

Migration Specialties International, Inc.

217 West 2nd Street, Florence, CO 81226-1403

+1 719-371-1711, Fax: +1 888-854-3417

E-mail: Info@MigrationSpecialties.com

www.MigrationSpecialties.com



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INTRODUCTION

Migration RPG is a programming language oriented for use in business data processing operations involving data file manipulation and report generation. User application programs are developed within defined specifications that describe data file, workstation, input, output, calculation, and control parameters.

Migration RPG compiles a set of program specifications into machine language instructions, which are then linked together with the Migration RPG runtime system for execution under the OpenVMS operating system.

Migration RPG is an extended implementation of the RPG II programming language, originally developed by IBM for commercial applications. It supports most of the features found in the IBM System/3, System/34, and System/36 RPG II, and includes MSI extensions for integration with the OpenVMS operating system.

Migration RPG was developed to make the porting of IBM RPG II applications to the OpenVMS operating system possible. Migration RPG can also be used to port other vendor RPG's, such as WANG, Sperry, Burroughs, and Digital PDP and VAX RPG. Migration RPG offers varying degrees of compatibility with these versions of RPG.

YEAR 2000 COMPLIANCE

Migration RPG is fully year 2000 compliant. See the *Migration RPG Year 2000 Compliance Guide* for detailed information on how Migration RPG achieves Year 2000 compliance.

FEATURES

A Migration RPG program is developed by a programmer through the specification of input and output data and processing steps using pre-defined coding templates. The following RPG coding specification formats are supported by Migration RPG:

- **Header Specification**
 - Furnishes control information including listing, debug, date, currency, and form positioning parameters.
- **File Specification**
 - Identifies data file parameters including file name, record size, media type, file organization, and file access mode. File specifications are also used to identify workstation and disk devices.
- **Extension Specification**
 - Provides detailed descriptions of arrays, record address files, and tables.
- **Line Counter Specification**
 - Defines the number of available print lines and identifies the overflow line for printer files.

- **Input Specification**

- Describes data records and indicates field locations, names, formats, control levels, and other information related to input data files. Each record description in the Input specifications corresponds to an input or update file in the File specifications. Input specifications also describe data structures and a special external data structure, the Local Data Area (LDA).

- **Calculation Specification**

- Defines factors, relationships, control indicators, branching, and other options related to operations performed on data within the program.

- **Output Format Specification**

- Describes output file and print records including fields, edit operations, forms spacing, and constants. Each output record defined in the Output specifications corresponds to an output, update, or add file defined in the File specifications.

Migration RPG Compiler Features

- Language implementation that includes features of RPG II, such as table and array handling, multiple input file processing, and the ability to perform input/output operations during the calculation cycle. CHAIN, EXCPT, READ, READE, READP, DSPLY, MOVE, MOVEA, SET, KEY, SQRT, CAS_{xx}, DEFN, DO, DOU_{xx}, DOW_{xx}, ELSE, END/DO, END/DOU, END/DOW, END/IF, END/CAS, IF_{xx}, test/move zones, fetch overflow, look ahead, bit text/clear/set, data structures, 512-byte local data area, full procedural files, and help screens are supported.
- RED, a full-screen, interactive RPG source statement editor for RPG program development and modification.
- The ability to access and maintain data files with RPG programs in a batch or indirect command operation mode. The same data files can be accessed with programs written in other languages which use RMS file support, such as DEC COBOL.

Migration RPG Screen Format Generator

The Migration RPG Compiler Kit includes a Screen Format Generator. This utility is used to compile screen specifications to generate interactive workstation display screens for entering and viewing data. Screen specifications are also used to define user menus and prompt screens.

The Screen Format Generator supports the following screen specifications:

- **Screen Specification**

- Describes the screen size, starting line, and available command and function keys.

- **Help Specification**

- Describes help screens which can be associated to individual fields, portions of a screen, or an entire screen.

- **Description Specification**

- Describes input fields, output fields, and constant data which appear on the screen. Description specifications include indicator-based control of how and when data is displayed. Control options include highlighting, underlining, blinking, non-display, and cursor positioning.

Migration RPG Compiler Kit Components

- **RPG - RPG Compiler**

Generates an object module from RPG source specifications.

- **SFG - Screen Format Generator**

Generates a screen object module from S, H, and D screen format specifications.

- **AUTO - Auto Report Utility**

Used to assemble an RPG program which contains /COPY members and compiler directives.

- **RPGCON - Console Utility**

Generates screen S & D specifications for files containing console specifications.

- **RDP - File Dump Utility**

Used to generate a hexadecimal dump of a file which contains ASCII or EBCDIC data.

- **RPGMSG - Message File Utility**

Used to create and maintain files containing text that may be accessed by an RPG program through message identification codes (MIC).

- **RED - Full Screen RPG Editor**

A full screen editor designed for the entry, manipulation, and modification of RPG source code.

- **REX - External Indicator and Date Utility**

Allows the setting of external indicators (U1 - U8) and the definition of a date other than the system date.

- **PROMPT - Prompt Screen Utility**

Allows a DCL command file to display a screen that was defined using Migration RPG S, H, and D specifications. The data keyed into the screen by the user is used to maintain and update the local symbols P1 - P64.

- **MENU - Menu Utility**

Supports menus using Migration RPG S, H, and D specifications to generate the menu screen.

SERVICE OPTIONS

MSI software specialists are available on a per-call or resident basis to help in all phases of software development, migration, or implementation. Specialists are available to serve as technical consultants, decision support consultants, or business system analysts. Resources are available to:

- **Provide software migration services**
- **Provide OpenVMS support and management services**
- **Supplement programming staff**
- **Assume project management responsibility**
- **Develop software**
- **Augment system start-up service packages with tailored services to meet specific needs**

DIFFERENCES BETWEEN MIGRATION RPG & DIGITAL VAX RPG II

VAX RPG II was Digital's own interpretation of the RPG programming language. VAX RPG II was only available on VAX/VMS systems. It is no longer supported by Digital and is not fully IBM RPG II compatible.

In many respects, VAX RPG II is a subset of Migration RPG. The major difference between the two RPG's is the methods used to support workstation screens. VAX RPG II uses DECforms, another Digital product. Migration RPG uses S & D screen specifications.

The following table compares the features of MSI's Migration RPG 6.0 and Digital's VAX RPG II version 2.1:

Comparison of Features in Migration RPG 6.0 and VAX RPG II

Feature	Migration RPG	VAX RPG II
Basic System/3, /34, /36 compatibility	✓	✓
Full (99%+) System/3, /34, /36 compatibility	✓	
Figurative constants (*BLANK, *ZERO, etc.)	✓	
Structured opcodes (CABxx, CASxx, DOUxx, DOWxx, ELSE, IFxx, etc.)	✓	
READP (Read Prior)	✓	
Workstation Support		
Basic WORKSTN subset via FMS		✓
S & D specification support	✓	
FMS conversion utility/aid	✓	✓
Exception time processing routines	✓	
Function key support (Help, Roll-Up, Roll-Down, Clear, Home)	✓	

Feature	Migration RPG	VAX RPG II
External CALL Support		
By descriptor [1]	✓	✓
By reference/value [1]		✓
PLIST	✓	✓
EXTRN	✓	✓
GIVNG/Return Status	✓	✓
FREE	✓	
RETRN	✓	
Access to DECforms/Rdb/etc. via CALL	✓	✓
Access to DECforms/Rdb/etc. via EXIT/RLABL	✓	
RPG subprograms	✓	
Local Data Area		
Set via a file	✓	
Set via symbols		✓
External Indicators		
Set via a file	✓	
Set via RPG\$EXT_INDS logical		✓
File I/O Extensions		
Multi-key ISAM (key computed from F spec)	✓	✓
Multi-key ISAM (key of reference specified)	✓	
Multiple keys to same file in same program	✓	✓
Word/longword keys for ISAM files		✓
Record lock indicator on READ and CHAIN	✓	✓
File Continuation Options		
FMTS [2]	✓	✓
ID	✓	
IND [2]	✓	
INFSR subroutine	✓	
INFDS data structure	✓	✓
NUM [2]	✓	
RECNO	✓	
SAVDS [2]	✓	
SLN variable start line	✓	✓

Feature	Migration RPG	VAX RPG II
Miscellaneous		
Automatic blank to zero numeric data conversion	✓	✓
/CHECK (EXSR recursion or array/table bounds)		✓
/COPY statement support within RPG source code	✓	✓
/COPY_CDD		✓
Compiler-generated cross reference	✓	✓
Machine code annotated with RPG cycle	✓	✓
Auto Report Utility (AUTOCL)	✓	
RPG Full Screen Editor	✓	✓
TPU-based including spec help	✓	✓
Compile and error review within editor		✓
Full customization via TPU/EVE code additions	✓	✓

[1] The compilers implement argument passing mechanisms with different language syntax.

[2] Option is recognized as valid by the Migration RPG Compiler, but no action is taken in response to the option.

DIFFERENCES BETWEEN IBM SYSTEM/36 RPG II & MIGRATION RPG:

Migration RPG was specifically designed to be compatible with IBM RPG II, allowing IBM System/3, System/34, and System/36 applications to be ported to OpenVMS systems. The following IBM RPG II functionality is not directly supported by Migration RPG under OpenVMS:

- RMS under OpenVMS does not support relative (direct) access to an indexed file. Supporting the functionality under OpenVMS requires modifications to the converted RPG programs and data files.
- RMS under OpenVMS does not support multiple updates to a file after a single read. Converted RPG programs using this feature must be modified to perform a read before each update.
- Multiple Requester Terminal (MRT) programs do not exist in the OpenVMS environment. MRT code can be removed from converted RPG programs.
- Read-under-format is not supported under OpenVMS. Converted RPG programs using this feature are modified to bring up the read-under-format screen as the first data entry screen.
- Telecommunication specifications are not supported by Migration RPG.

RPG OPCODE COMPARISON

The following table compares the RPG opcodes supported by Migration RPG, IBM RPG II, and VAX RPG II:

RPG Opcode Comparison

RPG Opcodes	Migration RPG	IBM RPG II	VAX RPG II
ANDxx	✓	✓	
ACQ	no-op	✓	
ADD	✓	✓	✓
BEGSR	✓	✓	✓
BITOF	✓	✓	✓
BITON	✓	✓	✓
CABxx	✓		
CALL	✓		✓
CASxx	✓	✓	
CHAIN	✓	✓	✓
COMP	✓	✓	✓
DEBUG	✓	✓	no-op
DEFN	✓	✓	
DIV	✓	✓	✓
DO	✓	✓	
DOUxx	✓	✓	
DOWxx	✓	✓	
DSPLY	✓	✓	✓
ELSE	✓	✓	
END	✓	✓	
ENDSR	✓	✓	✓
EXCPT	✓	✓	✓
EXIT	✓	✓	
EXSR	✓	✓	✓
EXTRN	✓	✓	✓
FORCE	✓	✓	✓
FREE	✓	✓	
GIVNG			✓

RPG Opcodes	Migration RPG	IBM RPG II	VAX RPG II
GOTO	✓	✓	✓
IFxx	✓	✓	
KEY	✓	✓	
LOKUP	✓	✓	✓
MOVE	✓	✓	✓
MOVEA	✓	✓	✓
MOVEL	✓	✓	✓
MHHZO	✓	✓	
MHLZO	✓	✓	
MLHZO	✓	✓	
MLLZO	✓	✓	
MULT	✓	✓	
MVR	✓	✓	✓
NEXT	no-op	✓	
ORxx	✓	✓	
PARM	✓	✓	✓
PARMD			✓
PARMV			✓
PLIST	✓	✓	✓
POST	no-op	✓	
READ	✓	✓	✓
READE	✓	✓	
READP	✓	✓	
REL	no-op	✓	
RETRN	✓	✓	
RLABL	✓	✓	
SET	✓	✓	
SETLL	✓	✓	✓
SETOF	✓	✓	✓
SETON	✓	✓	✓
SHTDN	no-op	✓	
SORTA	✓	✓	
SQRT	✓	✓	✓

RPG Opcodes	Migration RPG	IBM RPG II	VAX RPG II
SUB	✓	✓	✓
TAG	✓	✓	✓
TESTB	✓	✓	✓
TESTN	✓		
TESTZ	✓	✓	
TIME	✓	✓	✓
XFOOT	✓	✓	✓
Z-ADD	✓	✓	✓
Z-SUB	✓	✓	✓

no-op - The opcode is recognized by the compiler, but is not acted upon.

The following table compares the devices supported by Migration RPG, IBM RPG II, and VAX RPG II:

Devices Supported by Migration RPG, IBM RPG II, and VAX RPG II

Device Type	Migration RPG	IBM RPG II	VAX RPG II
BSCA			✓
CONSOLE		✓	*
CRT	✓	✓	*
DBDISK	✓		*
DECTAP	✓		*
DISC	✓		*
DISK	✓	✓	✓
DISK40	✓		✓
DKDISK	✓		*
DMDISK	✓		*
DPDISK	✓		*
KEYBORD	✓	✓	*
PRINTER	✓	✓	✓
PRINTR	✓		✓
READER	✓	✓	✓
READ40	✓		✓
SPECIAL	✓	✓	*

Device Type	Migration RPG	IBM RPG II	VAX RPG II
TAPE	✓		✓
TTY	✓	✓	✓
WORKSTN	✓	✓	✓

* Accepted by VAX RPG II with a warning and treated as a disk device unless column 15 is D, in which case TTY device is assumed.

SOFTWARE MAINTENANCE SERVICES

The Migration RPG Compiler Kit includes software maintenance services for one (1) year. Maintenance services include:

- **Software Media and Documentation Updates**

The customer automatically receives any new software release with corresponding documentation.

- **Telephone Support**

MSI can be contacted by telephone with questions concerning the use of Migration RPG or to report problems with the product. MSI can be reached by telephone between the hours of 8:00AM and 5:00PM MST, Monday through Friday, excluding U.S. holidays.

- **Fax Support**

MSI can be contacted by fax with questions concerning the use of Migration RPG or to report problems with the product. MSI can be reached by fax 24 hours a day, seven days a week.

- **Email Support**

MSI can be contacted electronically via the Internet using email with questions concerning the use of Migration RPG or to report problems with the product. MSI can be reached by email 24 hours a day, seven days a week.

- **Critical Problem Resolution**

The following are defined as critical problems:

- The Migration RPG Compiler encounters a fatal run-time error.
- The installation of the Migration RPG Compiler for a new site fails.

If, at any time during the software license period, the customer experiences a problem with the licensed software, a Software Problem Report which describes the nature of the problem may be sent to MSI. The customer will receive a written response from MSI. This response will either:

- Acknowledge that the reported problem is a software error and provide an immediate work-around; or

- Acknowledge that the reported problem is a software error and provide an estimated date of the next software release which will fix the software error; or
- Acknowledge that the reported problem is a known restriction; or
- Explain why the reported problem is not considered a software error by MSI and, if possible, provide a work-around.

DOCUMENTATION AND MEDIA

The Migration RPG Compiler Kit includes the following documentation:

- *Migration RPG User's Guide*

The Migration RPG Compiler Kit is distributed on the following media:

- 1600 or 6250 BPI 9-track Magtape
- TK50 Tape Cartridge
- 4mm DAT Tape Cartridge

HARDWARE REQUIREMENTS

Any valid OpenVMS computer system running OpenVMS version 6.1 or higher. A VT compatible video terminal is required for:

- Workstation programs
- MENU Utility
- PROMPT Utility
- RED Editor
- DFU Utility

Disk Block Requirements:

Approximately 3,500 blocks of free disk space.

PREREQUISITE SOFTWARE

The Migration RPG Compiler has been tested with, will run with, and requires the following software:

- OpenVMS Operating System version 6.1 or higher.

ORDERING INFORMATION

The Migration RPG Compiler Kit is sold as a software and service package by MSI. For more information concerning how to obtain the Migration RPG Compiler Kit, please contact MSI at:

Migration Specialties International
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Florence, CO 81226-1403
Phone: 719-371-1711, Fax: 888-854-3417
msi1@earthlink.net

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A separate license is needed for each additional Licensed Processor or OpenVMS cluster on which Migration RPG will be executed, except as otherwise specified.

For any executable images produced with the Migration RPG Compiler that are exported to a non-licensed processor, a Migration RPG Runtime License must be purchased for that processor.

SOFTWARE WARRANTY

MSI WILL NOT BE LIABLE IN ANY EVENT FOR ANY DAMAGES INCLUDING ANY LOSS OF DATA, PROFITS OR SAVINGS, CLAIMS AGAINST YOU BY ANY OTHER PARTY OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF YOUR USE OF, OR INABILITY TO USE THE SOFTWARE OR MEDIA, EVEN IF MSI IS ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

USAGE INFORMATION

This software kit is intended for use with a customer's own software or software for which the customer obtained proper rights and interests. Any use of this software with software proprietary to a third party is prohibited under the terms of this license agreement.

The Customer agrees to indemnify and hold MSI harmless from any loss, damage or liability, including reasonable attorneys' fees, arising from any claim that the conversion of Customer's software infringes any United States patent, copyright, trademark, trade secret or other proprietary right of any third party.**

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