E	15
18	Release	R	16
18-20	Record addition field	ADD DEL	16-18

<i>Table 31 (Page 2 of 2). RPG IV Externally Described Files, Record Identification and Control Entries (O)</i>			
Positions	Name	Entry	RPG III
21-29	Output indicators	Blank 01-99 KA-KN, KP-KY L1-L9 H1-H9 U1-U8 MR LR RT 1P	23-31
30-39	EXCEPT name	Record group name	32-37
40-80	Reserved	Blank	38-74
81-100	Comments	Optional	75-80

<i>Table 32. RPG IV Externally Described Files, Field Description and Control Entries (P)</i>			
Positions	Name	Entry	RPG III
6	Form type	O	6
7-20	Reserved	Blank	7-22
21-29	Field output indicators	See output indicators	23-31
30-43	Field name	Valid field name *ALL	32-37
44	Reserved	Blank	38
45	Blank after	Blank B	39
46-80	Reserved	Blank	n/a
81-100	Comments	Optional	75-80

Table 33. RPG IV Program Described Files, Record Identification and Control Entries (Record Line) (OD)

Positions	Name	Entry	RPG III
6	Form type	O	6
7-16	File name	Valid file name	7-14
16-18	AND/OR	AND or OR	14-16
17	Type	H or D T E	15
18	Fetch overflow F Release	Blank F R	16
18-20	ADD/DEL	ADD DEL	16-18
21-29	Output indicators	Blank 01-99 KA-KN, KP-KY L1-L9 H1-H9 U1-U8 OA-OG, OV MR LR RT 1P	23-31
30-39	EXCEPT name	Record group name	32-37
40-42	Space before	0 or blank 1-255	17
43-45	Space after	0 or blank 1-255	18
46-48	Skip before	1-255	19-20
49-51	Skip after	1-255	21-22
52-80	Reserved	Blank	n/a
81-100	Comments	Optional	75-80

Table 34 (Page 1 of 2). RPG IV Program Described Files, Field Description and Control Entries (Field Line) (P)

Positions	Name	Entry	RPG III
6	Form type	O	6
7-21	Reserved	Blank	7-22
21-29	Field output indicators	See output indicators	23-31
30-43	Field name	Valid field name PAGE, PAGE1-PAGE7 UPDATE, UDAY, UMONTH, UYEAR, *DATE, *DAY, *MONTH, *YEAR *PLACE *IN, *INxx, *IN(xx)	32-37
44	Edit code	Blank 1-4 5-9 A-D, J-Q, X, Y, Z	38
45	Blank after	Blank B	39
47-51	End position in output record	Blanks, +nnnn, -nnnn, nnnn K1-K8	40-43

Table 34 (Page 2 of 2). RPG IV Program Described Files, Field Description and Control Entries (Field Line) (P)

Positions	Name	Entry	RPG III
52	Data Format	Blank A B C D F G I L N P R S T U Z	44
53-80	Constant, Edit word, Data attribute, Format name	Constant, Edit word, Data attribute, Format name	45-70
81-100	Comments	Optional	75-80

Procedure Specifications

<i>Table 35. RPG IV Procedure Specification (PR)</i>		
Positions or Keyword	Name	Entry
6	Form type	P
7-21	Name	Symbolic name
24	Begin/End Procedure	B E
44-80	Keywords	
81-100	Comments	Optional
EXPORT	Procedure can be exported	

Built-In Functions

Table 36 (Page 1 of 4). RPG IV Built-In Functions Summary		
Built-in Function Name	Argument(s)	Value Returned
%ABS	numeric expression	absolute value of expression
%ADDR	variable name	address of variable
%CHAR	graphic, UCS-2, date, time or timestamp expression	value in character data type
%DEC	numeric expression {:digits:decpos}	value in packed numeric format
%DECH	numeric expression :digits:decpos	half-adjusted value in packed numeric format
%DECPOS	numeric expression	number of decimal digits
%DIV	n:m	integer portion of <i>n</i> divided by <i>m</i>
%EDITC	non-float numeric expression:edit code {:*CURSYM *ASTFILL currency symbol}	string representing edited value
%EDITFLT	numeric expression	character external display representation of float
%EDITW	non-float numeric expression:edit word	string representing edited value
%ELEM	array, table, or multiple occurrence data structure name	number of elements or occurrences
%EOF	{file name}	'1' if the most recent file input operation or write to a subfile (for a particular file, if specified) ended in an end-of-file or beginning-of-file condition
		'0' otherwise

Table 36 (Page 2 of 4). RPG IV Built-In Functions Summary

Built-in Function Name	Argument(s)	Value Returned
%EQUAL	{file name}	'1' if the most recent SETLL (for a particular file, if specified) or LOOKUP operation found an exact match
		'0' otherwise
%ERROR		'1' if the most recent operation code with extender 'E' specified resulted in an error
		'0' otherwise
%FLOAT	numeric expression	value in float format
%FOUND	{file name}	'1' if the most recent relevant operation (for a particular file, if specified) found a record (CHAIN, DELETE, SETGT, SETLL), an element (LOOKUP), or a match (CHECK, CHECKR, SCAN)
		'0' otherwise
%GRAPH	char, graph, or UCS-2 expression {: ccsid}	graphic value for the expression
%INT	numeric expression	value in integer format
%INTH	numeric expression	half-adjusted value in integer format
%LEN	any expression	length in digits or characters
%NULLIND	null-capable field name	value in indicator format representing the null indicator setting for the null-capable field
%OPEN	file name	'1' if the specified file is open
		'0' if the specified file is closed
%PADDR	procedure name	address of procedure
%PARMS	none	number of parameters passed to procedure

Table 36 (Page 3 of 4). RPG IV Built-In Functions Summary

Built-in Function Name	Argument(s)	Value Returned
%REM	n:m	remainder of <i>n</i> divided by <i>m</i>
%REPLACE	replacement string: source string{:start position {:source length to replace}}	string produced by inserting replacement string into source string, starting at start position and replacing the specified number of characters
%SCAN	search argument:string to be searched{:start position}	first position of search argument in string or zero if not found
%SIZE	variable, array, or literal {:* ALL}	size of variable or literal
%STATUS	{file name}	0 if no program or file error occurred for the most recent operation code with extender 'E' specified
		most recent value set for program or file status, if an error occurred
		if a file is specified, the value returned is the most recent status for that file
%STR	pointer{:maximum length}	characters addressed by pointer argument up to but not including the first x'00'
%SUBST	string:start{:length}	substring
%TRIM	string	string with left and right blanks trimmed
%TRIML	string	string with left blanks trimmed
%TRIMR	string	string with right blanks trimmed
%UCS2	char, graph, or UCS-2 expression {: ccsid}	UCS-2 value for the expression
%UNS	numeric expression	value in unsigned format
%UNSH	numeric expression	half-adjusted value in unsigned format

Table 36 (Page 4 of 4). RPG IV Built-In Functions Summary

Built-in Function Name	Argument(s)	Value Returned
%XFOOT	numeric array expression	sum of the elements in the array

Operation Codes

- An empty column indicates that the field must be blank.
- All underlined fields are required.
- An underscored space denotes that there is no resulting indicator in that position.
- Symbols

+ Plus
- Minus

- Extenders

(d)	Pass operational descriptors on bound call
(d)	Date field
(e)	Error handling
(h)	Half adjust the result
(m)	Default precision rules
(n)	Do not lock record on input, if file is update
(n)	Set pointer to *NULL after successful DEALLOC
(b)	Pad the result with blanks
(r)	No intermediate value will have fewer decimal positions than the result
(t)	Time field
(z)	Timestamp field

- Resulting indicator symbols

BL	Blank(s)
BN	Blank(s) then numeric
BOF	Beginning of the file
EOF	End of the file
EQ	Equal
ER	Error
FD	Found
HI	Greater than
IN	Indicator
LO	Less than
LR	Last record
NR	No record was found
NU	Numeric
OF	Off
ON	On
Z	Zero
ZB	Zero or Blank

<i>Table 37 (Page 1 of 6). Operation Code Specifications Summary</i>				
Codes	Factor 1	Factor 2	Result Field	Resulting Indicators
ACQ (e⁸)	<u>Device name</u>	<u>WORKSTN file</u>		_ ER _
ADD (h)	Addend	<u>Addend</u>	<u>Sum</u>	+ - Z
ADDUR (e)	Date/Time	<u>Duration:</u> <u>Duration Code</u>	Date/Time	_ ER _
ALLOC (e)		<u>Length</u>	<u>Pointer</u>	_ ER _
ANDxx	<u>Comparand</u>	<u>Comparand</u>		
BEGSR	<u>Subroutine name</u>			
BITOFF (BITOF)		<u>Bit numbers</u>	<u>Character field</u>	
BITON		<u>Bit numbers</u>	<u>Character field</u>	
CABxx	<u>Comparand</u>	<u>Comparand</u>	Label	HI LO EQ
CALL (e)		<u>Program name</u>	Plist name	_ ER LR
CALLB (d e)		<u>Program name</u>	Plist name	_ ER LR
CALLP (e m/r)		<u>NAME{ (Parm1 (:Parm2...)) }</u>		
CASxx	Comparand	Comparand	<u>Subroutine name</u>	HI LO EQ
CAT (p)	Source string 1	<u>Source string 2:</u> number of blanks	<u>Target string</u>	
CHAIN (e n)	<u>Search argument</u>	<u>File name or Record name</u>	Data structure	NR ² ER _
CHECK (e)	<u>Comparator string</u>	<u>Base string:</u> start	Left-most position(s)	_ ER FD ²
CHEKCR (e) (CHEKR)	<u>Comparator string</u>	<u>Base string:</u> start	Right-most position(s)	_ ER FD ²
CLEAR	*NOKEY	*ALL	<u>Structure, Variable, or Record name</u>	
CLEAR	*NOKEY	<u>Structure, Variable, or Record name</u>		
CLOSE (e)		<u>File name</u>		_ ER _
COMMIT (e) (COMIT)	Boundary			_ ER _
COMP¹	<u>Comparand</u>	<u>Comparand</u>		HI LO EQ
DEALLOC(e/n)			<u>Pointer</u>	_ ER _
DEBUG	Identifier	Output file	Debug info	

Table 37 (Page 2 of 6). Operation Code Specifications Summary				
Codes	Factor 1	Factor 2	Result Field	Resulting Indicators
DEFINE (DEFN)	*LIKE	Referenced field	Defined field	
DEFINE (DEFN)	*DTAARA or *NAMVAR	External data area	Internal program area	
DELETE (e) (DELET)	Search argument	File name		NR ² ER _
DIV (h)	Dividend	Divisor	Quotient	+ - Z
DO	Starting value	Limit value	Index value	
DOU (m/r)		Indicator expression		
DOUxx	Comparand	Comparand		
DOW (m/r)		Indicator expression		
DOWxx	Comparand	Comparand		
DSPLY (e) ⁴	Message identifier	Output queue	Response	_ ER _
DUMP	Identifier			
ELSE				
END		Increment value		
ENDCS				
ENDDO		Increment value		
ENDIF				
ENDFOR				
ENDSL				
ENDSR	Label	Return point		
EVAL (h m/r)		Result = Expression		
EVALR (m/r)		Result = Expression		
EXCEPT (EXCPT)		EXCPT name		
EXFMT (e)		Record format name		_ ER _
EXSR		Subroutine name		
EXTRCT (e)		Date/Time ;Duration Code	Target field	_ ER _
FEOD (e)		File name		_ ER _
FOR		Index-name = start-value BY increment TO DOWNTO limit		
FORCE		File name		
FREE		Program name		_ ER _

<i>Table 37 (Page 3 of 6). Operation Code Specifications Summary</i>				
Codes	Factor 1	Factor 2	Result Field	Resulting Indicators
GOTO		<u>Label</u>		
IF (m/r)		<u>Indicator expression</u>		
IFxx	<u>Comparand</u>	<u>Comparand</u>		
IN (e)	*LOCK	<u>Data area name</u>		_ ER _
ITER				
KFLD		Indicator	<u>Key field</u>	
KLIST	<u>KLIST name</u>			
LEAVE				
LEAVESR				
LOOKUP ¹ (LOKUP)				
(array)	<u>Search argument</u>	<u>Array name</u>		HI LO EQ ⁷
(table)	<u>Search argument</u>	<u>Table name</u>	Table name	HI LO EQ ⁷
MHHZO		<u>Source field</u>	<u>Target field</u>	
MHLZO		<u>Source field</u>	<u>Target field</u>	
MLHZO		<u>Source field</u>	<u>Target field</u>	
MLLZO		<u>Source field</u>	<u>Target field</u>	
MOVE (p)	Date/Time format	<u>Source field</u>	<u>Target field</u>	+ - ZB
MOVEA (p)		<u>Source</u>	<u>Target</u>	+ - ZB
MOVEL (p)	Date/Time format	<u>Source field</u>	<u>Target field</u>	+ - ZB
MULT (h)	Multiplicand	<u>Multiplier</u>	<u>Product</u>	+ - Z
MVR			<u>Remainder</u>	+ - Z
NEXT (e)	<u>Program device</u>	<u>File name</u>		_ ER _
OCCUR (e) OCUR	Occurrence value	<u>Data structure</u>	Occurrence value	_ ER _
OPEN (e)		<u>File name</u>		_ ER _
ORxx	<u>Comparand</u>	<u>Comparand</u>		
OTHER				
OUT (e)	*LOCK	<u>Data area name</u>		_ ER _
PARM	Target field	Source field	<u>Parameter</u>	
PLIST	<u>PLIST name</u>			
POST (e) ³	Program device	<u>File name or Record name</u>	<u>INFDS name</u>	_ ER _

<i>Table 37 (Page 4 of 6). Operation Code Specifications Summary</i>				
Codes	Factor 1	Factor 2	Result Field	Resulting Indicators
READ (e n) ⁵		<u>File name or Record name</u>	Data structure	_ ER EOF ⁶
READC (e)		<u>Record name</u>		_ ER EOF ⁶
READE (e n) ⁵	Search argument	<u>File name or Record name</u>	Data structure	_ ER EOF ⁶
READP (e n) ⁵		<u>File name or Record name</u>	Data structure	_ ER BOF ⁶
READPE(e n) ⁵ (REDPE(n))	Search argument	<u>File name or Record name</u>	Data structure	_ ER BOF ⁶
REALLOC (e)		<u>Length</u>	<u>Pointer</u>	_ ER _
REL (e)	<u>Program device</u>	<u>File name</u>		_ ER _
RESET	*NOKEY	<u>Structure or Variable or Record name</u>		_ ER _
RESET (e)	*NOKEY	*ALL	<u>Structure or Variable or Record name</u>	_ ER _
RETRN				
RETURN (h m/r)		<u>Expression</u>		
ROLBK (e)				_ ER _
SCAN (e)	<u>Comparator string:length</u>	<u>Base string:start</u>	Left-most position(s)	_ ER FD ²
SELECT (SELEC)				
SETGT (e)	<u>Search argument</u>	<u>File name or Record name</u>		NR ² ER _
SETLL (e)	<u>Search argument</u>	<u>File name or Record name</u>		NR ² ER EQ ⁷
SETOFF ¹ (SETOF)				OF OF OF
SETON ¹				ON ON ON
SHTDN				ON _ _
SORTA		<u>Array name</u>		
SQRT (h)		<u>Value</u>	<u>Root</u>	
SUB (h)	Minuend	<u>Subtrahend</u>	<u>Difference</u>	+ - Z
SUBDUR (e) (duration)	<u>Date/Time/ Timestamp</u>	<u>Date/Time/ Timestamp</u>	<u>Duration: Duration Code</u>	_ ER _

<i>Table 37 (Page 5 of 6). Operation Code Specifications Summary</i>				
Codes	Factor 1	Factor 2	Result Field	Resulting Indicators
SUBDUR (e) (new date)	Date/Time/ Timestamp	<u>Duration:</u> <u>Duration Code</u>	<u>Date/Time/</u> <u>Timestamp</u>	_ ER _
SUBST (e p)	Length to extract	<u>Base string:</u> start	<u>Target</u> <u>string</u>	_ ER _
TAG	<u>Label</u>			
TEST (e)⁹			<u>Date/Time/</u> <u>Timestamp</u> <u>Field</u>	_ ER _
TEST (e d/t/z)⁹	Date/Time/ Timestamp Format		<u>Character/</u> <u>Numeric</u> <u>field</u>	_ ER _
TESTB¹		<u>Bit numbers</u>	<u>Character</u> <u>field</u>	OF ON EQ
TESTN¹			<u>Character</u> <u>field</u>	NU BN BL
TESTZ¹			<u>Character</u> <u>field</u>	AI JR XX
TIME			<u>Numeric/</u> <u>Date/Time/</u> <u>Timestamp</u>	
UNLOCK (e) (UNLCK)		<u>Data area</u> or <u>file</u> <u>name</u>		_ ER _
UPDATE (e)⁵ (UPDAT)		<u>File name</u> or <u>Record name</u>	<u>Data</u> <u>structure</u>	_ ER _
WHEN (m/r)		<u>Indicator expression</u>		
WHENxx (WHxx)	<u>Comparand</u>	<u>Comparand</u>		
WRITE (e)⁵		<u>File name</u> or <u>Record name</u>	<u>Data</u> <u>structure</u>	_ ER EOF ⁶
XFOOT (h)		<u>Array name</u>	<u>Sum</u>	+ - Z
XLATE (e p)	<u>From:</u> <u>To</u>	<u>String:</u> start	<u>Target</u> <u>string</u>	_ ER _
Z-ADD (h)		<u>Addend</u>	<u>Sum</u>	+ - Z
Z-SUB (h)		<u>Subtrahend</u>	<u>Difference</u>	+ - Z

Table 37 (Page 6 of 6). Operation Code Specifications Summary

Codes	Factor 1	Factor 2	Result Field	Resulting Indicators
<p>Notes:</p> <ol style="list-style-type: none"> 1. At least one resulting indicator is required. 2. The %FOUND built-in function can be used as an alternative to specifying an NR or FD resulting indicator. Note that in RPG III, the NR indicator is required on the CHAIN operation. 3. You must specify factor 2 or the result field. You may specify both. 4. You must specify factor 1 or the result field. You may specify both. 5. A data structure is allowed in the result field only when factor 2 contains a program-described file name. 6. The %EOF built-in function can be used as an alternative to specifying an EOF or BOF resulting indicator. Note that in RPG III, the EOF and BOF indicators are required. 7. The %EQUAL built-in function can be used to test the SETLL and LOOKUP operations. 8. For all operation codes with extender 'E', either the extender 'E' or an ER error indicator can be specified, but not both. 9. You must specify the extender 'E' or an error indicator for the TEST operation. 				

Data Types

Language Availability

The majority of data types described in this section are only available in RPG IV. The following data types are an exception, and are available in both RPG IV and RPG III:

- Character data
 - Fixed-length character data and predefined indicators.
- Numeric data
 - Binary, left sign, packed decimal, and right sign formats.

Character Data

For character data specify one of the following formats:

A Fixed- or Variable Length Character
N Indicator

Fixed-length character fields are one or more bytes long. The default initialization value is blanks.

Variable-length character fields have a declared maximum length and a current length that can vary while running a program. For internal formats, the definition specification keyword VARYING is used to specify variable-length fields. For external formats, the *VAR data attribute is used to specify variable-length fields on the corresponding input or output specification. A variable-length field is initialized by default to have a current length of zero.

The indicator format is a special type of character data. Indicators are all one byte long and can only contain the character values '0' (on) and '1' (off). They are generally used to indicate the result of an operation or to condition (or control) the processing of an operation. The default value of indicators is '0'.

A special set of predefined RPG IV indicators (*INxx) is also available.

Graphic Data

The graphic data type is a character string where each character is represented by 2 bytes. Graphic data can be defined in either fixed-length or variable-length format.

Fixed-length graphic fields are one or more double bytes long.

Variable-length graphic fields have a declared maximum length and a current length, measured in double bytes, that can vary while running a program. For internal formats, the definition specification keyword `VARYING` is used to specify variable-length fields. For external formats, the `*VAR` data attribute is used to specify variable-length fields on the corresponding input or output specification. A variable-length field is initialized by default to have a current length of zero.

Fields defined as graphic data do not contain shift-out (SO) or shift-in (SI) characters. The default initialization value for graphic data is `X'4040'`. The value of `*HIVAL` is `X'FFFF'` and the value of `*LOVAL` is `X'0000'`.

UCS-2 Data

The Universal Character Set (UCS-2) format is a character string where each character is represented by 2 bytes. This character set can encode the characters for many written languages.

Fields defined as UCS-2 data do not contain shift-out (SO) or shift-in (SI) characters.

The length of a UCS-2 field, in bytes, is two times the number of UCS-2 characters in the field.

The fixed-length UCS-2 format is a character string with a set length where each character is represented by 2 bytes.

Variable-length UCS-2 fields have a declared maximum length and a current length, measured in double bytes, that can vary while running a program. For internal formats, the definition specification keyword `VARYING` is used to specify variable-length fields. For external formats, the `*VAR` data attribute is used to specify variable-length fields on the corresponding input or output specification. A variable-length field is initialized by default to have a current length of zero.

You define a UCS-2 field by specifying `C` in the Data-Type entry of the appropriate specification. You can also define one using the `LIKE` keyword on the definition specification where the parameter is a UCS-2 field.

| The default initialization value for UCS-2 data is X'0020'. The value of
 | *HIVAL is X'FFFF', the value of *LOVAL is X'0000', and the value of
 | *BLANKS is X'0020'.

Numeric Data

The numeric data type represents numeric values. Numeric data has one of the following formats: binary, integer, packed-decimal, unsigned, zoned-decimal, or float.

You can specify an internal format for a specific field on a definition specification in position 40. The default internal format is packed-decimal. You can specify an external format for a program-described field on the corresponding input or output specification.

<i>Table 38. Entries and Locations for Specifying External Formats</i>		
Type of Field	Specification	Using
Input	Input	Position 36
Output	Output	Position 52
Array or Table	Definition	EXTFMT keyword

For any program-described field, specify one of the following formats:

B Binary
F Float
I Integer
L Left sign
P Packed decimal
R Right sign
S Zoned decimal
U Unsigned

For numeric data other than float, the default external format is zoned decimal. The external format for compile-time arrays and tables must be zoned-decimal, left-sign or right-sign for numerics other than float.

The default external format for float data is the float external display representation. For float compile-time arrays and tables, the compile-time data is specified as either a numeric literal or a float literal.

The default initialization value for numeric fields is zero.

The range of values allowed for an integer or float field depends on its length.

Field length	Range of Allowed Values
4-byte float (8 digits)	$\pm 1.1754944\text{E}-38$ to $\pm 3.4028235\text{E}+38$, 0.0E+0
8-byte float (16 digits)	$\pm 2.225073858507201\text{E}-308$ to $\pm 1.797693134862315\text{E}+308$, 0.0E+0
3-digit integer	-128 to 127
5-digit integer	-32768 to 32767
10-digit integer	-2147483648 to 2147483647
20-digit integer	-9223372036854775808 to 9223372036854775807
3-digit unsigned	0 to 255
5-digit unsigned	0 to 65535
10-digit unsigned	0 to 4294967295
20-digit unsigned	0 to 18446744073709551615

Date Data

Date fields have a predetermined size and format. There are two kinds of date data formats that can be defined on the definition specifications: 2-digit, and 4-digit year formats. Leading and trailing zeros are required for all date data.

Table 39 on page 65 lists the RPG-defined formats for date data and their separators.

<i>Table 39. RPG-defined date formats and separators for Date data type</i>					
Format Name	Description	Format (Default Separator)	Valid Separators	Length	Example
2-Digit Year Formats					
*MDY	Month/Day/Year	mm/dd/yy	/ - . , '&'	8	01/15/96
*DMY	Day/Month/Year	dd/mm/yy	/ - . , '&'	8	15/01/96
*YMD	Year/Month/Day	yy/mm/dd	/ - . , '&'	8	96/01/15
*JUL	Julian	yy/ddd	/ - . , '&'	6	96/015
4-Digit Year Formats					
*ISO	International Standards Organization	yyyy-mm-dd	-	10	1996-01-15
*USA	IBM USA Standard	mm/dd/yyyy	/	10	01/15/1996
*EUR	IBM European Standard	dd.mm.yyyy	.	10	15.01.1996
*JIS	Japanese Industrial Standard Christian Era	yyyy-mm-dd	-	10	1996-01-15

Table 40 on page 66 lists the *LOVAL, *HIVAL, and default values for all the RPG-defined date formats.

<i>Table 40. Date Values</i>				
Format name	Description	*LOVAL	*HIVAL	Default Value
2-Digit Year Formats				
*MDY	Month/Day/Year	01/01/40	12/31/39	01/01/40
*DMY	Day/Month/Year	01/01/40	31/12/39	01/01/40
*YMD	Year/Month/Day	40/01/01	39/12/31	40/01/01
*JUL	Julian	40/001	39/365	40/001
4-Digit Year Formats				
*ISO	International Standards Organization	0001-01-01	9999-12-31	0001-01-01
*USA	IBM USA Standard	01/01/0001	12/31/9999	01/01/0001
*EUR	IBM European Standard	01.01.0001	31.12.9999	01.01.0001
*JIS	Japanese Industrial Standard Christian Era	0001-01-01	9999-12-31	0001-01-01

Several formats are also supported for fields used by the MOVE, MOVEL, and TEST operations only. This support is provided for compatibility with externally defined values that are already in a 3-digit year format and the 4-digit year *LONGJUL format. It also applies to the 2-digit year formats when *JOB RUN is specified.

Table 41 on page 67 lists the valid externally defined date formats that can be used in Factor 1 of a MOVE, MOVEL, and TEST operation.

<i>Table 41. Externally defined date formats and separators</i>					
Format Name	Description	Format (Default Separator)	Valid Separators	Length	Example
2-Digit Year Formats					
*JOB RUN ¹	Determined at run time from the DATFMT, or DATSEP job values.				
3-Digit Year Formats²					
*CYMD	Century Year/Month/Day	cyy/mm/dd	/ - . , '&'	9	101/04/25
*CMDY	Century Month/Day/Year	cmm/dd/yy	/ - . , '&'	9	104/25/01
*CDMY	Century Day/Month/Year	cdd/mm/yy	/ - . , '&'	9	125/04/01
4-Digit Year Formats					
*LONGJUL	Long Julian	yyyy/ddd	/ - . , '&'	9	2001/115
Notes:					
1. *JOB RUN is valid only for character or numeric dates with a 2-digit year since the run-time job attribute for DATFMT can only be *MDY, *YMD, *DMY or *JUL.					
2. Valid values for the century character 'c' are:					
	'c'	Years			
	0	1900-1999			
	1	2000-2099			
	.	.			
	.	.			
	.	.			
	9	2800-2899			

Time Data

Time fields have a predetermined size and format. They can be defined on the definition specification. Leading and trailing zeros are required for all time data.

Table 42 on page 68 shows the time formats supported and their separators.

RPG name	Description	Format (Default Separator)	Valid Separators	Length	Example
*HMS	Hours:Minutes:Seconds	hh:mm:ss	: , &	8	14:00:00
*ISO	International Standards Organization	hh.mm.ss	.	8	14.00.00
*USA	IBM USA Standard. AM and PM can be any mix of upper and lower case.	hh:mm AM or hh:mm PM	:	8	02:00 PM
*EUR	IBM European Standard	hh.mm.ss	.	8	14.00.00
*JIS	Japanese Industrial Standard Christian Era	hh:mm:ss	:	8	14:00:00

Table 43 lists the *LOVAL, *HIVAL, and default values for all the date formats.

Format name	Description	*LOVAL	*HIVAL	Default Value
*HMS	Hours:Minutes:Seconds	00:00:00	24:00:00	00:00:00
*ISO	International Standards Organization	00.00.00	24.00.00	00.00.00
*USA	IBM USA Standard. AM and PM can be any mix of upper and lower case.	00:00 AM	12:00 AM	00:00 AM
*EUR	IBM European Standard	00.00.00	24.00.00	00.00.00
*JIS	Japanese Industrial Standard Christian Era	00:00:00	24:00:00	00:00:00

If *JOB RUN is specified, the format is determined at runtime from the TIMESEP job value.

Timestamp Data

Timestamp fields have a predetermined size and format. They can be defined on the definition specification. Timestamp data must be in the format `yyyy-mm-dd-hh.mm.ss.mmmmmm` (length 26).

Microseconds (`.mmmmmm`) are optional for timestamp literals and if not provided will be padded on the right with zeroes. Leading zeros are required for all timestamp data.

The default initialization value for a timestamp is midnight of January 1, 0001 (0001-01-01-00.00.00.000000). The `*HIVAL` value for a timestamp is 9999-12-31-24.00.00.000000. Similarly, the `*LOVAL` value for timestamp is 0001-01-01-00.00.00.000000.

TIP

When coding a date, time or timestamp format on a MOVE, MOVEL or TEST operation, separators are optional for character fields. To indicate that there are no separators, specify a valid format followed by a zero.

Basing Pointer Data

Basing pointers are used to point to data in storage.

The length of the basing pointer field must be 16 bytes long and must be aligned on a 16 byte boundary. The default initialization value for basing pointers is `*NULL`.

Procedure Pointer Data

Procedure pointers are used to point to procedures or functions.

The length of the procedure pointer field must be 16 bytes long and must be aligned on a 16 byte boundary. The default initialization value for procedure pointers is `*NULL`.

Edit Codes

<i>Table 44. Edit Codes</i>				
Edit Code Description	No Sign	Cr Sign	-Sign(R)	-Sign(L)
Commas and zero balances	1	A	J	N
Commas	2	B	K	O
Zero balances	3	C	L	P
No commas or zero balances	4	D	M	Q
User-defined edit codes	5 - 9			
Hexadecimal F sign	X ¹			
Date edit	Y ²			
Suppress leading zeros	Z ³			

Notes:

- The X edit code ensures a hexadecimal F sign for positive values. Because the system does this for you, normally you do not have to specify this code.
- The Y edit code suppresses the leftmost zeros of date fields, up to but not including the digit preceding the first separator. The Y edit code also inserts slashes (/) between the month, day, and year according to the following pattern (with zero suppression):
 - nn/n
 - nn/nn
 - nn/nn/n
 - nn/nn/nn
 - nnn/nn/nn
 - nn/nn/nnnn
 - nnn/nn/nnnn
 - nnnn/nn/nn
 - nnnn/nn/nn
- The Z edit code removes the sign (plus or minus) from a numeric field and suppresses leading zeros.



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