



IBM System/3 Model 4 and Model 6 RPG II Compiler Program Number 5703-RG1

The IBM System/3 Model 4 and Model 6 RPG II Compiler is a disk-resident computer program used on the System/3 Model 4 or System/3 Model 6. It requires as input an RPG II source language program and produces as output a System/3 machine language object program, either cataloged in an object library or punched into 96-column cards.

The compiler also produces a source program listing, diagnostic messages, and a main storage map. The compiler halts if errors are found. If only warning messages occur, the user has the option to continue the compilation. If terminal errors are found, the program must be corrected and recompiled.

The compiler selects from its own library the I/O routines needed for the object program. These routines initiate the request for records from disk system management, which initiates the I/O operations.

Disk system management indicates I/O errors or device conditions by turning on a light on the system console. For other error conditions, the I/O routine places a halt identifier code in the halt code display lights on the system console. Using the identifier code, the operator can find an explanation of the error and the recovery procedure in the *IBM System/3 Model 6 Halt Guide*, GC21-7541.

The object program processes user files until a valid end-of-file error condition occurs. In either case, a code is placed in the halt code display lights indicating the condition.

System/3 Model 4 and Model 6 RPG II provides most of the functions available in previous IBM RPG languages plus the following RPG II capabilities:

- Defines, points to (indexes), and accesses fields within an array of like fields. The array can be read from data records or created in storage.
- Defines subroutines that can be executed from any point in calculations. After the subroutine is executed, calculations resume where interrupted.
- Performs output during both detail and total calculations. When the requested output is completed, calculations resume where interrupted.
- Looks at the contents of fields of the next record awaiting processing for calculations, testing, comparison, or output.
- Determines and controls the file or record that is to be processed during the next RPG II program cycle.
- Loads tables, at either compile or object time, that might contain fewer than the total number of allowable entries. If tables are loaded at object time, temporary expansion of the tables without modification to the source program is allowed.
- Updates and writes out tables.
- Prints identical invoices or labels side-by-side (2-up, 3-up) without user redefinition of the individual fields on the output-format specifications.
- Edits output fields according to a user specified single character code (includes slashes in date fields).
- Checks user switches to condition calculations, input files, output files, or specific output records.
- Calls the overflow routine during the printing of a line when the user specifies fetch overflow.
- Controls page length and overflow line via line counter specifications.
- Performs repetitive printing of the first page (1P) output to assist in the proper alignment of printer forms.
- Translates, character-by-character, using a file translation table (external code to internal code and internal code to external code).
- Assists the user in debugging a program by using the DEBUG operation code.
- Retrieves records from an indexed file by using the CHAIN operation code.
- Finds the square root of a number.
- Displays output and accepts input from an operator console when the user specifies the DSPLY operation code.
- Supports the console as a normal RPG II file. This differs from the DSPLY function that supports the console as a field-entering device.
- Executes a program in less storage by automatically generating overlays.
- Inserts the user's own program support for any input/output device attached to System/3.

- Processes spread cards. A spread card is a record that contains fixed data pertaining to the whole record and a variable number of trailer data that contains the same type of information.
- Sets and tests bits of a 1-byte binary field if the user specifies.
- Reads input records from a sequentially processed file if the user specifies the READ op code.
- Uses the same data management input buffer for all single volume disk input files (shared I/O).
- Provides access to the system date that has been previously entered via OCL. This allows the entire date, or any of the three parts of the date, to be referenced by the reserved names UDATE, UMONTH, UDAY, or UYEAR. These fields may be referenced on the calculation specifications or on the output-format specifications.
- Uses dual I/O areas for performance improvement when processing sequential disk files, if specified.
- Uses more than one line of conditioning indicators during a calculation by the user specifying AN/OR indicators.
- Sends and receives binary synchronous data over voice-grade or high-speed communication lines by means of the telecommunications feature (see *Features*).
- Controls multifile processing with nine matching fields.
- Stores all or part of the cylinder index in main storage.
- Controls the printer, enters input fields via the keyboard, and turns on command key indicators by the user specifying the SET and KEY operations.
- Command keys might be used to condition calculations and/or output.

To use the RPG II compiler, the user supplies information about the job to be processed. The job can be described on specifications sheets prior to entering the source statements into the system. The specification sheets are:

- *Control Card and File Description Specifications*—define control information to the RPG II compiler and specify variables relating to the data files in the program.
- *Extension and Line Counter Specifications*—describe tables, arrays, and record address files; specify the line number where overflow should occur and the number of available print lines on the form.
- *Telecommunications Specifications*—define the information necessary to establish and maintain the binary synchronous communications (BSC) link.
- *Input Specifications*—define data files, records, and fields of the records to be used by your program.

- *Calculation Specifications*—describe all operations to be performed on data and the logic of the user's program.
- *Output Specifications*—specify the data to be written or punched and the arrangements of the data on printed reports, cards, disk files, CRT, and/or ledger cards.

Model 4 and Model 6 RPG II object programs use three file organizations—sequential, indexed, and direct. The access methods supported for these organizations are as follows:

Sequential Organization:

- Random processing by relative record number, including updating in place, but excluding file loading.
- Consecutive processing, including updating in place and file loading.

Indexed Organization:

- Random processing by key.
- Sequential processing by key, including file loading. The keys and data for a file can be in different sequences; that is, the most active records can be placed at the beginning of the file and the index can be in sequence by item number.

Direct Organization:

- Consecutive processing.
- Random processing by relative record number, including updating and file loading. The open routine during file load clears the file space on disk.

Standard System/3 disk labels are required on all disk files.

Programming Systems

This program operates under control of the IBM System/3 Model 4 or Model 6 Disk System Management Program. RPG II object programs have access to a date field (UDATE, UMONTH, UDAY, UYEAR) that is defined by OCL. Indicators (U1-U8), initialized by OCL, can be used to condition files, calculations, or output.

System Requirements

The minimum system configuration and optional device support for the IBM System/3 RPG II compilation and object program execution is:

Model 4

- 5404 Processing Unit with Operator Keyboard Console, Model A18 (64K bytes)
- 5447 Disk Storage and Control, one of the following:
 - Model A1
 - Model A2
- 5213 Printer, Model 3

Model 6

- 5406 Processing Unit with Operator Keyboard Console, one of the following:
 - Model B2 (8K bytes)
 - Model B3 (12K bytes)
 - Model B4 (16K bytes)
- 5444 Disk Storage Drive, one of the following:
 - Model 1
 - Model 2
 - One Model 2 and one Model 3
 - Two Model 2s
- Printer, one of the following:
 - 5213 Printer, Model 1, 2, or 3
 - 2222 Printer, Model 1 or 2

SCP 5703-SC1 is also required as part of the Model 4 or Model 6 minimum configuration.

Additional devices and features supported by Model 6 RPG II Object Program are:

- Serial Input/Output Channel (SIOC)
- Binary Synchronous Communications Adapter (BSCA)
- Local Communications Adapter (LCA)
- Command keys
- 129 Card Data Recorder, Models 1, 2, and 3
- 2265 Display Station, Model 2
- 5496 Data Recorder, Model 1
- Directly attached 3741 Data Station, Models 1 and 2, and Programmable Work Station, Models 3 and 4
- Ledger card device on the 2222 Printer

Note: Not all of these devices and features are available on the Model 4. Local work stations used on the Model 4 are transparent to the RPG II Program. These work stations are 3277 Display Station (Models 1 and 2), 3284 Printer (Models 1 and 2), 3286 Printer (Models 1 and 2), and 3288 Line Printer (Model 2).

Compatibility

System/3 Model 6 RPG II is source language compatible with the System/3 Model 10 Disk RPG II (5702-RG1) except for the different file description specifications required to support the Model 6 input/output devices and the following support that is unique to the Model 6:

- Support of 2265 Display Station—object program support as an output device.
- Support of Operator Keyboard Console—object program support as in interactive input device.
- Operation codes, KEY and SET, provide operator interaction.
- Support of 5496 Data Recorder or 129 Card Data Recorder—object program support as an input/output device.
- Support of 2222 Printer—object programs support 220 positions, two sets of forms tractors, and the ledger card device, which is supported as a combined file or as an output file.

Features

RPG II Auto Report Feature, Feature Number 6008 and 6009, adds three new functions to the capabilities of RPG II. These functions, designed to simplify the job of report writing, are:

- Page headings—simplifies the method of specifying headings at the top of every page of a report.
- Simplified output specifications—makes it easier to specify column headings, totals, total lines, edit codes, and report formats.
- Copy—permits RPG II source statements located in a library to be copied into the RPG II source program.

The Auto Report feature accepts as input a combination of RPG II source statements and statements specifying the Auto Report functions. The RPG II source statements supplied by the user, along with those produced by the Auto Report feature, are used as input to the RPG II Compiler.

An additional specification sheet, the *RPG Auto Report Specifications*, allows the user to specify whether the source program generated by Auto Report will be punched into cards and/or cataloged into a library, whether date and page information will be suppressed from the first heading line, and whether total-level indicators will be suppressed from the first heading line or from generated total lines.

The Auto Report feature will, at the user's option, generate a listing that includes a printout of the specifications used by Auto Report (for the job being run), a list of any errors encountered in the Auto Report specifications, and a message describing each error.

The minimum system requirements for the Auto Report feature are the same as for the RPG II Compiler (see *System Requirements*).

RPG II Telecommunications Feature, Feature Number 6000 or 6002, provides the user with the ability to use the binary synchronous communications adapter (BSCA) as an input/output device to send and receive binary synchronous data over voice-grade or high-speed communication lines. The user adds to the RPG II source program the telecommunications specification statements necessary to describe the configuration.

The generated object program will allow the system to:

- Receive only
- Receive with conversational reply (not supported on 2770 and 2780)
- Transmit only
- Transmit with conversational reply (not supported on 2770 and 2780)
- Transmit and receive (no conversational reply [not supported on 2770 and 2780])
- Receive a file, then transmit a file

System/3 Model 4 or 6 with a BSCA and the telecommunications feature can communicate with the following:

- Another System/3 with BSCA and the telecommunications feature
- System/360 Model 20 with BSCA and BSCA IOCS program support
- System/360 or System/370 with DOS BTAM, OS BTAM, or OS TCAM (except conversational TCAM) program support (see Note 1)
- 2770 Data Communication System
- 2780 Data Transmission Terminal

The telecommunications feature supports three types of communications networks: point-to-point switched, point-to-point nonswitched, and multipoint (as a tributary station). It also supports manual call, manual answer, auto call, auto answer, medium speed, high speed, station selection, EBCDIC data transparency, intermediate block checking, and EBCDIC or ASCII code.

System/3 Model 4 or Model 6 with BSCA can be intermixed with other BSC terminals (System/360 Model 20, 1130, 1800, 2770, 2780, and 2715 Model 2) on a multipoint line when operating as a tributary station with a central System/360 or System/370 computer, using DOS BTAM, OS BTAM, or OS TCAM (except conversational TCAM) (see note 1). The system can also share the same phone number at the central System/360 or System/370 computer (see note 1) with other BSC terminals—System/360 or System/370 computers (see note 2), System/360 Model 20, 1130, 1800, 2770, 2780, and 2715 Model 2.

RPG II source programs containing telecommunications feature specifications can be compiled on the minimum system configuration (see *System Requirements*). For object program execution, the BSCA feature (Feature Number 2074) is required on the processing unit in addition to the other units specified. In addition, support of the 2770 or 2780 requires a minimum of 12K bytes.

Notes:

1. System/360 Models 22, 25, and 30 with DOS/360; Models 40, 50, 65, 67 (in 65 mode), and 75 with DOS/360 and OS/360; and Models 85, 91, and 195 with OS/360. System/370 Models 135, 145, and 155 with DOS and OS; and Model 165 with OS when operating in basic compatibility mode.
2. System/360 Model 22 with DOS; Models 25 and 30 with BOS/BPS or DOS/360; Models 40, 50, 65, 67 (in 65 mode), and 75 with BOS/BPS, DOS or OS/360; and Models 85, 91, and 195 with OS/360; System/370 Models 135, 145, and 155 with DOS and OS; and Model 165 with OS when operating in basic compatibility mode.

RPG II 3270 Display Control Feature, Feature Number 6030 (Model 4 only), provides users an alternate solution to batch teleprocessing for the development of programs using the IBM 3270 Information Display System. The 3270 Display Control Feature allows a user to write application programs that have full access to the 3270 system facilities.

The 3270 Display Control Feature offers the following:

- Low initial installation costs
- Full support of IBM 3270 displays and printers directly controlled by RPG II application programs
- Automatic control of terminal configurations
- Full support of the 3270 field concept
- Simple and flexible mapping support
- Easy system operation since application programs are batch programs
- Symbolic naming of up to 18 terminals

The 3270 Display Control Feature is written in System/3 Assembler and is linked into the application program through the SPECIAL file facility of RPG II. Because of the simplicity and ease of use of the Display Control feature, the user requires only a knowledge of RPG II and the IBM 3270 Information Display System, and a minimal knowledge of teleprocessing and line control.

The RPG II 3270 Display Control Feature operates in a dedicated System/3 Model 4 under control of the system control program.

The 3270 Display Control Feature operates on a minimum System/3 Model 4 configuration (see *System Requirements*) plus at least one locally attached 3270 device. It can also communicate with remote 3270 terminals via the optional BSCA feature.

Reference Material

- *IBM System/3 Model 6 RPG II Reference Manual*, SC21-7517
- *IBM System/3 Disk Systems RPG II Auto Report Feature General Information Manual*, GC21-7563
- *IBM System/3 RPG II Auto Report Feature Reference Manual*, SC21-5057
- *IBM System/3 RPG II Telecommunications Programming Reference Manual*, SC21-7507
- *IBM System/3 RPG II 3270 Display Control Feature Reference and Logic Manual*, SC21-5161

Programming Service Classification: A

The programming service classification assigned to any licensed program may be changed by IBM in accordance with the terms of the license agreement for IBM Program Products. Some reclassifications may constitute a discontinuance of service.

Note: The SPECIAL exit is included under the Class A Maintenance plan of the RPG II Program Product but Class A Maintenance will not be provided for a user's routine under the program product agreement for RPG II.

International Business Machines Corporation
General Systems Division
5775D Glenridge Drive N.E.
Atlanta, Georgia 30301
(USA Only)

IBM World Trade Corporation
821 United Nations Plaza, New York, New York 10017
(International)