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## **IBM System/360 Operating System: RDE Guide**

**OS Release 21**

This publication describes the Reliability Data Extractor (RDE), a control program option that can be included in any IBM System/360 Operating System using the Models 135,145,155,165, or 195. RDE allows the user to:

- Generate system initialization (IPL) and system termination (EOD) records, and collect them on SYS1.LOGREC.
- Print and accumulate the IPL and EOD records collected on SYS1.LOGREC.
- Write the records from SYS1.LOGREC to a measurement data set.
- Summarize and print the IPL and error data collected on the measurement data set.

This publication is intended for programmers who are using RDE and are involved in maintaining or using SYS1.LOGREC. The publication includes:

- A description of RDE.
- The information required to include RDE in a user's system.
- The information required to use RDE.
- A description of how RDE works.



Third Edition (January, 1972)

This is a major revision of, and obsoletes, GC28-6747-1. A Summary of Amendments follows the Contents. Changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

This edition applies to release 21 of IBM System/360 Operating System, and to all subsequent releases until otherwise indicated in new editions or Technical Newsletters. Changes are continually made to the information herein; before using this publication in connection with the operation of IBM systems, consult the latest IBM System/360 and System/370 SRL Newsletter, Order No. GN20-0360, for the editions that are applicable and current.

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This publication describes the Reliability Data Extractor (RDE), a control program option that can be included in any IBM System/360 Operating System using the Models 135,145,155,165, or 195. RDE allows the user to:

- Generate system initialization (IPL) and system termination (EOD) records, and collect them on SYS1.LOGREC.
- Print and accumulate the IPL and EOD records collected on SYS1.LOGREC.
- Write the records from SYS1.LOGREC to a measurement data set.
- Summarize and print the IPL and error data collected on the measurement data set.

This publication is intended for programmers who are using RDE and are involved in maintaining or using SYS1.LOGREC. The publication includes:

- A description of RDE.
- The information required to include RDE in a user's system.
- The information required to use RDE.
- A description of how RDE works.

The publication is divided into three sections. The first section is a brief description of RDE. The second section contains complete descriptions of how to specify and use RDE. It includes:

- System generation procedures.
- Operator responses.
- System messages.
- Record formats.
- Sample printouts.
- Examples.

The third section is a program logic summary of how RDE works.

Prerequisite information is contained in:

IBM System/360 Operating System: System Generation, GC28-6554

IBM System/360 Operating System: Service Aids, GC28-6719

The reader should also be familiar with:

IBM System/360 Operating System: Service Aids Logic, GY28-6721

IBM System/360 Operating System: Input/Output Supervisor Program Logic Manual, GY28-6616



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IFCEREPO SUMMARY FUNCTION

The IFCEREPO summary function allows the user to summarize and print the IPL and error data collected on the measurement data set. This function can be specified only if RDE has been included in the system.





The Reliability Data Extractor (RDE) is a control program option that can be included in any OS/360 MFT or MVT system using the Models 135, 145, 155, 165, or 195. Selecting RDE allows you to:

- Generate system initialization (IPL) and system termination (EOD) records, and collect them on the SYS1.LOGREC data set.
- Use the IFCEREPO service aid to print IPL and EOD records, and to print a summary of all the IPL and EOD records that are on the SYS1.LOGREC data set; this allows you to examine the records to determine the reasons for repeated system initializations.
- Use the IFCEREPO service aid to write the records from the SYS1.LOGREC data set to a measurement data set (generally a tape). The information on the SYS1.LOGREC data set includes, in addition to the IPL, and EOD records, error recording records from the SER1, SER0, MCH, MDR, CCH, and OBR error recording routines.
- Use the IFCEREPO service aid to summarize and print the IPL and error data collected on the measurement data set.



Using RDE requires:

- Getting RDE into your system by specifying it during system generation.
- Running RDE to generate the IPL and EOD records and to write them to SYS1.LOGREC; this is done by the operator in response to system messages.
- Using IFCEREPO to write the IPL and EOD records from SYS1.LOGREC to your own data set.
- Using IFCEREPO to create the measurement data set and write the records from SYS1.LOGREC to it.
- Using IFCEREPO to produce a sequential summary of the IPL records on the measurement data set, and a summary of the device error data on the measurement data set.

Specifying RDE During System Generation

To include the RDE option in your system, specify the keyword RDE in the OPTIONS= parameter of the system generation SUPRVSOR macro instruction as follows:

```
SUPRVSOR .....,OPTIONS=(..,RDE,..)
```

If you specify the RDE option, you must specify the models 135,145,155,165, or 195 in the MODELS= parameter of the system generation CENPROCS macro instruction.

See the publication IBM System/360 Operating System: System Generation for a description of the SUPRVSOR and CENPROCS macro instructions.

Running RDE

RDE writes two records in addition to the records normally written on SY1.LOGREC: an IPL record that is generated during each master scheduler initialization of the system, and an EOD record that is generated when the operator enters the HALT EOD command. The information in the IPL record contains the reason for restarting the system and names the type of equipment or program (if any) that is responsible for the restart. The EOD record defines the time span of processing for the RDE data.

## GENERATING THE IPL RECORD

The IPL record is generated when the operator replies to the system message:

```
id  IFB010D  ENTER 'IPL REASON, SUBSYSTEM ID' or 'U'
```

Message IFB010D requests the operator to provide: (1) the reason for the IPL, and (2) the device or program (subsystem) that was responsible for the restart.

The operator should reply to message IFB010D by entering the REPLY command as follows:

REPLY R	id,'rr,ss'
------------	------------

id

The identifier of the message IFB010D.

rr

The IPL reason codes; the reason for starting or restarting the system (Figure 1).

ss

The subsystem ID codes used with the IPL reason codes IE, IM, CE, and ME (Figure 2). The subsystem code for all other IPL reason codes is 00.

Code	Reason	Description
NM	Normal	Normal system initialization.
IE	IBM hardware/ programming problem, CE/SE not required	System restarted after a stop caused by a hardware failure or IBM programming problem and a CE/SE was not required.
IM	IBM hardware/ programming problem, CE/SE required.	System restarted after a stop caused by hardware failure or IBM programming problem and it was necessary for a CE/SE to perform corrective maintenance.
ME	Media	An IBM hardware unit failed because of faulty or damaged media (such as a damaged tape, disk etc).
UN	Unknown	An undetermined failure of either hardware or software.
OP	Operational	An operator error or procedural problem.
UP	User program	A program other than an IBM supplied system control program or programming product failed in such a way as to cause a system restart.
EN	Environmental	A failure other than hardware/software or operational caused the system to be restarted (power failure, air conditioning, etc).
CE	CE/SE has the system	System restarted at the request of the CE/SE to perform corrective maintenance.

Figure 1. IPL Reason Codes

ID	Subsystem Name	Components
00	Null	Subsystem is unknown or the subsystem code is not required by the reason code.
10	Processor	CPU, channels (for example integrated, 2860, 2870, 2880) storage units, operator consoles (for example 1052, 2150).
20	Direct access	2314, 3330, 2301, 2303, 2305, 2321, 2311 and other control units.
30	Other	All devices other than those specified under other subsystem IDs (for example 2911, 2914, paper tape).
40	Tape	24XX, 2803, 2816, 3420, 3803.
50	Card/Print	2821, 1403, 1442, 1443, 2540, 2520, 2501, 3811, 3211.
60	MICR/OCR	1419, 1287, 1288.
70	Teleprocessing	2701, 2702, 2703.
80	Graphics/Display /Audio	2840, 2250, 2848, 2260, 7770, 7772.
90	IBM System Control Program	IBM programming system (for example OS MVT or DOS).
91	IBM Programming Product	IBM programming products such as FORTRAN, COBOL, or RPG.

Figure 2. Subsystem ID Codes

Invalid reply to IFB010D: If the operator's reply to IFB010D is incorrect, the system will issue the message:

IFB020I INVALID REPLY TO IFB010D

The message IFB010D will then be repeated and the operator can enter the REPLY command with the proper codes, or, he can enter the REPLY command as follows:

REPLY R	id, 'U'
------------	---------

id  
The identifier of the message IFB010D.

U  
Assume the default values.

Restart will continue after either a valid or 'U' reply; in the case of a 'U' reply, the IPL record will be formatted with zeros in the subsystem id field and a X'DF' in the IPL reason field.

#### FORMAT OF THE IPL RECORD

When the operator's reply to message IFB010D is accepted, an IPL record containing the information supplied by the operator and additional information supplied by the RDE routines is written to SYS1.LOGREC. Figure 3 shows the format of the IPL record on SYS1.LOGREC.

← 8 bytes →			
0 (0) CLASSRC Class/ Source	1 (1) SYSREL System/ Release	2 (2)  SWITCHES	4 (4)  Not Used
8 (8)  DATE Date record was made		12 (C)  TIME Time record was made	
16 (10)  Not Used	17 (11)  CPUSER CPU Serial Number	20 (14)  CPUID CPU Identifier	22 (16)  MCELLING Maximum MCEL Length
24 (18) SUB SYSTEM Subsystem id	25 (19)  Not Used	28 (1C)  IPL REASON	30 (1E)  Not Used
32 (20)  CHANNEL ASSIGNMENT Channel Types			39 (27)  RDESWTCH
40 (28)  STORAGE Highest storage address		44 (2C)  Not Used	

Figure 3. IPL Record Format on SYS1.LOGREC

<u>Offset</u>	<u>Bytes and Bit Pattern</u>	<u>Field Name</u>	<u>Field Description</u>
0 (0)	1	CLASSRC	Class/Source
	.1.1 ....		IPL Record
1 (1)	1	SYSREL	System/Release level
	000x xxxx		OS
	..1x xxxx		DOS
	bits 3-7		
	0-1F		Release level 0-31.
2 (2)	2	SWITCHES	
	Byte 0		
	1... ....		More records follow.
	0... ....		Last record.
	.1.. ....		Time-of-Day clock.
	..1. ....		Reserved
	.... 1...		TIME macro used.
	...x .xxx		Unassigned
	Byte 1		Not used for IPL or EOD records.
4 (4)	4		Not used.
8 (8)	4	DATE	The date the record was made.
12 (C)	4	TIME	The time the record was made.
16 (10)	1		Not used.
17 (11)	3	CPUSER	CPU serial number (this field is not meaningful for the Model 195).
20 (14)	2	CPUID	CPU identifier (135,145,155,165, or 195)
22 (16)	2	MCELLING	Maximum machine check extended logout area length.
24 (18)	1	SUBSYSTEM	The type of device or program that caused the restart. See Figure 2.
25 (19)	3		Not used.
28 (1C)	2	IPL REASON	The reason for the IPL. See Figure 1.
30 (1E)	2		Not used.
32 (20)	7	CHANNEL ASSIGNMENT	The channel types in the system.
39 (27)	1	RDESWTCH	RDE in system.
	xxxx xxx1		
40 (28)	4	STORAGE	The address of the last valid byte of storage found at IPL time.
44 (2C)	4		Not used.

#### GENERATING THE EOD RECORD

The EOD record is generated when the operator enters the HALT EOD command. The HALT EOD command should be entered before the following conditions:

- When the power is turned off.
- When the system is entering a long wait state.
- When a program other than OS is going to be run.

FORMAT OF THE EOD RECORD

When the HALT EOD command is issued, an EOD record with the date and time is written to SYS1.LOGREC by the RDE routines. Figure 4 shows the format of the EOD record on SYS1.LOGREC.

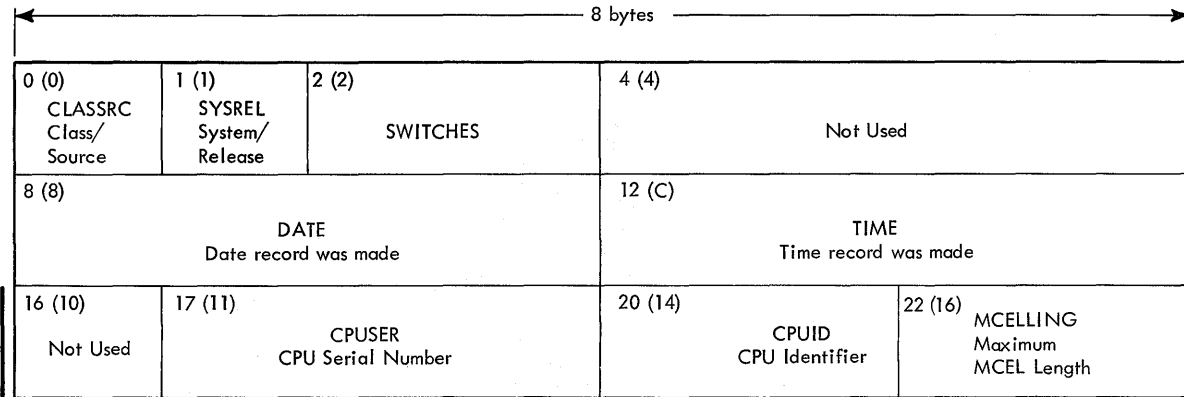


Figure 4. EOD Record Format on SYS1.LOGREC

Offset	Bytes and Bit Pattern	Field Name	Field Description
0 (0)	1	CLASSRC	Class/Source
1 (1)	1 000x xxxx ..1x xxxx bits 3-7	SYSREL	EOD Record OS DOS
2 (2)	2 0-1F	SWITCHES	Release level 0-31.
4 (4)	4 Byte 0 1... .. 0... .. .1... .. ..1. .... .... 1... ..x .xxx		More records follow. Last record. Time-of-Day clock. Reserved. TIME macro used. Unassigned.
8 (8)	4	DATE	Not used for IPL or EOD records. Not used. The date the record was made.
12 (C)	4	TIME	The time the record was made.
16 (10)	1		Not used.
17 (11)	3	CPUSER	CPU serial number (this field is not meaningful for the Model 195).
20 (14)	2	CPUID	CPU identifier (135,145,155,165, or 195).
22 (16)	2	MCELLING	Maximum machine check extended logon area length.



## SYSTEM MESSAGES

There are four messages that can occur when the RDE routines attempt to write the IPL or EOD records to SYS1.LOGREC: (1) an input/output error message, (2) a format error on SYS1.LOGREC message, (3) a data set full condition message, and (4) a measurement data set could not be opened message.

When any of the preceding messages occur, you must use IFCEREPO to write SYS1.LOGREC to the measurement data set. After SYS1.LOGREC has been written to the measurement data set, it can be cleared by writing it to the printer and/or to your own cumulative data set. For a complete explanation of IFCEREPO see the publication IBM System/360 Operating System: Service Aids.

Input/Output Error: When a permanent input/output error occurs during an attempted read or write of SYS1.LOGREC, the operator will receive the system error message:

IFB030I SYS1.LOGREC I/O ACCESS ERROR

The system will cancel any further attempt to write EOD or IPL records to SYS1.LOGREC until (1) IFCEPEPO is run to clear SYS1.LOGREC and (2) IFCDIP00 is run to reinitialize the data set.

Format Error On SYS1.LOGREC: When a format error on SYS1.LOGREC is detected during an attempt to write the IPL or EOD records, the operator will receive the system error message:

IFB050I SYS1.LOGREC FORMAT ERROR

The system will cancel any attempt to write IPL or EOD records to SYS1.LOGREC until (1) IFCEREPO is run to clear SYS1.LOGREC and (2) IFCDIP00 is run to reinitialize the data set.

Data Set Full Condition: When there is inadequate space on SYS1.LOGREC, the operator will receive the system error message:

IFB040I SYS1.LOGREC AREA IS FULL

The system will cancel any attempt to write IPL or EOD records to SYS1.LOGREC until IFCEREPO is run to clear SYS1.LOGREC.

Measurement Data Set: If IFCEREPO is used in an attempt to clear SYS1.LOGREC, and the measurement data set has not been created, or its DD card is incorrect, the operator will receive the system message:

IFC00FI DDNAME DD STATEMENT INCORRECT STEP TERM

IFCEREPO cannot be used to clear SYS1.LOGREC until the RDE routines have written SYS1.LOGREC to the measurement data set. For a complete explanation of IECEREPO and IECDIP00, see the publication IBM System/360 Operating System: Service Aids.

## Writing and Printing the IPL and EOD Records

You can examine the IPL and EOD records on SYS1.LOGREC by using the IFCEREP0 service aid to do the following:

- Print the individual IPL and EOD records collected on SYS1.LOGREC.
- Print a summary of the IPL and EOD records collected on SYS1.LOGREC; this summary consists of a list of pertinent items selected from the individual records.
- Accumulate a history of all the IPL and EOD records on your own cumulative data set and print the cumulative data set at your convenience.

Figures 5 and 6 show sample IPL and EOD record printouts. Figures 7 and 8 show sample IPL and EOD record summaries.

```
DATE          DAY  YEAR          HH MM SS TH
089          089  71          TIME 08 00 00 00

MODEL - 155          CPU SERIAL NO. - 237912

-- CHANNEL TYPE --
CHANNELS 0 - 14

MPX          SEL  SEL  SEL  MPX  BLKMPX BLKMPX UNATT
UNATT        UNATT UNATT UNATT UNATT UNATT UNATT

IPL REASON CODE - NM NORMAL
SUBSYSTEM ID - 00
HIGHEST STORAGE ADDRESS 000FFFFF

END OF IPL RECORD
```

Figure 5. Sample Printout - IPL Record

```
DATE          DAY  YEAR          HH MM SS TH
089          089  71          TIME 23 00 00 00

MODEL - 155          CPU SERIAL NO. - 237912

END OF EOD RECORD
```

Figure 6. Sample Printout - EOD Record

```

SUMMARY OF IPL RECORDS
                DAY YEAR  DAY YEAR
DATE RANGE FROM  067  71 TO 090  71

NO. OF RECORDS 054

SUBSYSTEM NAME AND NUMBER OF OCCURRENCES

NULL           032  PROCESSOR           010
TAPE           005  TELEPROCESSING      002
MICRIOCR       000  GRAPHIX/DISPLAY/AUDIO  000
CARD/PRINT     000  IBM CONTROL PROGRAM    001
DIRECT ACCESS  002  IBM PROGRAMMING PRODUCT 001
OTHER          000

IPL REASON CODE AND NUMBER OF OCCURRENCES

NORMAL         025      MEDIA           001
UNKNOWN        004      OPERATIONAL      000
USER PROGRAM   001      ENVIRONMENTAL    001
IBM HARDWARE PROGRAMMING PROBLEM CE/SE NOT REQUIRED - 000
IBM HARDWARE PROGRAMMING PROBLEM CE/SE REQUIRED   - 13
CE/SE HAS THE SYSTEM      007
INVALID IPL REASON CODE  001
DEFAULT - U    001

END OF IPL SUMMARY

```

Figure 7. Sample Printout - IPL Summary

```

SUMMARY OF EOD RECORDS
                DAY YEAR  DAY YEAR
DATE RANGE FROM  067  71 TO 089  71

NO. OF RECORDS 020

END OF EOD SUMMARY

```

Figure 8. Sample Printout - EOD Summary

### Example 1: Writing, Summarizing, and Accumulating IPL and EOD records

In this example:

- IPL and EOD records are moved to an accumulated output data set.
- IPL and EOD records are printed in a full record format.
- IPL and EOD records are summarized.
- A measurement data set is created.
- SYS1.LOGREC is reset.

```

//JOBA    JOB
//        EXEC    PGM=IFCEREPO,PARM='TYPE=IE,ACC=Y,PRINT=PS,ZERO=Y'
//SERLOG  DD      DSNAME=SYS1.LOGREC,DISP=(OLD,KEEP)
//EREPTT  DD      SYSOUT=A
//ACCDEV  DD      DSNAME=ACCUMSET,UNIT=2311,DISP=(NEW,CATLG)
//        VOLUME=SER=111112,SPACE=(TRK,(40,10))
//MEASURE DD      DSNAME=EREPTAPE,UNIT=2400,LABEL=(,SL),
//        DISP=(NEW,KEEP),VOL=SER=EREPTT

```

#### Control Statements for Example 1

The EXEC statement specifies (1) that IPL (TYPE=I) and EOD (TYPE=E) records are to be processed, (2) the type of printout (full record and summary), and (3) accumulation.

The SERLOG DD statement defines the input (SYS1.LOGREC) data set.

The EREPTT DD statement defines the edited output data set. The output records are written on the system output device (printer assumed).

The ACCDEV DD statement defines the accumulated output data set. The MEASURE DD statement defines the measurement data set; the DSNAME must be EREPTAPE.

## Creating and Updating the Measurement Data Set

When you use RDE, you must create and update a measurement data set. The measurement data set is created by running IFCFREPO and updated by periodically running IFCEREP0 to write the contents of SYS1.LOGREC to it. The contents of SYS1.LOGREC includes IPL and EOD records written by the RDE routines, and error recording records from the SER1, MDR, MCH, CCH, and OBR error recording routines. The measurement data set should always be updated, in time order sequence, on the same magnetic tape volume.

### Example 2: Creating the Measurement Data Set, Printing all Records on SYS1.LOGREC, and Summarizing all Records on SYS1.LOGREC

In this example:

- All records on SYS1.LOGREC are printed and summarized.
- A measurement data set is created on standard label tape.
- The SYS1.LOGREC data set is reset.

```

//JOBA   JOB
//      EXEC   PGM=IFCEREP0
//SERLOG DD   DSNAME=SYS1.LOGREC,DISP=(OLD,KEEP)
//EREPTT DD   SYSOUT=A
//MEASURE DD  DSNAME=EREPTAPE,UNIT=2400,LABEL=(,SL),
              DISP=(NEW,KEEP),VOL=SER=EREPTT

```

### Control Statements for Example 2

The EXEC statement: specifies (1) that all records are to be printed and accumulated, (2) the type of printout (full record and summary), and (3) the measurement data set is to be created.

The SERLOG DD statement defines the input (SYS1.LOGREC) data set.

The EREPTT DD statement defines the edited output data set. The output records are written on the system output device (printer assumed).

The MEASURE DD statement defines the measurement data set; the DSNAME must be EREPTAPE.

Example 3: Updating the Measurement Data Set, Printing all Records on SYS1.LOGREC, and Summarizing all Records on SYS1.LOGREC

In this example:

- All records on SYS1.LOGREC are printed and summarized.
- The old measurement data set is updated with data from SYS1.LOGREC.
- SYS1.LOGREC is reset.

```
||//JOBA    JOB
||//      EXEC  PGM=IFCEREPO
||//SERLOG DD  DSNAME=SYS1.LOGREC,DISP=(OLD,KEEP)
||//EREPTT DD  SYSOUT=A
||//MEASURE DD DSNAME=EREPTAPE,UNIT=2400,LABEL=(,SL,)
||//      DISP=(MOD,KEEP),VOL=SER=EREPTT
```

Control Statements for Example 3

The EXEC statement: specifies (1) that all records are to be printed and accumulated, (2) the type of printout (full record and summary), and (3) the records are to be written to the measurement data set.

The SERLOG DD statement defines the input (SYS1.LOGREC) data set.

The EREPTT DD statement defines the edited output data set. The output records are written on the system output device (printer assumed).

The MEASURE DD statement defines the measurement data set; the DSNAME must be EREPTAPE.

## Printing a Summary of the Information on the Measurement Data Set

You can print a summary of the IPL and error records on the measurement data set by specifying the summary function of the IFCEREPO service aid. IFCEREPO will process the records on the measurement data set and print the following reports for any time period that you specify.

- An IPL report that contains each IPL in sequence, with the date and time of the IPL, the reason for the IPL, and the subsystem, if any, that was responsible for the IPL. In addition, the average time between IPLs will be printed on the report.
- A hardware error report that contains a count of the errors for each device, CPU, and channel in the system. The error count is divided into two types: severe errors -- errors that caused the system to be stopped and reinitialized -- and non-severe errors -- errors that affected system performance, but did not cause the system to be reinitialized.

### SPECIFYING THE SUMMARY FUNCTION

You specify the summary function in the procedure for running the IFCEREPO service aid. Specifying the summary function, requires:

- Coding PARM='RDESUM=Y' on the EXEC statement.
- Adding a control card after the SYSIN DD statement.

When you specify the summary function, IFCEREPO will not perform any other function within the same job step; it will only produce IPL and error reports.

### Example 4: Processing the Measurement Data Set to Produce IPL and Error Reports

In this example the measurement data set is processed to produce IPL and error reports.

```
| //JOBA  
| //      EXEC  PGM=IFCEREPO,PARM='RDESUM=Y'  
| //EREPT  DD   SYSOUT=A  
| //RDETP  DD   DSNAME=EREPTAPE,UNIT=2400,LABEL=(,SL),  
| //      DISP=(OLD,KEEP),VOL=SER,EREPTP  
| //SYSIN  DD   *  
| (Control Card)  
| /*
```

#### Control Statements for Example 4

The EXEC statement specifies that the summary function of IFCEREPO is to be run (the default is 'RDESUM=N'). If any additional parameters are specified, they will be ignored.

The EREPPT DD statement defines the edited output data set. The output records are written on the system output device (printer assumed).

The RDETP DD statement defines the input (measurement) data set.

The SYSIN DD statement indicates that input in the form of a control card will follow.

The Control Card is necessary to initiate processing of the summary function.

Its format is:

Field	Length	Position	Comments	Default
Identification	6	1-6	Control Card Identifier 'CTLCRD'	None - You must specify 'CTLCRD'.
Report Starting Date	5	11-15	The date specified as YYDDD that you want the report to begin on. This date must be within 30 days of the date of the first record on the measurement data set.	None - You must specify the date.
Report Ending Date	5	17-21	The date specified as YYDDD that you want the report to end on.	Last available data on the measurement data set.
IPL Clustering Interval (See note)	2	23-24	The numeric clustering interval specified in minutes.	No Clustering
Company	55	26-80	EBCDIC company name.	Blanks.

Note: IPL clustering will indicate how often the system was initialized within the clustering interval that you specify on the control card. For example: if you specify a clustering interval of 30 minutes, the IPL report will print all groups of IPLs that occurred within 30 minutes of each other.



## ERROR MESSAGES

Six errors can occur when you run the summary function of IFCEREPO:

1. A sequence error on the measurement data set.
2. A starting date error on the control card.
3. An ending date error on the control card.
4. A clustering error on the control card.
5. A missing control card in the IFCEREPO procedure.
6. No IPL records on the measurement data set.

Each of the following error messages will be written on the output device specified in your IFCEREPO procedure.

Sequence Error: When the measurement data set contains 16 or more consecutive records that are out of sequence, the message:

```
IFC020I 'ENCOUNTERED MORE THAN 16 SEQ ERRORS STOP RUN'
```

will be issued. The IPL report includes system initializations up to the point of the error, but does not include clusters or mean IPL time. The hardware error report is not printed. The IFCEREPO job step is terminated.

Starting Date Error: When the report starting date specified on the control card is not numeric or before January 1, 1960, the message:

```
IFC021I 'INVALID START DATE CORRECT AND RESTART THE JOB'
```

is issued. The IFCEREPO job step is terminated.

Note: The starting date specified on the control card must be completely numeric and within 30 days of the first record on the measurement data set.

Ending Date Error: When the end date specified on the control card is not completely numeric, the message:

```
IFC022I 'INVALID END DATE CORRECT AND RESTART THE JOB'
```

will be issued. The IFCEREPO job step is terminated.

Clustering Error: When the IPL clustering interval specified on the control card is not all numeric, the message:

```
IFC023I 'INVALID CLUSTER VALUE CORRECT AND RESTART THE JOB'
```

will be issued. The IFCEREPO job step is terminated.

Control Card Error: When the control card is missing from the IFCEREPO procedure for running the summary function, the message:

```
IFC024I 'SUPPLY AN RDE CONTROL CARD AND RESTART THE JOB'
```

will be issued. The IFCEREPO job step is terminated.

IPL Record Error: If there are no IPL records on the measurement data set, the message:

```
IFC025I 'NO IPL RECORDS PROCESSED'
```

will be issued. IFCRDESM processing will continue, but no IPL and error reports are produced.

ERROR REPORT FORMAT

Figure 9 shows the format of an error report printed by the summary function of IFCEREP0. The figure is followed by notes explaining each of the fields in the error report.

<u>STATISTICS OF ERRORS FROM HARDWARE UNITS ON MODEL 165 SYSTEM</u>		
<u>NON-TRANSPARENT ERRORS</u>		
<u>SUBSYSTEM</u> <span style="border: 1px solid black; padding: 0 2px;">1</span>	System Continued <span style="border: 1px solid black; padding: 0 2px;">2</span> To Operate (Possible Partial Degradation)	System Stopped <span style="border: 1px solid black; padding: 0 2px;">3</span> Re-IPL Required
<u>PROCESSOR SUBSYSTEM</u>		
CPU	1	2
STORAGE	3	1
<u>CHANNELS</u>		
1	2	1
2	0	1
3	1	0
TOTAL	3	2
UNKNOWN PROCESSOR	1	1
TOTAL	8	6
<u>TAPE SUBSYSTEM</u>		
180	5	3
181	1	0
280	3	0
281	1	2
282	1	0
UNKNOWN	0	1
TOTAL	11	6
<u>DASD SUBSYSTEM</u>		
336	0	1
337	2	0
UNKNOWN	0	1
TOTAL	2	2
UNKNOWN SUBSYSTEM	0	1

Figure 9. Hardware Error Report Produced by IFCEREP0 Summary Function

## Notes on Figure 9

### 1. Subsystem

This column contains the equipment in your system that had an error recorded for it. It is divided into subsystems (processor, tape, DASD, and unknown), and the addresses are specified whenever possible.

### 2. System Continued to Operate

This column contains the number of non-severe errors that occurred for each subsystem -- errors in this column are severe enough to degrade system performance, but not severe enough to force the system to be re-initialized. For errors of this type, the system has recovered by using the hardware or error recovery procedures. The recovery procedures may have cancelled the job associated with the error. An example of this type of error is a transmit error from tape to core storage. This error results from the transfer of invalid data and may be caused by a faulty tape drive or a bad tape. The system error recovery procedures will attempt to retry reading the tape. If it is impossible to read the section of invalid data, the error will be considered permanent and the associated error recovery program will be notified of the condition. If the error recovery program has not been provided for a permanent error, the job will be terminated.

### 3. System Stopped

This column contains the number of severe errors that occurred for each of the subsystems -- errors in this column are severe enough to force the system to be re-initialized. This type of error occurs when the normal error recovery procedures fail to recover from the error.

IPL REPORT FORMAT

Figure 10 shows the format of an IPL report produced by the summary function of IFCEREPO. The figure is followed by notes explaining the fields in the IPL report.

XYZ CORPORATION				
STATISTICS OF IPL'S DUE TO ALL CAUSES ON THE MODEL 165 SYSTEM				
STARTING DATE OF REPORT = 70.313				
<b>1</b> SEQUENCE #	DATE	TIME	IPL RECORD REASON FOR IPL* <b>2</b>	SUBSYSTEM RESPONSIBLE* <b>3</b>
1	70.313	07.43.31	MM-Normal IPL	00-Normal or Unknown
2	70.313	09.12.51	IF-IBM Problem-No Ce/Se Reqd	20-DASD
3	70.313	09.21.10	IF-IBM Problem-No Ce/Se Reqd	40-Tape
4	70.313	09.25.13	IE-IBM Problem-No Ce/Se Reqd	40-Tape
5	70.313	09.43.57	UN-Unknown	00-Normal or Unknown
6	70.313	13.27.01	IM-IBM Problem-Ce/Se Reqd	70-Tele-processing
7	70.313	19.33.41	OP-Operational Problem	00-Normal or Unknown

\* Please note this information was provided by operator.

ENDING DATE OF REPORT: 70.313

Average Running TIME/IPLS: 101 MINUTES. **4**

IPL CLUSTERING, MULTIPLE IPL'S WITHIN 30 MINUTES: **5**

GROUP 1 - 2-4  
GROUP 2 - 3-5

END OF IPL REPORT

Figure 10. IPL Report Produced by IFCEREPO Summary Function

## Notes on Figure 10

### 1. Sequence Number

The lowest sequence number is for the first IPL recorded during the report period you specified on the control card; the highest sequence number is for the last IPL recorded during the report period you specified on the control card.

### 2. IPL Record Reason for IPL

The IPL reason code provided by the operator in reply to system message IFB010D. The reason code is taken from the IPL record on the measurement data set. (See Figure 1)

### 3. Subsystem Responsible

The subsystem id provided by the operator in reply to system message IFB010D. The subsystem id is taken from the IPL record on the measurement data set. (See Figure 2)

### 4. Average Running Time/IPL

The total running time divided by the number of IPLs. This number cannot be larger than 4 decimal digits.

### 5. IPL Clustering Multiple IPLs Within 30 Minutes

This field contains the groups, by sequence numbers, of IPLs that occurred within 30 minutes of each other. In this figure, 30 minutes was specified as the clustering interval. Group 1 contains the IPLs with sequence numbers 2,3, and 4. Group contains the IPLs with sequence numbers 3,4, and 5. The sequence numbers in this field cannot exceed 99. When 99 is reached, the next sequence number will be 1.



RDE has been implemented as an additional function of the IFCEREPO service aid. The additional function has caused the following changes or additions to the system control program modules:

- The master scheduler modules IEEVIPL and IEESD569 have been modified to load register 0 with an 8 prior to issuing SVC 76.
- SVC 76 (IGC0007F) has been changed from a type 3 SVC to a type 4 SVC with the addition of three modules IGC0107F, IGC0207F, and IGC0307F.
- The RDE portion of IFCEREPO consists of two modules: IFCRDE03 and IFCRDESM. IFCRDE03 reads the SYS1.LOGREC data set and writes it to the printer or to the measurement data set. IFCRDESM summarizes the IPL and EOD records on the measurement data set.

### Writing the IPL and EOD Records

SVC 76 is used to write the IPL and EOD records to SYS1.LOGREC. SVC 76 will gain control:

- During master scheduler initialization of the system. The master scheduler will load an 8 in register 0 and issue SVC 76. The 8 in register 0 causes SVC 76 to issue an operator message requesting the IPL reason code and the subsystem id code. With this information, RDE writes an IPL record on SYS1.LOGREC. Control is then returned to the master scheduler.
- When the operator enters the HALT EOD command. A 0 is loaded into register 0, and SVC 76 is issued. The 0 in register 0 causes SVC 76 to write the EOD record to SYS1.LOGREC.

See the publication IBM System/360 Operating System: Input/Output Supervisor PLM, for a further explanation of SVC 76.

Figure 11 shows the processing modifications to SVC 76 for RDE.

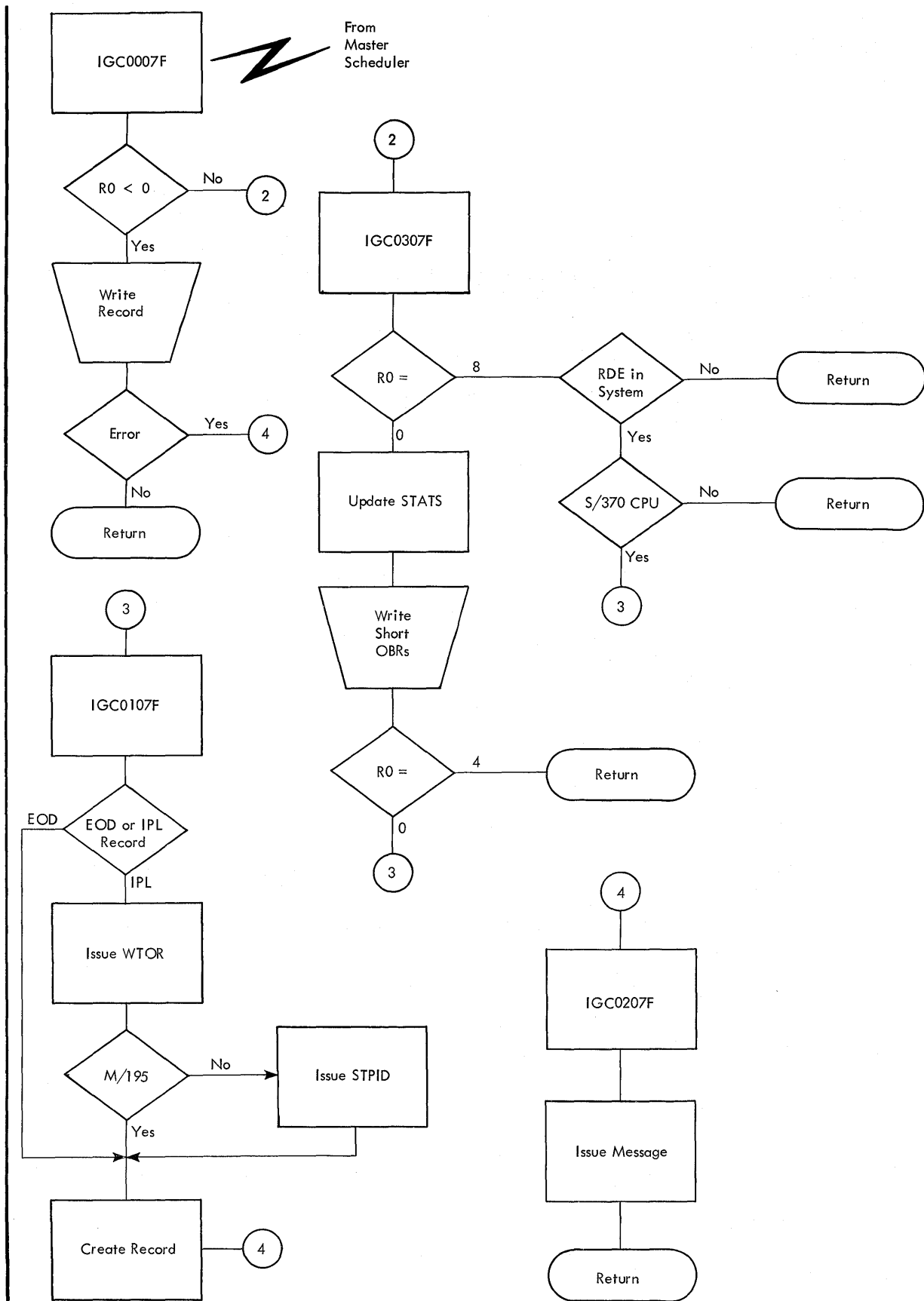


Figure 11. RDE Modifications to SVC 76



## Writing to the Measurement Data Set

The IFCEREPO service aid is used to write to the measurement data set. When IFCEREPO control modules (IFCEREPO and IFCEREPI) are loaded, IFCEREPI determines if RDE has been selected. If RDE has been selected during system generation, IFCEREPI will link to IFCRDE03. IFCRDE03 reads SYS1.LOGREC, writes it to the measurement data set, and returns control to IFCEREPO. See the publication IBM System/360 Operating System: Service Aids Logic for an explanation of IFCEREPO.

Figure 12 shows how IFCRDE03 works.

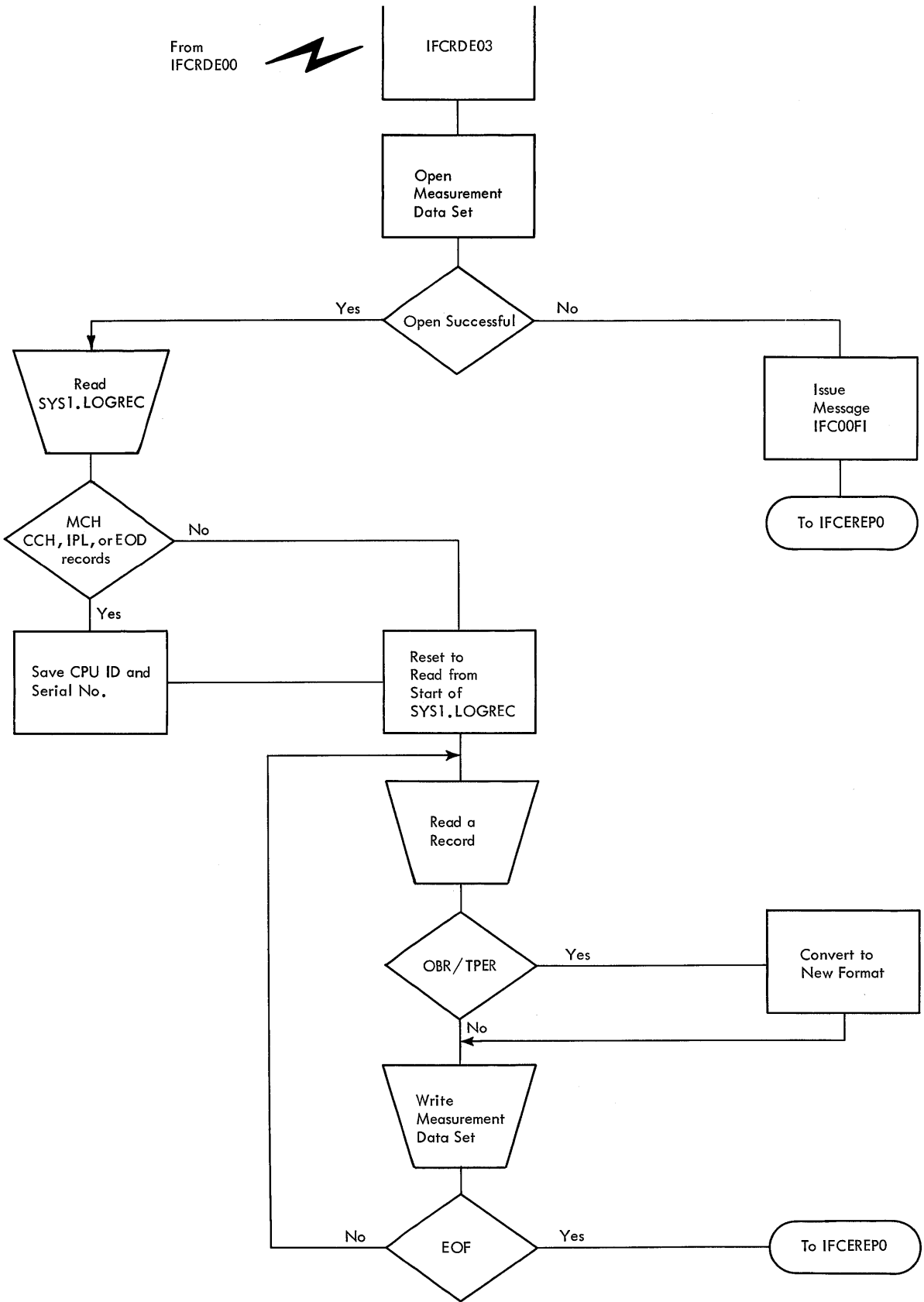


Figure 12. RDE Modifications to IFCEREPO

## Writing the IPL and Error Summaries

The IFCEREPO service aid is used to write the IPL and error records. When IFCEREPO control modules (IFCEREPO and IFCEREPI) are loaded, IFCEREPI determines if the parameter 'RDESUM=Y' has been specified. If 'RDESUM=Y' has been specified, IFCEREPI does an XCTL to module IFCRDESM. IFCRDESM processes and writes the summaries and returns control to the control program; IFCRDESM does not return to IFCEREPI and normal IFCEREPO processing will not resume after IFCRDESM finishes.



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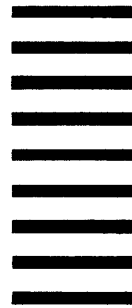
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