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IBM System/360 Time Sharing System

Test and Maintenance

User's Guide

This publication describes, for the IBM System/360 Time Sharing System (TSS/360), how to use the On Line Test System (OLTS), and how to retrieve system error recordings using the Error Recording Edit and Print (EREP67/VMEREP) procedures. Device partitioning and system quiescence are described, and the error recordings interpreted.

This publication is meant for use by system monitor and/or maintenance personnel. It may be used to determine the hardware component responsible for failures, and in the testing of the component.

PREFACE

This publication is divided into two sections. The first section contains the information necessary for using the On Line Test System (OLTS) to test devices used with IBM TSS/360. The second section describes the methods for retrieving error information that has been recorded on the paging drum. The use of the Error Recording Edit and Print (EREP67) and Virtual Memory Error Recording Edit and Print (VMEREP) procedures is described for this retrieval.

Three appendixes are included. One contains sample terminal sessions showing the use of OLTS for testing devices. Another describes methods for partitioning and quiescing TSS/360. A third is an aid for interpretation of the error records retrieved by EREP67 and VMEREP.

There are no prerequisite publications.

First Edition (September 1970)

This edition applies to Version 8, Modification 0, of IBM System/360 Time Sharing System, and to all subsequent releases until otherwise indicated in new editions or Technical Newsletters. Changes are periodically made to the specifications herein; before using this publication in connection with the operation of IBM systems, refer to the latest edition of IBM System/360 Time Sharing System: Addendum, Form GC28-2043, for the editions of publications that are applicable and current.

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CONTENTS

ILLUSTRATIONS

The On-Line Test System (OLTS) and the Virtual Memory Error Recording Edit and Print (VMEREP) routines complement each other as maintenance tools. The system monitor, either by running VMEREP himself, or by studying the results of periodic VMEREP recordings, can determine which devices should be tested with OLTS. It may even be possible to determine which of the OLTS tests would point to the problem on the failing device. The operation and interpretation of errors, for both programs, are explained in this book.

OLTS UNDER TSS/360

The On-Line Test System (OLTS) consists of a set of routines composing the On-Line Test Control Program (OLTCP), and a group of programs that can be used by system monitors to test failing equipment, to verify repair, as a tool in adjustment, or for periodic check of peripheral equipment such as the IBM 1050 and IBM 2741 terminals, the IBM 2311 and IBM 2314 disks, etc. A system monitor is defined as a user with the 'E' privilege. This section illustrates procedure from log-on to log-off; lists commands, fields, options, delimiters, and tables; and presents sample terminal sessions and error output under TSS/360.

OLTS is designed to take advantage of the TSS/360 conversational mode, in which OLTS runs as any other TSS/360 task. Before the facilities of the system can be utilized, the system monitor must become a user. This implies the user of a USERID and PASSWORD, and the 'E' privilege.

OLTS Walk-Through

The following steps are numbered in the order in which they might occur for any given OLTS session.

1. The system monitor is allocated a USERID and PASSWORD, and the 'E' privilege; he is then joined to the system by the system administrator. The procedure for this may vary from system to system, however it need be done only once.

2. The system monitor should ensure that the device to be tested is not in use (or is SYSIN), and that the required CE Test Packs are mounted. If the system monitor is at a remote terminal, this function will be performed after step 6 by OLTCP generated system messages to the operator.

3. The system monitor dials into the system and goes through the log-on procedure.

4a. If a Terminal Table is to be used, it is now built or modified.

4b. If a Subsystem Table is to be used, it is now built or modified.

5. The On Line Test System is called by using the SYSTEST command.

6. The DEVICES/TESTS, ROUTINES/OPTIONS fields are entered.

7. Response is made to any prompting or diagnostic message.

8. The available tests are run, and results printed at the system monitor's terminal.

9. The system monitor ends the terminal session via the LOGOFF command.

Notes and Restrictions

The following suggestions and restrictions may be helpful when using OLTS.

- The device-diagnostic programs generate their own messages which are separate from those generated by the OLTS Control Program, and may

require their own responses. If a copy of the diagnostic program is not available, a response of:

I = Initialization
E = End of OLTCP

- CE-format disk packs should not be up at Startup.
- Devices must be compatible with tests. Two or more entries in the DEVICE field must be of the same device type.
- If the TEST or OPTION is being changed for a device, the DEVICE field may be defaulted and the same device will be tested again (see Sample Terminal Session 3).
- A direct access device that is not ready, does not have a CE-format pack, or has an unreadable R0, will cause the following message on the operator's console:

  CANNOT VERIFY MOUNT OF CE VOLUME ON 00XX.

  ENTER Y FOR MOUNTED, NO FOR SKIP TEST, R FOR READ ONLY.

  If the device is ready and has a scratch-pack or a CE-pack mounted, respond R to allow read-only. For a CE pack, this may help define the trouble. If the device is not ready, make it ready and respond Y if CE format, or R if scratch-format.

- Do not activate the Error Loop or Scope Loop options after an error.
- Testing 2702 lines -- The system operator must do a HOLD on line 0, as well as all other lines to be tested. A HOLD on a line that is in use will ABEND that user's task. (See the section on "Allocation of Non-SYSIN Lines.")
- Testing terminals -- No Terminal Table or HOLD is required for SYSIN.

A Terminal Table is necessary for testing non-SYSIN terminals or for testing more than one terminal at a time.

Do not specify Test Loop when testing SYSIN. Attention interruptions are processed by the test section; dynamic modifications cannot be made.

Error Loop is recommended since routines may be skipped, added, or repeated under control of the master terminal.

When multiple terminals are tested, the first entry is the master and each subsequent entry is secondary. The master is tested in order with each secondary.

LOG-ON PROCEDURE

The system monitor must be assigned the 'E' privilege class by the system administrator. The system administrator also assigns the USERID and PASSWORD. (A system may have one USERID and PASSWORD for all system monitors, however they need be assigned only once.)

The general procedure for logging on is:

1. Turn on the power for the terminal and reset the data check that will occur.

2. Press the TALK button on the data phone and dial a line number for the system. When the steady tone occurs, press the DATA button.

3a. If the terminal is a 2741, the keyboard will unlock as the signal to log-on.

3b. If the terminal is a 1050, the PROCEED light is the signal to log-on.

4. The LOGON command may be entered with a USERID and PASSWORD or USERID only, with the PASSWORD prompted for by the system.

Without prompt:

```
LOGON  USERID,PASSWD
```

The system response includes the TASKID, date and time.

With prompt:

```
LOGON  USERID
B003   ENTER PASSWD
MMMMMMMM  (The system provides a combination of characters over
  which the PASSWORD can be entered.  This should provide securi-
  ty for a user's password.)
```

The system response includes the TASKID, data and time.

CALLING IN OLTS

When log-on has been accepted by the TSS/360, the On Line Test System must be called by the system monitor. He does this by entering the SYSTEST command, which elicits this response:

```
SYSTEST

ENTER P FOR PROMPTING OR DEVICES/TESTS,ROUTINES/OPTIONS
```

The system monitor must now specify:

1. The DEVICE to be tested.

2. The TEST sections and ROUTINES to be run.

3. The OPTIONS that will be in effect.

As indicated in the system response, if the system monitor wants to use the prompting mode, these input parameters will be requested one field at a time (see sample terminal session 1).

Delimiters

The delimiter separating each field is a slash. During input stream analysis, the program assumes it is within a field until a slash or an end-of-message character is encountered.

```
slash   /
```

The delimiters within a field are the comma, the hyphen, and the right and left parentheses.

```
Comma   ,
Hyphen  -
```

Left Parenthesis (
Right Parenthesis)

The comma is the basic separator; example:

1D,21
specifies symbolic devices 1D and 21.

The dash is the inclusive generator; example:

1D-21
specifies symbolic devices 1D,1E,1F,20, and 21

Parentheses enclose characters describing a specific path; example:

040(08C0)
describes device 040 via physical address 08C0.

SPECIFYING FIELDS FOR DEVICES/TESTS,ROUTINES/OPTIONS

This section contains an overview that gives examples of the possible entries, as well as very specific information concerning the individual fields.

Overview

Examples of possible entries and their meanings:

21,23-25/2311A/NEP
tests specific 2311s that are assigned Symbolic Device Address (SDA) 21, 23, 24, and 25; test section A; no error print.

T1050/1050A,2-4,6
tests the SYSIN device (S1050 would do the same thing); test section A - routines 2, 3, 4, and 6; options defaulted.

02A(0B04)/2311A-C/NCP
tests the 2311 specified as SDA 02A via physical device path 0B04; using test sections A, B and C; no control-print.

S03,T05-T07/2741A
tests the 2741 (SYSIN) which is the 3rd entry in the Terminal Table, and those 2741s that are the 5th, 6th and 7th entries; test section A; options defaulted.

SUB10/2314B,A/SL
tests those 2314s listed in the 10th entry of the Subsystem Table; test section B then A; scope loop option (see "Option Selection").

040/2400
tests the tape drive specified as SDA 40; all test sections are run (see "Multiple Test Selection"); options defaulted.

DEVICE Selection

The DEVICES field names the devices to be tested. This field consists of one or more entries of the same device type, separated by commas and ended by a slash. The DEVICE field entries are in one of three forms.

1. 1 to 4 hexadecimal characters representing the Symbolic Device Allocation (SDA) number assigned to the device at SYSGEN time. This entry would describe a 1403, 2311, 2314, 2400, 2540, 2541, 2702, or 2703.

Examples:

10,0A,08/
represents the devices specified by SDAs 10, 0A, and 08 respectively. The symbolic address will be displayed on the device at most locations.

1E-21/
describes SDA devices 1E, 1F, 20 and 21.

040(08C0)/
describes device 040 via physical path 08C0.

10,1E-21, 040(08C0)/
describes the combination defined in a, b, and c.

2. Terminals (1050,2741) - Testing SYSIN terminals is generally handled differently from testing terminals that are not SYSIN.

SYSIN T1050/ OR S1050/
T2741/ OR S2741/

Note that without a terminal table, SYSIN may be represented with either a T or an S. For the designated terminal type, either representation will test SYSIN.

Non-SYSIN

For terminals that are not SYSIN, or SYSIN terminals declared in a Terminal Table, the DEVICES field format is a 2-4 character representation associated with a line number in the Terminal Table. (See "Table Generation and Use," for procedure, restrictions, and allocation of terminals.)

TXXX if the terminal is <u>not</u> SYSIN
SXXX if the terminal is SYSIN
where XXX are decimal numbers corresponding to the line number in the Terminal Table. Note that to test a terminal that is not SYSIN, or to test two terminals at the same time, a Terminal Table <u>must</u> be used.

Examples:

T07/
specifies the 7th entry in the Terminal Table (not SYSIN).

T002,T004/
specifies the 2nd and 4th entries in the Terminal Table (not SYSIN).

T15-T17/
specifies the 15th, 16th, and 17th entries in the Terminal Table (not SYSIN).

S7,T12/
specifies the 7th entry (SYSIN) and the 12th entry (not SYSIN) in the Terminal Table.

3. A 5-character representation associated with a line number in the Subsystem Table (see "Table Generation and Use"). The format is:

SUBXX
WHERE XX are decimal numbers associated with a line number in the Subsystem Table.

Examples:

SUB02/
specifies the devices defined by the 2nd entry in the Subsystem Table.

SUB11/
specifies the devices defined by the 11th entry in the Subsystem Table.

TESTS and ROUTINES Selection

The TESTS, ROUTINES field specifies the test section and routine numbers to be run. The ROUTINES portion of the field is permitted only when a single TEST section is run. The field entries are separated by commas and the field is ended with a slash.

TEST SECTIONS AVAILABLE		
Direct Access		
2311	A through E	Disk drive tests
2314	A through E	Disk drive tests
2311	G through O	Control unit tests
2314	G through O	Control unit tests
2841	A through I is an alias for 2311 G through O	
Tape and Unit Record		
2400	A through O	Tape drive tests
1403	A through Q	Printer tests
2540	A-B	Punch tests
2541	A-B	Reader tests
Terminals		
1050	A	1050 terminal test
2741	A	2741 terminal test
Transmission Control Units		
2702	A through C	Interface and Wrap Tests
2703	A through C	Interface and Wrap Tests
2702D and 2703D		IBM Type 1 Terminal Control
2702E and 2703E		IBM Type 2 Terminal Control
2702F and 2703F		TTY Type 1 Terminal Control
2702G and 2703G		TTY Type 2 Terminal Control

Figure 1. Available Test Sections

The first four characters of this field identify the type of device to be tested. The next character or characters depend on whether one runs Single Test Selection with ROUTINES defaulted; Single Test Selection with ROUTINES specified; or Multiple Test Selection, and selection when available TESTS are not known.

1. Single Test Selection, default ROUTINES

   This entry consists of the 4-character device type and a 1-character test section.

2311A/
2314G/
2702E/
1050A/ specifies the test section as shown (2311A, 2314G, 2702E, or 1050A respectively) and all routines covered by the Normal Routine Mask for that test. The normal routines for any specific test can be found in the description of the diagnostic program. Any optional routine (routine not specified in the Normal Routine Mask) must be specified (see below).

2. Single Test Selection, ROUTINES specified

This entry consists of the 4-character device type and a 1-character test section, followed by the individual routines requested.

1050A,1,3,9/
specifies test section 1050A, routines 1, 3, and 9

2314E,1-3,5/
specifies test section 2314E, routines 1, 2, 3, and 5

Note that routines can be specified only by using the Single Test option. Also, some routines of a test may be optional and therefore will be run only if specified. For example, test section 2314E (above) has routines 1 through 5. Routines 1-3 are specified in the Normal Routine Mask; routines 4 and 5 are optional. The following conditions would apply, using 02A as a possible Symbolic Device Address:

02A/2314E/
routines 1-3 of test 2314E would be run. The ROUTINES entry is defaulted to the Normal Routines Mask.

02A/2314E,2,5/
routines 2 and 5 would be run. The Normal routines are not run automatically when ROUTINES are specified.

3. Multiple Test Selection

This entry will consist of the 4-character device type, and the required test sections.

2702A,C-E/
specifies test sections 2702A,C,D, and E, each running normal routines.

2314D,L,E,B,A/
specifies test sections 2314D,L,E,B, and A, each running normal routines. The test sections are run in the order specified.

2311A,A,A,B/
specifies test section 2311A to be run three times, then 2311B once. Normal routines.

2841/
specifies all test sections for the 2841 (see below).

When the available test sections are not known, the device type may be specified with no test section entry. The OLTS control program will try to load sections A through Z and this message will follow.

XXXXZ COULT NOT BE FOUND.

DO YOU WANT DIFFERENT SECTIONS? ENTER YES OR NO

Respond NO and all test sections for that device will be run.

OPTIONS Selection

Option	Yes	No	Default
Test Loop	TL	NTL	NTL
Error Loop	EL	NEL	NEL
Error Print	EP	NEP	EP
Control Print	CP	NCP	CP
Scope Loop *	SL	NSL	NSL

*SL also forces TL, EL, NEP, and NCP. NSL, if entered as an option, forces NTL, NEL, EP, and CP.

Test Loop
Recycle test section currently specified.

Error Loop
Test section loops on code causing first error detected. Never activate this option after an error print. The loop may not occur on the I/O that failed.

Error Print
NEP suppresses error printing.

Control Print
Suppresses section 'START' and 'TERMINATE' messages, and certain non-error printouts from test sections.

Scope Loop
Facilitates use of oscilloscope through a change in task level. Forces options as noted above. This option should not be activated after an error, since the loop would probably occur on the next routine.

Two or more options are separated by commas, and the order of entry is immaterial. If two or more entries of the same option occur, the last will be accepted.

NCP,TL,EL,NTL
specifies NCP, EL, and NTL

DYNAMIC PROGRAM CONTROL

Dynamic modifications may be made at any time during the execution of the test sections (except when running terminal tests on SYSIN) by depressing the ATTN key on a 2741, or reset line on a 1050. This message will be issued:

ENTER O,F,I OR E FOR OPTIONS, FREE, INITIALIZE, OR END

Responses:

O
enters the Option Change routine which prompts for and accepts changes. The interrupted program will restart at the point of interruption.

F
terminates the current test section and starts the next. If the current test section is the last, the job terminates and the program goes to the initialization point.

I

returns OLTS to the initial point.

E

returns control to the TSS/360 Command System.

Note that a response of I or E to any of the OLTS control program messages, instead of the requested entry, will cause initialization or end.

Attention Interruptions: An attention interruption during an error print will cause the line that was being printed to be repeated followed by:

DEPRESS ATTENTION AGAIN

If attention does not occur within approximately 5 seconds, the rest of the error print is cancelled.

An attention interruption during the execution of the OLTS Control Program, when no messages are being printed nor responses being awaited, will cause this message to be issued:

ENTER I OR E FOR INITIALIZE OR END

An attention interruption during the execution of the OLTS Control Program, when a message is being printed or a response being awaited, returns the program to the initial point.

ENDING AN OLTS SESSION (LOG-OFF)

After entering E and returning to the Command System, the system monitor can end the terminal session by issuing:

LOGOFF

The system will confirm that log-off was accepted, and gives a date and time.

TABLE GENERATION AND USE

To facilitate running OLTS, two tables can be generated and updated by the system monitor. The Terminal Table describes both SYSIN and other terminals to OLTS, while the Subsystem Table facilitates testing several devices of the same type.

Terminal Table

The Terminal Table is designed mainly to describe to the system, terminals other than SYSIN. There is no other way to describe to the OLTS Control Program the features and terminal type for different SDA defined devices. Note that the SYSIN terminal can be described in this table, but it is not necessary that it be defined in the Terminal Table for it to be tested (see "TESTS,ROUTINES Selection").

This table can have a maximum of 999 entries, and is created as a line data set using the DATA command, may be displayed (LINE? command), modified (MODIFY command), and erased (ERASE command).

The Terminal Table can have two formats:

```
TYPE C,FEAT
TYPE D,SDA#,FEAT
```

where

TYPE = 4-character terminal type (1050 and 2741)

C = SYSIN only

D = Dedicated, or non-SYSIN call-in terminals

FEAT = 4-byte features field. The only possible entries are 1300, 2300, 4300, or 5300:

byte 0 =	1	2	4	5
Arrangement	PTTC/EBCD	PTTC/EBCD	CORRESPONDENCE/ EBCD	PTTC/BCD
Elements	System/360	System/360	Standard OPD Selectric	Other than System/360
Ball type	BALL 963	BALL 952	BALL 015	BALL 939

byte 1 = 3 = Transmit-Interrupt feature. At present, 3 is the only allowable character.

byte 2-3 = 0 = spare.

SDA # = for Dedicated lines, the SDA of the 2702 or 2703 line for that terminal.
for Call-in (non-SYSIN), any SDA line other than SYSIN or the operator's terminal.

Allocation of Non-SYSIN Lines: Certain procedures differ in allocating lines that are not SYSIN to the system monitor's task. This difference is between dedicated and call-in lines.

Dedicated

If the terminal is not in use, it can be directly allocated to the system monitor's task.

If the terminal is in use, it is necessary for the operator to issue a FORCE command against the task to which this terminal is assigned, and then to issue a HOLD command followed by a DROP command against the terminal.

The Terminal Table is built as shown below. The power must be turned on for the dedicated terminal. The test automatically issues I/O and it is not necessary to press the attention key.

When the terminal is to be re-activated, the system monitor should request that the operator DROP the line, making the terminal available.

Call-in

The SDA for the call-in line has an associated telephone number. Any SDA line, other than SYSIN or the operator's terminal, may be used in the Terminal Table. When OLTEP passes control to the test section, S1050A or S2741A will be printed out at the system monitor's SYSOUT. The system monitor then dials in using the correct phone number, thereby connecting the failing non-SYSIN call-in terminal to the test, via the line corresponding to the above SDA. Note that from the time the test section attempts the first write to the terminal until the system monitor dials in, any user dialing the same phone number will connect his terminal to the test. The test will then be run on his terminal rather than on the failing device.

When the terminal is to be reactivated, the system monitor should request that the operator DROP the line, making the terminal available.

Building a Terminal Table: The Terminal Table, is generated as a line data set. The commands needed to manipulate this table are discussed under "Modify, Display, or Erase Tables." The system monitor enters the DATA command with the operands as described, and TSS prints a line number followed by a space. The system monitor then types in the entry (format described above), as in the following example:

```
DATA     TABLE.T.OLTS,I,100,100
100      1050C,1300
200      1050D,0061,2300
  .
  .
  .
600      2741C,2300
700      2741D,0066,1300
  .
  .
1400     %E
```

The %E ends the data set. In this example, S01 = line 100; T02 = line 200; S06 = line 600; T07 = line 700. Entries based on this table might look like this:

S01/1050A/NEP
specifying the SYSIN device described in the first entry in the Terminal Table, and which has the Transmit Interrupt feature, uses ball-type 963, the PTTC/EBCD arrangement and System/360 elements. (See "Terminal Table," FEAT field.)

S06,T07/2741A
specifying 6th and 7th entries as above, S06 uses ball 952 and S07 uses ball 963 - for most purposes this is the basic difference in the FEAT field, T07 has an SDA number of 0066 (subject to the possibilities listed under Allocation of Non-SYSIN Terminals).

Note that combinations such as T02,T07 from the above table could not be tested together, since they are different device types.

Subsystem Table

If several devices of the same type are often tested as a group, the Subsystem Table is a convenient method of defining the entire group in one entry.

This table is generated as a line data set. The commands necessary to manipulate this table are discussed under "Modify, Display, or Erase Tables." The system monitor enters the DATA command and TSS prints the line number and then a space. The entries might be handled as follows:

```
DATA     TABLE.S.OLTS,I,100,100
100      50,57-5C,60-65 (group of 2702 lines)
200      S1,T3,T6-T8 (group of same type terminals - must be defined in
  .      Terminal Table)
  .
  .
500      19(0B03), 1A(0B02), 1B(0B04) (2311s by specific paths)
600      %E
```

The %E ends the data set. Note that all rules for mounting or HOLDing devices still apply. Sample entries using the Subsystem Table:

SUB01/2702A/NEL.NEP
Note that SUB01 is the entry recognized for line 1 in the Subsystem Table.

SUB02/1050A,1-3,7/EL
defines 2nd entry in Subsystem Table, which in turn defines the 1st, 3rd, 6th, 7th and 8th entries in the Terminal Table.

Modify, Display, or Erase Tables

Either the Terminal Table or Subsystem Table may be manipulated by the system monitor through the use of one of the following commands:

MODIFY changes one or more lines in the table.

LINE? displays the line or lines designated.

ERASE eliminates the table.

Sample Use of Commands: To illustrate the use of these commands, we will create (DATA), modify, display and erase a sample data set (table). The DATA command is used as was explained under "Building a Terminal Table."

```
DATA TABLE.T.OLTS I,100,100
100  1050C,1300
200  2741C,1300
300  2741D,0067,2300
400  1050D,0062,1300
500  %E (this entry returns us to the Command System)
```

This table is now in the system under the name TABLE.T.OLTS. If it is to be modified, we would probably want to display it, since it may have been created in a different terminal session, or possibly modified since we saw it last.

```
LINE? TABLE.T.OLTS (this will display the entire data set)
0000100 1050C,1300
0000200 2741C,1300
0000300 2741D,0067,2300
0000400 1050D,0062,1300

LINE? TABLE.T.OLTS,200 (will display entry 200 only)
0000200 2741C,1300
```

Now that we know what the data set looks like, we can modify it. The MODIFY command gives a system response - ENTER MODIFICATIONS - and prompts with the number symbol (#). %E must be entered in order to exit from the MODIFY command.

```
MODIFY TABLE.T.OLTS              (user)
B011  ENTER MODIFICATIONS        (system)
#                                (system)
100,1050C,2300                   (user)
#                                (system)
300,2741C,2300                   (user)
#                                (system)
%E                               (user)
```

If we now display the table:

```
LINE? TABLE.T.OLTS
0000100 1050C,2300
0000200 2741C,1300
0000300 2741C,2300
0000400 1050D,0062,1300
```

When this Terminal Table is of no further value, we can erase it:

ERASE TABLE.T.OLTS

OLTS MESSAGES

The informational, prompting, diagnostic, and System Operator messages for OLTS are listed below. Note that messages preceded by an asterisk (*) cause an ABEND from that module.

Information Messages

CMATF • ROUTINES ARE PROGRAM SELECTED

CMATF • ROUTINES ARE X, X, X,.....

CZATG • FOLLOWING DEVICES ALLOCATED----------

CMATF • OPTIONS ARE NTL, NEL, EP, CP, NSL

CMATF • SXXXXX (Start of Section Execution)

CMATF • T (Termination of Section Execution)

CMATF • *T (Abnormal Termination. Section terminated prematurely)

CMATF • JOB TERMINATED

Prompting Messages

CMATF • ENTER P FOR PROMPTING OR DEVICES/TESTS, ROUTINES/OPTIONS DEFAULT IS CURRENT VALUES.

CMATF • ENTER O, F, I OR E FOR OPTIONS, FREE INITIALIZE OR END.

CMATF • ENTER I OR E FOR INITIALIZE OR END.

CZATG • ENTER DEVICE NAMES, HHHH, TERMINAL ID'S, TDDD, AND/OR SUBSYSTEM NAMES, SUBDD.

CZATG • DO YOU WANT DIFFERENT DEVICES. ENTER YES OR NO.

CMATF • ENTER TESTS. EXAMPLE 2311A, B, D-L, N/

CMATF • DO YOU WANT DIFFERENT SECTIONS. ENTER YES OR NO.

CMATF • ENTER ROUTINES. EXAMPLE: 1, 4-7, 9, 14/. DEFAULT GETS PROGRAM SELECTIONS.

CMATF • DO YOU WANT DIFFERENT ROUTINES. ENTER YES OR NO.

CMATF • ENTER OPTIONS TL-NTL, EL-NEL, CP-NCP, EP-NEP, SL-NSL OR ENTER D FOR DEFINITION.

CMATF • ENTER TL TO LOOP TEST, EL TO LOOP ON ERROR, NEP FOR - NO ERROR PRINT, NCP FOR NO CONTROL PRINT, SL FOR SCOPE LOOP. OPPOSITE CONDITIONS ARE DEFAULT.

CMATF • DO YOU WANT DIFFERENT OPTIONS. ENTER YES OR NO.

CMATC • SENSE FAILED. SENSE CC XX. SENSE STATUS XX XX.

CMATC • INVALID INPUT TO CMATC
(The PRINT module cannot accept its input)

CMATC • DEPRESS ATTENTION AGAIN.

Diagnostic Messages
(* = ABEND messages)

CZATG* • INCORRECT USER PRIVILEGE CLASS
(User must be joined with Privilege Class 'E' to use OLTS)

CZATA* • SECTION CONTROL TABLE HAS BEEN ALTERED BETWEEN CREATION AND USE (Test program jeapordizes system integrity)

CZATA* • INVALID PARAMETER PROVIDED BY CALLING PROGRAM (Invalid SCT or TECB pointer or excessive CCW count)

CZATA* • DEVICE NOT ASSIGNED TO TASK (There was no entry in the task symbolic device list for the particular device.)

CZATB* • I/O PATH NOT AVAILABLE (I/O Supervisor reports that specific path provided is invalid)

CZATB* • CCW SPECIFICATION ERROR (I/O Supervisor reports illegal CCW).

CZATB-A** OLTS IMPROPERLY INITIATED (User must be joined with Privilege Class 'E').

CZATG* • SCT DEVICE CAPACITY EXCEEDED (User is trying to test more devices than OLTS can handle).

CZATB* • RC FROM CKALOC NOT 3 (This message should not occur. Possible hardware error.)

CZATA* • TERMINAL IN USE BY MTT (This terminal is assigned to a Multiterminal Task).

CZATA* • INVALID CCW SEQUENCE FOR DIRECT ACCESS DEVICE (See OLT Control Program PLM).

CZATA* • INVALID SEEK ADDRESS. (See OLT Control Program PLM.)

CZATG • SUBSYSTEM XXXXX NOT IN SUBSYSTEM TABLE

CZATG • TERMINAL XXX NOT IN TERMINAL TABLE

CZATG • ERROR IN DEVICE FIELD XXXXXXX

CZATG • ILLEGAL PATH DEFINITION XXXXX

CZATG • UNEXPECTED EXIT CODE FROM DATADEF PROGRAM FOR DEVICE XXXX (Call by OLTCP to DDEF for device allocation and JFCB build resulted in an improper return code from DDEF.) (The parameters defined for this device are not what the system expects them to be.)

CZATG • XXXX NOT IN SDAT (All devices must be listed in the SDAT.)

CZATG • ILLEGAL SUBSYSTEM DEFINITION XXXX

CZATG • OPERATOR REFUSES REQUEST TO TEST XXXX

CZATG • XXXX CANNOT BE TESTED UNLESS HELD (System operator must use HOLD command on non-private devices before testing).

CZATG • XX VISAM ERROR CODE (Attempt to Access Terminal or Subsystem Table record was unsuccessful)

CZATG • ERROR IN TERMINAL TABLE FOR TXXX

CZATG • NO AUTOCALL UNIT WITH TERMINAL ADAPTER TYPE 1 AVAILABLE IN SDAT

CZATG • ERROR MET IN ATTEMPT TO USE TERMINAL TABLE. CHECK TABLE STATUS. (Call to DDEF to define data set resulted in error return code)

CZATG • ERROR MET IN ATTEMPT TO USE SUBSYSTEM TABLE. CHECK TABLE STATUS (Call to DDEF to define data set resulted in error return code)

CMATF • TEST SECTIONS EXCEED 26 ENTRIES

CMATF • FIRST FOUR CHARACTERS OF TEST FIELD NOT DIGITS

CZATG • ERROR IN DASH OPTION

CMATF • XXXXXX COULD NOT BE FOUND

CMATF • FORMAT OF DASH OPTION INCORRECT

CMATF • NO SECTIONS FOUND

CMATF • ILLEGAL INPUT CHARACTER

CMATF • ERROR IN ROUTINE SELECTION FIELD

CMATF • ERROR, ROUTINE SELECTION NOT ALLOWED WITH MULTIPLE SECTIONS

CMATF • ERROR IN OPTION FIELD XXXX

CZATG • NO DEVICES ALLOCATED

Messages Sent to System Operator Via WTOR Macro

CZATG • OLTS REQUESTS OK TO TEST XXXX. ENTER YES OR NO.

CZATG • MOUNT SCRATCH TAPE ON XXXX. REPLY YES TO CONFIRM OR NO TO PREVENT TEST

CZATG • CANNOT VERIFY MOUNT OF CE VOLUME ON XXXX. ENTER YES FOR MOUNTED, NO FOR SKIP TEST, R FOR READ ONLY TESTS.

CZATG • REQUEST OK TO WRITE ON XXXX. ENTER NO TO PREVENT TEST, R FOR READ ONLY, YES FOR WRITE TESTS.

During the operation of TSS/360, a history of the system environment at the time of certain errors is maintained. The pertinent information is collected by various TSS/360 programs and recorded in unused 246-byte records on the paging drum. The drum is formatted in such a manner that there is an unused 246-byte record following each 4096 byte page. The error environment information is recorded on the even numbered records of each track. The first of these records, the index (track 0, record 2), contains a pointer to the end of the error information on the drum. Approximately 192,000 bytes, capable of describing about 500 error incidents, are available on any paging drum.

Error Recording

Several error conditions result in the recording of information on the drum error records. Machine checks resulting from Central Processor and Storage Unit hardware detected errors, system errors, solid outboard (device) errors and inboard (channel) errors are accumulated and recorded by system routines.

Statistics are gathered when an I/O retry operation for a device ends successfully (intermittent error) before the prescribed number of retries. The routines which record the error information on the paging drum are internal to the system and will not be accessed by the system monitor in the process of retrieving information from the drum error records. A system monitor is defined as a user with the 'E' privilege.

Error Retrieval

Two programs have been developed which retrieve this error information from the drum, organize the information in a useful format, and send it to an output device. The function of this section is to aid the system monitor to either load or call in the appropriate error record retrieving program, to list the commands available, and to interpret the error printouts that result.

The first of these programs to be discussed is Environment Recording Edit and Print-Model 67 (Erep67), a stand-alone program (i.e., not under TSS/360). The second program is Virtual Memory Environment Recording Edit and Print (VMEREP) which serves the same function but runs under TSS/360.

Error Retrieval Walk-Through

When error retrieval becomes necessary, two conditions are possible -- the system is down and the stand-alone program must be run, or the system is running and the system monitor can log on as a USER.

System Down: There are two possible conditions under which to run the stand-alone program --- with or without the console typewriter.

Without Console Typewriter

1. EREP67 is loaded using standard IPL procedure.
2. The various device addresses and job options are entered manually at the appropriate locations.
3. The Console Interrupt button is pushed to initiate the job.

4. When the job has been completed the program puts the CPU in the WAIT state.

Using Console Typewriter

1. EREP67 is loaded using standard IPL procedure.

2. The Request button is pushed and the parameters for devices and job options are prompted for by the program.

3. Response is made to any prompting or diagnostic message which may occur.

4. If the error information is no longer required, the system monitor usually executes a RESET INDEX request followed by an END request. The RESET INDEX effectively erases all error records from the drum.

System Running:

1. The system monitor must log onto the system using the procedure described under "LOGON Procedure" in the OLTS section of this manual.

2. The VMEREP command is issued giving the VMEREP routine control.

3. The various devices and job requests are entered after prompting.

4. Response is made to any prompting or diagnostic messages which may occur.

5. If the error information is no longer required, the system monitor usually executes a RESET INDEX request, effectively erasing all error records from the drum.

6. The END request is entered, returning control to the TSS/360 Command System.

7. LOGOFF is issued.

Available Job Options

These job options, unless otherwise stated, are available to both EREP67 and VMEREP. Note that these commands must be entered in the exact character string described.

PRINT INDEX
This option prints the contents of the Drum Index Record (track 0, record 2), which contains a pointer to the last track, record, and byte used for error recording, plus a character string for checking the validity of the index. The statistical Box Counts containing the number of intermittent failures for each CPU and storage element in the system are also printed. (See "Printout Interpretation")

PRINT ALL
This option prints the information contained under "PRINT INDEX" above, as well as all of the error information on the drum. The error records are processed in the order in which they appear on the drum -- the same order in which they occurred.

PRINT ID HHRRNN
This option prints information about a particular error. The error information is located at HHRRNN where:

HH = track number
RR = head number (record number)
NN = byte number

The HHRRNN is usually obtained from the record ID given in the online printout on the operator's terminal by the SERR module.

SEARCH CSEE

This option prints information on a particular class of errors. The CSEE parameter is defined:

C CPU number (1-8) to which the failure was attributed. (Primarily used with call types 01 and 09)
S Storage Element (A-H) to which the failure was attributed. (Primarily used with call types 01 and 09)

EE (call type)	Error
01	Internal Machine Check
09	Multiple Internal Machine Check
25	Immediate Report, Paging I/O
26	Immediate Report, Task I/O
27	Paging Device Statistical Data Recording Overflow
28	Solid Paging Device Error
29	External Machine Check
2A	Task Devices Statistical Data Recording Overflow
2B	Solid Task Device Error
2C	Task Channel Failure
2D	Paging Channel Failure
2E	Intermittent Paging I/O Outboard Error
2F	Intermittent Task I/O Outboard Error
41	System Error

Any parameter not used in a job should be replaced with the character X. For example: SEARCH XC01 retrieves all error information for internal machine checks caused by storage element C.

SEARCH XX27 retrieves all information pertaining to paging device statistical data recording overflows.
SEARCH 2XXX retrieves all error information pertaining to CPU 2. Call types 01 and 09 are implied.
SEARCH 1B01 retrieves all internal machine check error information pertaining to both CPU 1 and storage element B.

Note that if no errors of the Call Type specified exist, no printout (except the next job request prompt) occurs.

PRINT ZEROES

This option forces the printing of the complete log, zeroes and non-zeroes. This option is applicable only to error types 01 and 09 and must be entered in one of these three ways:

SEARCH CS01 PRINT ZEROES
SEARCH CS09 PRINT ZEROES
PRINT ALL PRINT ZEROES

Normally, only those controls and latches which are in the "one" state (on) are printed.

SET INDEX TO HHRRNN
This option sets the pointer in the Drum Index record to HHRRNN. The next error record is written starting at the byte following track HH, record RR, byte NN.

RESET INDEX
This option sets the pointer in the Drum Index Record to its initial value (track 0, record 4). Also, the Statistical Box Counts are reset to zero. Note that this option should not be entered if there is any further use for the error information on the drum.

END
This option is used by VMEREP when no further requests are to be made. It indicates that data sets should be closed, devices relinquished, etc. Its use with EREP67 is optional.

RESTART
This option is used by VMEREP only and causes a return to VMEREP initial point. It is used if a change in output devices is required, or if records on a different drum are to be processed. The same effect can be obtained in EREP67 by issuing a SYSTEM RESET and a PSW RESTART.

LIST FAILURES
This option is used by VMEREP only. A list of all failures is generated showing the call type, record ID, and failing unit or path for each error incident recorded (see Failure List under "Printout Interpretation"). This list may be used as a guide for the selective retrieval of error records.

SYSOUT
This option is used only by VMEREP. It causes the output (of this job option only) to be sent to SYSOUT instead of the high speed printer.

SET IR XXXX
This option is used by VMEREP only. The XXXX is a 4-digit hexadecimal value representing the Symbolic Device Address of a device to be placed in Immediate Report Mode. When operating in this mode, the error recording subsystem produces a short report to the System Operator, and a detailed report to the error recording medium, for each Inboard or Outboard error on the specified device.

RESET IR XXXX
VMEREP only. Removes device XXXX from the Immediate Report Mode. (See above)

EREP67, WITH CONSOLE TYPEWRITER

EREP67 is a stand-alone program operating in real core. In this instance we are discussing operation with a high speed printer as the output device, and a console typewriter for input and control information.

Loading: This program is self-loading and may be loaded from either tape or cards using normal Initial Program Load (IPL) procedure. It is loaded into memory starting at location 11000 (hex). When loading is successfully completed, the program puts the CPU into the WAIT state.

Device and Job Specification: Depress the Request pushbutton on the console typewriter. The following message occurs:

EREP67 ENVIRONMENT RECORDING EDIT AND PRINT MODEL 67
CCUU ENTER OUTPUT DEVICE ADDRESS

The four hex digit CCUU address is now entered, where CCUU is the actual hardware address of the device. For example: 080E is channel controller one, channel zero, unit address E. The program checks the specified device with a Test I/O. If the response is other than Condition Code 0 after several attempts, EREP prompts:

```
SPECIFIED DEVICE NOT AVAILABLE
CCUU ENTER OUTPUT DEVICE ADDRESS
```

When the device has been made ready and has been accepted by EREP, the following prompt occurs:

```
CCUU ENTER DRUM ADDRESS
```

The four hex digit address of the drum containing the error history is entered as above. An invalid address or unavailable device causes the same type printout as above:

```
SPECIFIED DEVICE NOT AVAILABLE
CCUU ENTER DRUM ADDRESS
```

When the drum is ready for use and accepted, the job request is prompted for by EREP:

```
MAKE JOB REQUEST
```

If the job request is not recognized, EREP prompts for a valid request:

```
INVALID JOB REQUEST
MAKE JOB REQUEST
```

The following are valid job requests or options. Note that the request must be entered in the exact character string described.

```
PRINT INDEX
PRINT ALL
PRINT ID HHRRNN
SEARCH CSEE
RESET INDEX
SET INDEX TO HHRRNN
PRINT ZEROES
END
```

For a detailed description of any of these job requests, see "Available Job Requests."

Termination: When the job is complete, the program again prompts with:

```
END OF JOB
MAKE JOB REQUEST
```

If no more jobs are to be run and there is no further use for the error information on the drum, the Customer Engineer will usually enter:

```
RESET INDEX
```

This option will effectively remove all error information from the drum, since the index will point to the first error record. The END request may also be entered but it is optional in EREP67.

EREP67 Messages

These messages, not previously explained, may appear on the console typewriter:

ILLEGAL RECORD FORMAT, PROGRAM TERMINATING
The format of the error record on the drum is illegal. The program goes into the WAIT state.

DRUM ERROR
An error occurs on an SIO to the drum. EREP goes into the WAIT state.

NO ERROR REPORTS ON DRUM
Does not occur on PRINT INDEX, or when the index record is to be changed.

UNEXPECTED PROG INT XXXXXXXXXXXXXXXX, PSW RESTART TO TRY AGAIN
EREP has received a program interrupt while running. The contents of the program interrupt old PSW are printed and the program is restarted as if it had just been loaded. The CPU is put into WAIT.

UNEXPECTED MC INT XXXXXXXXXXXXXXXX, PSW RESTART TO TRY AGAIN
EREP has received a machine check interrupt while running. The contents of the program interrupt old PSW are printed and the program is restarted as if it had just been loaded. The CPU is put into WAIT.

UNDEFINED ERROR TYPE - TERMINATING THIS REQUEST
The Call Type of this error is not recognized. EREP prompts for job request.

EREP67 WITHOUT CONSOLE TYPEWRITER

When necessary, it is possible to run EREP67 without using the console typewriter. The program is loaded from cards or tape, using normal IPL procedure, starting at location 11000 (hex). The output device address, drum address, job request, options, etc. are loaded manually by the system monitor at the following hexadecimal locations:

1. 1102A -- Halfword output device address

2. 1102E -- Halfword drum address

3. 11030 -- One byte job request option, specified as follows:
   - '80' PRINT ALL
   - '40' SEARCH CSEE (see also locations 11034-11036)
   - '20' PRINT ID HHRRNN (see also locations 1103D- 1103F and 16E5C)
   - '10' PRINT INDEX
   - '08' RESET INDEX
   - '04' SET INDEX TO HHRRNN (see also locations 11038-1103A)
   - '01' PRINT ZEROES

If the job requested is SEARCH CSEE, these additional locations must be set:

4. 11034 -- One byte CPU number (1-8) in hex

   CPU 1 = 01
   ↓
   CPU 8 = 08

5. 11035 -- One byte Storage Element (A-H) in hex

```
A = 01
B = 02
  ↓
H = 08
```

6. 11036 -- One byte Call Type, in hex (see SEARCH CSEE under "Available Job Options")

If the job requested is SET INDEX TO HHRRNN, these additional locations must be set:

7. 11038 -- Store track HH (hex)

8. 11039 -- Store record RR (hex)

9. 1103A -- Store byte NN (hex)

If the job requested is PRINT ID HHRRNN, these additional locations must be set:

10. 1103D -- Store track HH (hex)

11. 1103E -- Store record RR (hex)

12. 1103F -- Store byte NN (hex)

13. 16E5C -- Store control byte X'FF'

Initiation and Termination: When the job request fields have been properly stored, the job is initiated by pressing the Console Interrupt pushbutton. The CPU goes into the WAIT state when the program has been completed. The output will be on the high speed printer.

VMEREP ROUTINE

VMEREP operates as a virtual memory, privileged state program. The system monitor is able to retrieve error records without shutting down or otherwise interfering with the system.

LOGON Procedure

The system monitor logs onto the system as described in "LOGON Procedure" in the OLTS section of this manual. The only user class necessary for VMEREP is 'E', since the Command System is not necessary for this routine.

Calling in VMEREP

To call in the give control to the VMEREP routine, the VMEREP command is issued:

VMEREP

The system responds with:

```
VMEREP IS RUNNING
ENTER OUTPUT SELECTION (SYSOUT/DEFER) DEFAULT=DEFER
```

The system monitor enters SYSOUT if he wants the output on the SYSOUT terminal. The default sends the output to the high speed printer.

Whether SYSOUT is entered or the option is defaulted, the system response is:

```
ENTER SDA OF DRUM (4HEX DIGITS)
```

The system monitor enters the Symbolic Device Address (SDA) of the drum which contains the error information. If the SDA entered is not that of a 2301 drum, the system response is:

```
INVALID ADDRESS
ENTER SDA OF DRUM (4 HEX DIGITS)
```

When a drum SDA is entered, the system prompts:

```
ENTER JOB REQUEST
```

If the job request is not recognized, the system response is:

```
NO VALID JOB REQUEST RECEIVED
ENTER JOB REQUEST
```

When the job request is accepted, the system sends:

```
JOB IS BEING RUN
```

At the completion of the job, the system prompt is:

```
END OF JOB
ENTER JOB REQUEST
```

If the last job is completed and if there is no further need for the error information on the drum, the system monitor issues:

```
RESET INDEX   which sets the Drum Index Record pointer to its initial
               value -- effectively removing the error information
```

The final request entered is:

```
END   which releases devices and returns control to the TSS/360 Com-
      mand System for LOGOFF.
```

Job Requests in VMEREP

Any of the following are valid job requests or options in VMEREP. See "Available Job Options" for details. Note that these requests must be entered in the exact character string described.

```
PRINT INDEX
PRINT ALL
PRINT ZEROES
PRINT ID HHRRNN
SEARCH CSEE
RESET INDEX
LIST FAILURES
SET INDEX TO HHRRNN
RESTART
SET IR XXXX
RESET IR XXXX
END
```

VMEREP Messages

The following messages, not previously mentioned, are returned to the terminal.

SPECIFIED SDA FOR SET OR RESET IR INVALID. RE-ENTER JOB REQUEST AND SDA (4HEX DIGITS)

NO ERROR RECORDS HAVE BEEN WRITTEN ON THE DRUM
The validity check on the character string in the index is valid, but the address in the index points to the first error record.

NO ERROR REPORTS ON DRUM
The character string is invalid. It is assumed there is no index written and therefore no records.

ERROR RECORD SPECIFIED BY SEARCH REQUEST NOT ON DRUM
There are no records of the Call Type specified on the drum.

NEW ERROR INFORMATION HAS BEEN WRITTEN ON THE DRUM. THIS JOB REQUEST CANCELLED.
This response occurs to either SET or RESET INDEX.

WHILE SERVICING THIS JOB REQUEST NEW ERROR RECORDS WERE WRITTEN ON DRUM.
This response occurs to requests other than PRINT ID, and SET or RESET INDEX.

DDEF RESPONSE XXXXXXXX. VMEREP RESTARTING.
The return code from DDEF is other than zero.

ERROR INVALID CALL TYPE FOUND. THIS JOB REQUEST IS BEING TERMINATED.
This message is followed by a prompt for a job request.

SPECIFIED DRUM SDA IS UNAVAILABLE. VMEREP IS RESTARTING.

DRUM SIO FAILURE. VMEREP IS RESTARTING.

DRUM OPERATION COMPLETE WITH ERROR, VMEREP WILL TRY TO CONTINUE.
This occurs on a drum error other than the above two.

SPACE CANNOT BE ALLOCATED
A prompt for output selection will again occur.

APPENDIX A: SAMPLE TERMINAL SESSIONS

The following examples reflect the use of OLTS in testing various devices.

EXAMPLE 1 - A 'Prompt Mode' terminal session to test a 2311 disk drive.
Setup - Mount a Test Pack, formatted by the Off-line FFF0 program, on a private 2311 drive to be tested. For entries below, private 2311 SDA = NN (1-4 character hexadecimal representation)
Procedure - Log on with Privilege Class E USERID. X = Entry by the system monitor.

```
X   systest
    ENTER P FOR PROMPTING OR DEVICES/TESTS, ROUTINES/OPTIONS
X   p
    ENTER DEVICE NAMES, HHHH, TERMINAL IDS, TDDD, AND/OR SUBSYSTEM
    NAMES, SUBDD
X   NN (see SDA above)
    FOLLOWING DEVICES ALLOCATED, 00NN
    ENTER TESTS.  EXAMPLE - 2311A, B, D-L, N
X   2311a-e
    ENTER OPTIONS TL-NTL, EL-NEL, CP-NCP, EP-NEP, SL-NSL... OR ENTER D
    FOR DEFINITION
X     (Depress Carr Return)
    OPTIONS ARE NTL, NEL, EP, CP, NAP, NSL
    S2311A
    T
    S2311B
    T
    S2311C
    T
    S2311D
    RNDM SEEK BASE--rrrr (rrrr=hex random number)
    T
    S2311E
    T
    ENTER P FOR PROMPTING OR DEVICES/TESTS, ROUTINES/OPTIONS DEFAULT IS
    CURRENT VALUES
X   end
X   logoff
```

EXAMPLE2 - A 'Non-Prompt Mode' terminal session to test a 2311 disk drive with a Sample Error Printout.
Setup - Same as Example 1. For entries below, private 2311 SDA=NN (1-4 character hex representation)
Procedure - LOGON with Privilege Class E USERID. X = Entry by the system monitor.

```
X   systest
    ENTER P FOR PROMPTING OR DEVICES/TESTS, ROUTINES/OPTIONS
X   NN/2311a-e
    FOLLOWING DEVICES ALLOCATED, 00NN
    S2311A
    T
    S2311B
    T
    S2311C
    T
    S2311D
```

```
    RNDM SEEK BASE--rrrr  (rrrr hex random number)
    *C2311D0  02  1C-00252  CCW-001E8 UNIT-00NN
    RANDOM SEEK ROUTINE  Sample Error Print
    WAS AT   SEEK TO  GOT TO
    CYL  HD  CYL  HD  CYLHD
    187  07  192  04  191  04
    T*        (Because of the error, the termination print for this
               section is T*)
    S2311E
    T
    ENTER P FOR PROMPTING OR DEVICES/TESTS, ROUTINES/OPTIONS DEFAULT IS
    CURRENT VALUES
X   end
X   logoff
```

EXAMPLE 3 - A terminal session to test 2324 disk drive with various Options.
Setup - Mount a Test Pack, formatted by the Off-Line FFF1 program, on a private 2314 drive to be tested. For entries below, private 2314 SDA=NN (1-4 character hex representation)
Procedure - LOGON with Privilege Class E USERID. X = Entry by the system monitor.

```
X   systest
    ENTER P FOR PROMPTING OR DEVICES/TESTS, ROUTINES/OPTIONS
X   NN/2314a,c,d                    [Test Sections selected are 2314A,
                                    [2314C, and 2314D
    FOLLOWING DEVICES ALLOCATED, 00NN
    S2314A
    T
    S2314C
    T
    S2314E
    T*  (*Indicates error)
    ENTER P FOR PROMPTING OR DEVICES/TESTS, ROUTINES/OPTIONS DEFAULT IS
    CURRENT VALUES.
X   /2314e/t1                       [Default of Device field selects same
                                    [device.  Test section now 2314E.
                                    [The (TL) Test Loop Option now active.
    OPTIONS ARE TL,NEL,EP,CP,NSL
    S2314E
    T*
    S2314E
    T*
    S2314E
X      (DEPRESS ATTN)
    ENTER O, F, I OR E FOR OPTIONS, FREE, INITIALIZE OR END
X   o
    ENTER OPTIONS TL-NTL, EL-NEL, CP-NCP, EP-NEP, SL-NSL... OR ENTER D
    FOR DEFINITION
X   ntl
    OPTIONS ARE NTL,EP,CP,NSL
    T*  (Errors on each pass of test section)
    ENTER P FOR PROMPTING OR DEVICES/TESTS, ROUTINES/OPTIONS DEFAULT IS
    CURRENT VALUES
X   end
X   logoff
```

EXAMPLE 4 - A 1050 terminal session to test the SYSIN device.
Setup - None, no terminal table required because of 't1050' device entry.
Procedure - LOGON from 1050 terminal with Privilege Class E USERID. X = Entry by the system monitor.

```
X    systest
     ENTER P FOR PROMPTING OR DEVICES/TEST, ROUTINES/OPTIONS
X    t1050/1050a,2-4,6
     FOLLOWING DEVICES ALLOCATED,00SS  (SS= SDA of SYSIN line on 2702)
     ROUTINES ARE 2,3,4,6
     S1050A
     ------------------------------------

        1050 TERMINAL TEST SECTION OUTPUT
     ------------------------------------

     T
     ENTER P FOR PROMPTING OR DEVICES/TESTS,ROUTINES/OPTIONS DEFAULT IS
     CURRENT VALUES
X    end
X    logoff
```

APPENDIX B: HARDWARE RECONFIGURATION FOR MAINTENANCE

The following procedures are intended mainly for IBM Field Engineering personnel. Deviation from these procedures may result in a TSS/360 system error, requiring a re-IPL procedure.

Input/Output devices, control units, and channels that have been defined in the TSS/360 system generation may be temporarily removed from the configuration or added to the configuration after the startup procedure is complete. This capability is available for simplex, half duplex and full duplex configurations. The system facilities used for the following procedures are the console INTERRUPT key and the ASNBD, HOLD and DROP, and RSS SET commands.

Note: Unexpected asynchronous interrupts resulting from a device being made ready after the system has been using it will be ignored.

Warning: Device control units and channels should not be powered up after TSS/360 startup unless the proper power isolation features have been installed.

The following procedures refer to partitioning switches. Generally, these are the switches on the IBM 2167 Configuration Unit in the case of half and full duplex. Control units on simplex configurations, and channels on all other configurations, must be separated using the partitioning switch on the specific unit being partitioned.

REMOVING PRIVATE UNITS AFTER STARTUP

To remove devices from the configuration after startup, issue an ASNBD command (if applicable) and a HOLD command. This will make the device available for off-line testing by a system monitor.

To remove a control unit from the configuration after startup, the operator must issue ASNBD (as applicable) and HOLD commands for all devices attached to that control unit. After the operator has verified that all devices attached to that control unit are held, the following steps must be performed:

- Quiesce TSS according to the procedures at the end of this section.
- Set the associated control unit partition switch on the control unit or the IBM 2167 Configuration Unit, to the OFFLINE position.
- Partitioning will take place as the Resident Supervisor finishes processing its pending interrupts and enters the WAIT state. The Meter Disabled light on the control unit (except 2702) should turn on.

Note: All I/O and timer interrupts will be accepted and processed during this period.

The control unit may now be powered down after deactivating the driver degate circuitry. Follow the procedure under "Adding Units After Startup" to return the control unit and any of its devices to the system configuration.

To remove a channel, the procedure is the same as above except that all control units attached to the channel must be handled concurrently and in a similar manner. The AUTO/TEST switch on the channel must be

set to TEST, at the same time the control unit's switches are set off on the IBM 2167 Configuration Unit.

REMOVING SYSTEM/PUBLIC UNITS FOR TESTING AFTER STARTUP

The removal of system and public units after startup requires temporary suspension of TSS/360 operation.

Note that IBM 2314 disk packs may be moved from one IBM 2314 disk drive to another after operation has been suspended, only if the address plug is also moved. When operation is resumed, the IBM 2311 disk packs and IBM 2400 tape volumes must be at the same physical address that they were at when operation was suspended. (See the procedures for quiescing and activating the system.)

Powering Down a Control Unit: If it is necessary to power down a control unit for temporary maintenance during the period of the suspension of system operation, the following procedures should be followed to avoid machine checks and undue asynchronous interrupts during maintenance:

- Quiesce TSS according to the procedures at the end of this section.
- Set the associated control unit partition switch on the control unit or IBM 2167 Configuration Unit, to the OFFLINE position.
- Partitioning will take place as the Resident Supervisor finishes processing its pending interrupts and enters the WAIT state. The Meter Disabled light on the control unit (except 2702) should turn on.
- The units may be powered down as necessary.
- After the units have been powered up, and all devices (with proper volumes mounted) are ready, set the partition switches to on-line.
- Activate TSS according to the procedures at the end of this section.

Removing an IBM 2702 Transmission Control Unit: The removal of an IBM 2702 Transmission Control Unit is the same as any other private control unit, except that all users should have logged-off prior to issuing a HOLD command for all the lines. The FORCE command can be used to accomplish this.

The off-line (green) light will not turn on until the OFFLINE/NORMAL switch in the 2702 is turned to the OFFLINE position.

Note that the complete procedure for partitioning must be followed for the IBM 2702 control unit, to ensure that partitioning took place.

ADDING UNITS AFTER STARTUP

Channels and control units to be placed back into the configuration after startup, will have had their attached device paths marked unavailable during startup.

Devices attached to control units may be added to the system by issuing a DROP command for that device after the system monitor has completed off-line device tests.

Control units may be added to the configuration, after they have been powered up, by following these steps:

- Set the partition switches on the control unit and/or the IBM 2167 Configuration Unit to the on-line position. If the system conditions necessary to cause partitioning to take effect have occurred, the control unit's Meter Disabled light will go out, indicating that the unit is now on-line. If not, the following step must be performed.

- Quiesce TSS according to the procedures at the end of this section.

- Partitioning will take place as soon as the Resident Supervisor finishes processing its pending interrupts and enters the WAIT state.

- Activate TSS according to the procedures at the end of this section. Note that all I/O and timer interrupts will be accepted and processed.

- Issue a DROP command for all available devices attached to the control unit, to add them to the TSS/360 system. An ASNBD command must be issued if any of the devices are to be added to those available for use by bulk I/O.

If a channel and one or more control units are to be added to the configuration, the procedure is the same as above, except that the channel must also have its AUTO/TEST switch in the AUTO position prior to initiating the procedure.

OPERATIONAL PROCEDURE FOR QUIESCING TSS

The following steps should be taken to quiesce TSS:

1. Press the Interrupt key once to enter RSS: This action puts TSS into RSS Active mode and prints the $ on the console. Note: This action should not be taken before the Main Operator Task has been initialized.

2. Set the SLEEP Flag in the Internal Scheduler: Enter the following RSS command to set the SLEEP flag in the Internal Scheduler (CEAKI), signalling it to enter the WAIT state: SET CEAKIS = X'FF'.

3. Issue the RUN command to leave RSS Active mode: This action returns TSS to its operational state. TSS will now run until it enters the Internal Scheduler (all Resident Supervisor work has been completed), and will then enter the WAIT state.

The system is now in quiesced state. Interrupts that arrive after entering this state will be worked off by the Resident Supervisor which will then go back into WAIT state. Since no tasks are dispatched, all outstanding work would eventually be worked off. However, since NOT CLOCK will be generated whenever the system is in WAIT, normal operations may be resumed before this outstanding work is completed.

REACTIVATING TSS, AFTER QUIESCENCE

The following steps should be taken to activate TSS once it has been quiesced:

1. Press the Interrupt key once - This puts the system in RSS mode.

2. Turn off the SLEEP flag in the Internal Scheduler - Enter the following RSS command to reset the SLEEP flag: SET CEAKIS = X'00'

3. Issue the RUN command to leave RSS mode - The system is now in TSS mode and ready to do work. The CPU(s) will come out of the WAIT state when the next I/O interrupt is received. Note that this can be forced by pressing the Request key on the operator's console.

DEVICE/CONTROL UNIT REMOVAL

The following devices may be held, and tested with a CE Test Box concurrent with system operation:

IBM 2311	disk drive
IBM 2400	tape unit
IBM 2540	reader/punch
IBM 1403	printer

The following control units may be held and partitioned for detailed scoping or updating to conform to Engineering Changes (ECs).

IBM 2841	disk storage control unit
IBM 2803	tape control unit
IBM 2821	unit record control unit
IBM 2702	transmission control unit

An IBM 2860 Selector Channel may be partitioned for off-line testing. The channel cannot be powered down.

The VMEREP commands produce several different types of output in various formats.

DRUM INDEX RECORD

PRINT INDEX, PRINT ALL, AND PRINT ZEROES cause this record to be printed. It is preceded by a message showing the time span of the error recordings:

```
REPORT OF ERROR RECORDINGS FROM 01/02/70 01:02:03 TO 01/02/70 23:59:59
```

The Drum Index contains a pointer to the head number, record number, and byte number, in that order, followed by a character string used as a validity check. The pointer addresses the last head, record, and byte sued for error recording.

Example:

```
CURRENT DRUM INDEX RECORD 00000000000308541234567 89ABCDEF0
```

Statistical Box Counts

The Statistical Box Counts are updated only when intermittent MCI errors occur. In general all storage elements involved with the instruction in progress (elements containing the instruction or any of its operands), and the CPU which executed the failing instruction, are incremented. However, if the error detected was an ROS parity error, only the CPU count is incremented. Also, if any of the storage elements involved have memory errors indicated in the log, only those storage element counts are incremented instead of all storage elements associated with the instruction. The Statistical Box Counts are printed out immediately following the Drum Index Record above.

Example:

```
STATISTICAL BOX COUNTS

CPU 1 0000  CPU 2 0000
MEM A 0000  MEM B 0000  MEM C 0000  MEM D 0000
MEM E 0000  MEM F 0000  MEM G 0000  MEM H 0000
```

FAILURE LIST

The LIST FAILURES command results in the following type of printout.

Example:

REC ID	TYPE	FAILING UNIT
000400	01	CPU1
000884	01	CPU SE B
01021C	28	I/O PATH 020C

CALL TYPES

The possible call types that may be placed in the drum error records are 01, 09, 25, 26, 27, 28, 29, 2A, 2B, 2C, 2D, 2E, and 2F. Some of

these descriptions are paired in similar formats (i.e., 25 and 26 are similar; 27 and 2A; 28 and 2B; 2C and 2D; 2E and 2F; 01 and 09).

The first item in a report is the error identification which locates the error on the drum. Next is a title line showing the call type. Each error print contains these first two items. From that point on, they differ:

TYPES 01 AND 09

Call types 01 and 09 are identical. Type 09 implies that more than one internal machine check resulted from the error, while 01 implies a single machine check. The error report is broken into four parts: the Heading, CPU Local Store, Machine Check Logout, and SERR Module Reports. For examples of call types 01 and 09, see Figures 2 and 3.

Heading

The heading contains the error identification and title line as noted above followed by:

* CPU ID
  This identifies the CPU involved with the error. The CPU ID will be a number from 1-8. The CPU is always identified with an intermittent failure. On a solid failure, the CPU is identified only if it is the cause of the error. If a storage element caused the error (solid), the CPU ID will be omitted from the heading.

* SE ID
  This identifies the physical Storage Element associated with the error. It will be a letter from A-H. An SE ID is only included in the heading if the Memory Check Program (CPU/MEM 2) within SERR finds failures in a storage element, or a memory data or addressing check indicator is on in the machine check logout of the original error.

* Date, Time, User ID
  The time of error in hours, minutes and seconds from midnight along with the date, and the 8-character USERID obtained from the PSA, is given. The USERID is the current identity of the user of the CPU which took the original Machine Check Interrupt.

* MCOPSW, INT CODE, Prefix
  The original Machine Check Old PSW and Interrupt Code appear next, followed by the prefix of the CPU which took the first machine check. The prefix is three hex digits which correspond to the 12 high order bits of the prefixed storage address.

CPU Local Store

This section of the 01/09 printout shows the contents of the General Purpose registers (GP), the Floating Point registers (FP), and the Extended Control registers (ECP) of the CPU which took the original machine check. Usually, the contents shown are the contents at the time of error. On occasion, however, the particular general purpose register involved in the failing instruction may reflect the value at the beginning of the failing instruction (before execution), rather than the value at machine check time.

This will occur during certain instructions, when the 'no-retry trigger' is on but the instruction is locatable and retryable (as determined by SERR). In these instances the orginal value of the general purpose register is restored from the ST or AB registers.

```
**********INTERNAL MACHINE CHECK  CALL TYPE 01**********

                CPU ID 1
DATE AND TIME OF ERROR   06/22/70   12•52•16   USER ID   TSS*****
MCOPSW 0304C00000003568   INT CODE 0000            PREFIX      000

GP   0-3      00 00 00 82    00 00 3D 2C    00 00 00 00    00 00 00 01
GP   4-7      00 00 10 00    00 00 00 00    00 00 00 01    00 00 00 09
GP  12-15     40 00 3D F2    80 00 20 2C    40 00 3E 62    00 00 35 50

FP   0-3      00 03 04 58    24 00 00 00    00 00 00 00    00 00 00 00
FP   4-7      00 00 00 00    00 00 00 00    00 00 00 00    00 00 00 00

ECR  0-3      00 05 C1 00    00 00 00 00    00 00 CA A4    00 00 00 00
ECR  4-7      FF FF 00 00    00 00 00 00    00 80 00 FF    00 00 00 00
ECR  8-11     88 88 44 44    00 00 00 00    02 02 00 00    84 00 84 00
ECR 12-15     66 00 00 00    00 00 00 00    00 00 02 00    00 00 00 00

IC     1 00  1 35  0 70       ROSAR 4B9  PROSAA 091 PROSAB 034  PREV ADR A 1
IC IN LS WORK REG    0        ROSAR AND ROSLTH     00400C5E00031803300004123

Q  REG        1 47  0 80  1 F0  1 14  0 91  0 04  1 F0  0 6D          F REG 0  01
AB REG        1 00  1 00  1 35  0 BC  1 FF  1 FF  1 CA  0 C4  1 0     ABC       0
ST REG        1 00  1 00  0 08  0 AE  1 00  1 00  0 08  0 AE          STC       0
LS WORK REG   1 00  1 00  0 20  0 F8        PA LATCH 64-67   1 0     G REG     8
E REG  0 91  0 80  R REG  1 47  0 80 D REG  1 00  1 35  0 BC SA LATCHES 1 00   0
EXTENDED IC  1 00      EXTENDED D REG  1 00  EXT INTRPT MASK   1 11111111

SAR  1 0000000  0 0000001  DATA CKS  11100000  MARK CK  0  FETCH 1

CPU MARKS     11111111  **  CHECK SUMMARY *** 1  D0-23   TO PADDA 40-63C
SYS + EXT MSK 00000011  PASS                  1  E8-11   TO PADDB 56-59
MACH CK MSK          1  BUFFER 1              1  E12-15  TO PADDB 60-63
ADDR SEQ            05  PSW PARITY 0-7        1
FLT CLK              3  MAIN PREFIX           1
CHECK COUNTER       1F
ROS PARITY CK 6-42   1
ROS PARITY CK 69-99

H REG   1 00  EXTEND PSW MD 1  EXTEND MSK 11111111 11111111 00000000 00000000
H REG PAR CHK        0          EXT MSK PAR1        1        1        1

LAR   (PRE-LOG)         00   WRT LOC ST  (PRE-LOC)   0
LAR  (POST-LOG)         18   WRT LOC ST (POST-LOG)   1

           **********SERR MODULE REPORTS*******

IRE  INSTRUCTION DATA
     ADDR(RELOC) ADDR(REAL) INSTRUCTION   TIME     ERROR CODE   FCC
     00003564    003564     9180F6C       00.35.39 ROS PAR      40
     OPERAND DATA
     ADDR-1(RELOC) ADDR-1(REAL)/GPR1  CONTENTS (8 BYTES)
                   000008              000008AE00004C4D
     ADDR-2(RELOC) ADDR-2(REAL)/GPR2  CONTENTS(8 BYTES)
     000035BC      0035BC              0000001435C90000

PNTR PROG CODE 0000  ROS ADDR 034

R/V PROG CODE  00000000

SB   FAIL CPU PSW 000000  START OF SERR SAVE AREA 033000
```

Figure 2. Call Type 01. Internal Machine Check

```
ERROR REPORT ID  004B0

**********INTERNAL MACHINE CHECK  CALL TYPE 09**********

                                                SE ID      B
DATE AND TIME OF ERROR   06/14/70   15.47.53   USER ID   TSS*****
MCOPSW 0004E00000018A60   INT CODE 0000            PREFIX      03C

GP   0-3      E2 E3 E5 F0    00 00 01 C8    00 01 8A 56    00 01 91 98
GP   4-7      00 0B 59 78    00 00 00 00    00 01 89 F0    00 01 8A 9F
GP   8 11     00 00 00 FF    00 00 01 24    00 00 00 00    00 00 00 00
GP  12 15     00 70 10 02    00 00 12 2C    00 10 E8 34    00 70 10 00

FP   0 3      00 00 00 00    00 00 00 00    00 00 00 00    00 00 00 00
FP   4-7      00 00 00 00    00 00 00 00    00 00 00 00    00 00 00 00

ECR  0-3      00 06 51 80    00 00 00 00    00 70 10 02    00 00 00 00
ECR  4-7      FF FF 00 00    00 00 00 00    F0 80 00 FF    00 00 00 00
ECR  8-11     88 44 44 44    88 00 00 00    00 24 20 00    84 00 84 00
ECR 12-15     92 04 96 66    40 00 00 00    00 00 02 0C    00 00 00 00

IC     0 01  0 8A  0 68       ROSAR 224  PROSAA 490 PROSAB  94B  PREV ADR A 1
IC IN LS WORK REG    0
ROS BITS      ROS PAR       P1-99                      P6-42
    0-42      CK  0-42  0  /      A    B  C     D   / E    F      G     *  H
                           000000 0000 10 00000 001 1 1010 111111 00000 00 00000

ROS BITS      ROS PAR       L    NA          K     J
   43-68      CK 43-68  0  0000 0010000000 00000 1100001

ROS BITS      ROS PAR                              P43-68   P69-99
   69-99      CK 69-99  O  M     N    P   * Q   / R T    / U    * V
                           00000 0000 000 0 000 1 0 0000 1 0000 0 000

Q  REG        1 82  1 00  1 00  1 28  1 00  1 00  1 00  1 00          F REG 0 01
AB REG        1 00  1 00  1 00  1 00  1 00  1 00  1 00  1 FF  1 0     ABC      0
ST REG        1 00  1 00  1 00  1 FF  1 FF  1 FF  0 F1  1 DB          STC      0
LS WORK REG   1 00  0 01  0 8A  0 52        PA LATCH 64-67   1 0     G REG   00
E REG  0 5B   0 80  R REG  1 82  1 00 D REG  0 01  0 8A  1 9C SA LATCHES 1 00
EXTENDED IC   1 00      EXTENDED D REG  1 00  EXT INTRPT MASK   1 11111111

SAR  0 0110001  0 0101001  DATA CKS  00000001  MARK CK  0  FETCH 1

STOR FR 2 DATA CK     1   PAR ADD 56-67 H.S. CK 1  NO RETRY                  1
CPU MARKS      11111111   PAR ADD H.S. CHECK    1  EXTERNAL MACH MASK     1111
MACH CK MSK           1   STORAGE DATA CK       1
COND CODE             2   ** CHECK SUMMARY ***  1
ADDR SEQ             05   BUFFER 1              1
FLT CLK               3   PSW PARITY 0-7        1
ROS TEST SEQ          7   MAIN PREFIX           1
CHECK COUNTER        1F
FLT  COUNTER          F

H REG   1 44  EXTEND PSW MD 1  EXTEND MSK  11111111 11111111 00000000 00000000
H REG PAR CHK         0         EXT MSK PAR 1         1        1        1

LAR   (PRE-LOG)          08    WRT LOC ST  (PRE-LOG)   1
LAR  (POST-LOG)          18    WRT LOC ST (POST-LOG)   1

              *********SERR MODULE REPORTS********

IRE  INSTRUCTION DATA
     ADDR(RELOC) ADDR(REAL) INSTRUCTION   TIME      ERROR CODE   FCC
     00018A5C    018A5C     5B8060AC      15.47.53  PAR ADD      05
     OPERAND DATA
     ADDR-1(RELOC) ADDR-1(REAL)/GPR1  CONTENTS(8 BYTES)
                   000008              000000FF00000124
     ADDR-2(RELOC) ADDR-2(REAL)/GRP2  CONTENTS(8 BYTES)
     00018A9C      018A9C              00000F24000000FF

PNTR PROG CODE 2001  ROS ADDR 94B

R/V PROG CODE  00000000

CM2 1ST BAD ADDR  DATA  TYPE
         018A9F  24    INTERMITTENT
    BAD PAGE 1 018  BAD PAGE 2 000  BAD PAGE 3 000  BAD PAGE COUNT 01
    INTERMITTENT SUPERVISOR DATA NOT FIXED
SB  FAIL CPU PSA 03C000  START OF SERR SAVE AREA 040000
```

Figure 3. Call Type 09. Multiple Internal Machine Check

Machine Check Logout

This section of the 01/09 printout contains the machine check logout area of the original machine check. For most of the CPU non-addressable registers, the logged byte parity is compared with a calculated byte parity based on the contents of the byte as it appears in the log. If the comparison fails, an asterisk is printed between the byte and its parity bit. For example, F REG 0*00. This check is made for registers IC, Q, AB, ST, LSWR, E, R, D, F, EXTENDED IC, EXTENDED D, and H.

Usually only those controls and latches which are in the non-zero state will have their status printed. However, the PRINT ZEROES option causes all items to be printed.

SERR Module Reports

This section of the 01/09 error printout contains several error reports as gathered by the SERR modules. These are the IRE report, the Pointer report, the Restore/Validate report, the Checker report, the CPU/Memory Checkout report and the Bootstrap report. If a SERR module has nothing to report, its section of the module is omitted. Details on each report follow:

IRE Report

The IRE report presents the addresses and contents of the instruction and its operands as well as a time stamp, the primary error, and a failure classification code. An example of an IRE report appears below.

```
IRE INSTRUCTION DATA

   ADDR (RELOC) ADDR (REAL) INSTRUCTION   TIME    ERROR CODE FCC

   0001911E     01911E      90680160    16.50.03 MEM ADDR   03

   OPERAND DATA

   addr-1 (reloc) addr-1(real)/lst contents (8 bytes)

                  000006          0001913000019472

   addr-2 (reloc) addr-2(real)/lst contents (8 bytes)

   00000160       000160          00197FA00019130
```

The first items in the IRE report are the relocated and real addresses of the instruction being executed when the error occurred. If relocation was not active when the error occurred, the two addresses will be the same. Next, the instruction itself is presented. If the instruction could not be located, the instruction and instruction address are left blank.

The time printed is the time that the error occurred in hours, minutes and seconds from midnight.

The error code is the best determination of the cause of error. When multiple error indicators are present in the log out, a priority search is made to determine the most probable cause of the error. This routine is not infallible. The error code will be one of the following:

Error Code	Meaning
PAR ADD	Parallel Adder Check
SER ADD	Serial Adder Check
ROS PAR	Read-Only Storage Parity Check
E-REG	E-Register Parity Check

MEM DATA	Memory Data Error
MEM ADR	Memory Address Error
RELOC ER	Relocation Error
H-REG	H-REG Parity Check
MPY ERR	Multiplier Decode Check
CLK OVFL	Time Clock Overflow Error

The Failure Classification Code (FCC) is a one byte hexadecimal code passed to Recovery Nucleus by SERR to summarize the failure. It is interpreted as follows:

01 Solid CPU failure. Reconfiguration must be called to partition a CPU from the system if possible. Only the SERR CPU checkout program can report a solid CPU failure. (Failing CPU ID will be specified in header).

02 Intermittent Storage Element Failure. Intermittent failures have been found in more than one memory by a total of three or less pages are bad. The first failing SEID will be included in the header. Only the SERR Memory Checkout Program can report 02, 04, 05, 06.

03 Intermittent Failure. SERR did not find a fault within its scope of testing of the CPU's and SE's of the system. However, the instruction could not be retried because of threshold has been exceeded (i.e., the instruction has progressed to the point where information has been destroyed).

04 Solid Storage Failure. A solid failure in a single memory was found by the SERR memory check program. The SEID will be included in the header.

05 Intermittent Storage Element Failure. Less than four pages were found with bad parity but these were all within the same memory. An SE ID will be included in the header.

06 Intermittent Storage Element Failure. More than three pages were found with bad parity but these were all within the same memory. An SE ID will be included in the header.

80 Global Memory Damage. Failures were found in more than three pages in more than one memory.

4X Retry Possible. It is possible to re-execute the instruction in progress. X can be a 0 or 1.

The remainder of the IRE reports present the first and second operand addresses and contents of the first and second operands of the instruction being executed at the time of the error.

The relocated and real addresses of each operand are included. If either operand is a general purpose register or floating point register, the relocated address is left blank and the number of the GPR or FPR is printed in place of the real address. If relocation was not active at the time of error, the relocated and real addresses will be the same. The first eight bytes of each operand are printed, regardless of the true length of each operand. If the operand is a GPR, the contents of two GPRs starting at the one specified are printed.

The first operand is that operand closest to the operation code as it appears in the instruction format and its address is labeled ADDR-1. Some instructions do not have an address of the first operand, such as MVI or CLI. In these cases, the information in the ADDR-1 and CONTENTS fields will be meaningless. The data gathering program does not treat these as exceptions, but merely computes addresses and extracts data blindly from these addresses. The second operand is the operand furth-

est from the operation code as it appears in the instruction format and its address is labeled ADDR-2.

Pointer Report

The pointer report contains information obtained while pointer was attempting to locate the failing instruction. A sample report appears below:

PNTR PROG CODE 2002 ROS ADDR 401

The program code consists of 16 bits. They are numbered from 0 to 15, left to right, and have the following meaning.

First Byte:

Bit 0 An I-fetch (byte update) cycle is in progress (may exist for several cycles).

Bit 1 An Execute instruction is being done with the execution of the subject instruction now in progress.

Bit 2 The instruction is not retryable because of some threshold.

Bit 3 The instruction address computed for analysis is not legal. Thus the instruction is not retryable.

Bit 4 A BAL, BALR, BAS, BASR was restored. The location of the failing instruction was located by retrieving the instruction counter from a general purpose register.

Bit 5 Branch active - pointing to the successful branch address.

Bit 6 IC Indeterminate - pointer is unable to locate the failing instruction because of lack of information.

Bit 7 End op cycle is in progress.

Second Byte:

Bit 0 The ending sequence of an Execute instruction has been recognized. This is the portion where the subject instruction is finished, but the Q-Register needs to be refilled before continuing with the instructions sequence. This situation is not retryable.

Bit 1 The contents of the calculated address of the failing instruction does not check with the operation code in the E-Register. Therefore, no retry can be made. This check is done on all non-branch instructions.

Bit 2 No retry because necessary data in the log-out has been found to be bad by the SERR-Checker module.

Bit 3 No retry because a memory data check occurred while retrieving the suspected failing instruction.

Bit 4 While operating the SERR-Pointer module an unexpected machine check occurred, therefore no retry will be attempted.

Bit 5 Storage data error - the original machine check occurred because of a store into memory by a store type instruction. The instruction in progress at the time of error may or may not be the store type instruction. If not, any significant effects of the current instruction will be restored and the return point, if retryable, will be to the previous store instruction. If the current instruction is at fault and retryable, then it will be retried and no restore need be checked or done.

Bit 6 Special Memory Address Error. This situation arises due to a memory addressing error reported in the log when it has been determined that a possible store type instruction existed prior to the one now in execution. When this occurs, it is impossible to determine which instruction caused the addressing error, past or current instruction. Therefore, no retry will be made.

Bit 7 Repeat of a previous failure. This bit indicates no retry and is inserted into the pointer report by the SERR-IRE module to form a complete report.

If bit 5 of the second byte of the program code is set the following printout will occur.

MEM STORE ERROR, START OF DAMAGED FIELD - XXXXXX

where XXXXXX is the six hexadecimal digit address of the first bad byte.

If bit one of the first byte of the program code is set, the following printout will occur:

EXECUTE INSTR IN PROGRESS, LOCATION OF EXECUTE XXXXXX

where XXXXXX is the six hexadecimal digit address of the execute instruction.

Since the normal IRE report data only supplied the address of the current instruction, the addresses described above must be sought and recorded separately.

The ROS address indicated in the pointer report is a three hexadecimal digit address indicating the ROS word which was most significantly being executed at the time of the machine check. This address is simply determined by the PREV ADR A indicator in the logout. If it is a "one", PROSAB is recorded, if it is a "zero", PROSAA is recorded. This does not necessarily mean that the ROS word indicated by the address was the cause of the failure. It merely means that if data transfers were in progress at the time, the commands were probably issued by the ROS word indicated by that ROS address. An example where the ROS address cited is not the cause of the failure is a ROS parity. When a ROS parity occurs, just the opposite criteria of the PREV ADR A indicator has to be used to establish the failing ROS word.

Restore/Validate Report

The Restore/Validate report consists of a four byte program code. An example is given below.

R/V PROG CODE 20000000

Each bit of the report has a meaning assigned to it as described.

Byte One:
Bits 0-1 Spare
Bit 2 No retry because of program or hardware threshold (OR'ed into Pointer report).
Bit 3 Spare
Bit 4 BAL, BALR, BAS or BASR restored (OR'ed into Pointer report).
Bits 5-7 Spare

Byte Two:
Bits 0-7 Spare

Byte Three:
Bit 0 S,T,A, or B register is needed to restore GPR but had bad parity.
Bit 1 GPR or FPR has bad parity.
Bit 2 Past program retry threshold for this instruction.
Bit 3 Failing instruction O-Code not legal.
Bits 4-7 Spare

Byte Four:
Bits 0-7 Spare

The presence of any of the above conditions means that no retry can be made.

Checker Report

The Checker module report consists of the reporting of all parity errors in various critical registers or storage areas. A one bit printed under a register indicates the presence of bad parity in at least one byte of the register. The example below shows that bad parity was found in the extended mask.

```
CKER PARITY ERRORS

      IC  D  LSWR  R E A B S T O  EXT  MASK F H PSW LOG PSA CLOCK

                                    1

      GPRS0123456789ABCDEF  FPRS 01234567    ECRS0123456789ABCDEF
```

CPU/Memory Checkout Report

The CPU/Memory Checkout modules (CM1, CM2, CM3) prepare two reports. The first report contains information pertaining to a failing memory. The format of the printout of the first report is shown below.

```
CMS  FAIL CPU ID      ERROR CODE   TYPE

           2          1100         SOLID
```

This report is interpreted as follows: The FAIL CPU ID is the number (1-4) of the CPU in error. The error code is arranged in the following manner.

Bits 1-3	C/M ID	000-C/M 1 001-C/M 3 010-C/M 2
Bits 4-7	Error	0000 Hang occurred 0001 MCI occurred 0010 Functional Check failed
Bits 8-15	Routine Number	(C/M 1 only)

If C/M 3 detected a failing ROS address, that address is printed, as shown in the sample. The state of the solid/intermittent bit of the error code is also printed in words.

The second report is prepared only by the memory checkout module C/M 2. An example of this report is as follows:

```
CM2  1ST BAD BYTE ADDR  BYTE DATA TYPE PICK/DROP

        016372          03       SOLID 02

  BAD PAGE  1 016 BAD PAGE 2 027  BAD PAGE 3 000 BAD PAGE COUNT 02

  CPU-MEMORY CORRELATION  CPU1     CPU2      CPU3       CPU4

             MEMORY   ABCDEFGH  ABCDEFGH  ABCDEFGH   ABCDEFGH

                          1         1
```

The first portion of the report contains the address of the first bad parity byte found while scanning all active pages of memory and the original contents of the byte. The byte is exercised to determine whether

the failure is solid or intermittent. If the failure is solid, an attempt is made to determine whether bits are being picked or dropped and which bits are affected. If the PICK/DROP value printed is mostly zeroes, the implication is that the bits shown as ones are being picked. Similarly if the value shown is mostly ones the zero bits are being dropped.

The next portion of the report contains a count of the number of pages which have bad parity data in them. (Maximum of 255.) The page address (high order 12 bits - of a 24 bit address) is printed for the first three bad pages found.

The last portion of the report contains the results of a CPU/Memory interface test. The test performs a small interface check with each active memory in the system from each active CPU in the system. A one under a CPU/Memory combination indicates a failure on that interface. In the example shown above Memory E failed with both CPU1 and CPU2. The conclusion drawn is that the interface of Memory E is at fault. If CPU1 had trouble with several memories, the conclusion would be that the CPU1 interface is at fault.

Bootstrap Report

This report contains the prefix value for the failing CPU's active prefix. If it is zero, prefixing was disabled at the time of error. The report also contains the starting address of the SERR Save Area, which is used to save the environment of all the active CPU's in the system. The operating area for the SERR modules is the page below the SERR Save Area. An example of the SERR Bootstrap report appears below:

```
SB  FAIL CPU PSA 000000 START OF SERR SAVE AREA 002000
```

TYPES 25 AND 26

Call type 25 (Immediate Report - Paging) and call type 26 (Immediate Report - Task) are identical in printout form. Examples of these error reports for paging and task devices are shown in Figures 4 and 5. The CCW list may contain as many as 10 CCWs.

```
ERROR REPORT ID *0004B0

***IMMEDIATE REPORT - PAGING I/O ERROR CALL TYPE 25***

SYMBOLIC DEVICE ADDRESS: 0023

SEEK ADDRESS: 0000002A0012   RECORD NO:  03

FAILING PATH: 0290

SUCCESSFUL  AFTER  06(D) RETRIES

DEVICE TYPE: 2314

PHYSICAL ADDRESS C

VOLUME ID: ABCDEF

DATE & TIME OF ERROR:  01/28/69  07:10:56

SENSE DATA
0800 0000 0000 0000

CHANNEL STATUS WORD
KEY:40     STATUS:0E00   BYTE COUNT:0002

CHANNEL COMMAND WORD LIST
                                070063A8 40000006
                                310063AA 40000005  ***FAILING CCW
```

Figure 4. Call Type 25. Immediate Report, Paging I/O

```
ERROR REPORT ID *0006BA

****IMMEDIATE REPORT - TASK I/O ERROR CALL TYPE 26****

SYMBOLIC DEVICE ADDRESS: 0029

SEEK ADDRESS: 000000030000    RECORD NO.  05

FAILING PATH: 0B05

SUCCESSFUL  AFTER  01(D) RETRIES

DEVICE TYPE: 2311

VOLUME ID: 222222

DATE AND TIME OF ERROR:  10/10/69  05:47:57

SENSE DATA:
0400 00C0 0000 0001

CHANNEL STATUS WORD
KEY:40     STATUS:0C00  BYTE COUNT:0001

CHANNEL COMMAND WORD LIST

                              0707B2BA 00000006
                              0707B2BA 40000006
                              3107B2C0 40000005
                              0807B330 00000000
                              1D07B318 80000008
                              1D07B2C8 60000050
                              03008000 20000001  ***FAILING CCW
```

Figure 5. Immediate Report, Task I/O

TYPES 27 AND 2A

Call type 27 (Statistical Data Record - Paging) and call type 2A (Statistical Data Recording - Task) are outboard errors with similar format. Figures 6 and 7 are examples of these types of error print. There may be up to 10 Channel Command Words in the CCW list.

```
ERROR REPORT ID 0006B0

*****PAGING I/O STATISTICAL DATA RECORD CALL TYPE 27*****

SYMBOLIC DEVICE: 0031

DEVICE TYPE: 2311

THIS DEVICE HAS EXPERIENCED 15(D) INTERMITTENT ERRORS

DATE & TIME FIRST ERROR  01.27.69    10.15.30

DATE & TIME LAST ERROR  01.28.69    15.27.10

SENSE BYTE FREQUENCY COUNTERS
        BIT 0  BIT 1  BIT 2  BIT 3  BIT 4  BIT 5  BIT 6  BIT 7
BYTE 0      0      0      0      0      0      0      0      0
BYTE 1      0      0      0      0      0      0      0      0
BYTE 2      F      F      F      F      F      F      F      F
BYTE 3      F      F      F      F      F      F      F      F
BYTE 4      0      0      0      0      0      0      0      0
BYTE 5      F      F      F      F      F      F      F      F
BYTE 6      0      0      0      0      0      0      0      0
BYTE 7      0      0      0      0      0      0      0      0

**FOLLOWING DATA PERTAINS TO LAST ERROR ONLY**

    FAILING PATH: 03A4

    SEEK ADDRESS: 000000880006    RECORD NO:  14

    VOLUME ID: 123456ABCDEF

    SENSE DATA

    0800 0000 0000 0000

    CHANNEL COMMAND WORD LIST
                              0702A53A 40000000
                              3102A53C 40000000  ***FAILING CCW
```

Figure 6. Statistical Data Record Overflow, Paging I/O

```
ERROR REPORT ID 0006B0

******TASK I/O STATISTICAL DATA RECORD CALL TYPE 2A******

SYMBOLIC DEVICE: 0031

DEVICE TYPE: 2311

THIS DEVICE HAS EXPERIENCED 15(D) INTERMITTENT ERRORS

DATE & TIME FIRST ERROR  01.27.69    10.15.30

DATE & TIME LAST ERROR  01.28.69    15.27.10

SENSE BYTE FREQUENCY COUNTERS
        BIT 0  BIT 1  BIT 2  BIT 3  BIT 4  BIT 5  BIT 6  BIT 7
BYTE 0      0      0      0      0      0      0      0      0
BYTE 1      0      0      0      0      0      0      0      0
BYTE 2      F      F      F      F      F      F      F      F
BYTE 3      F      F      F      F      F      F      F      F
BYTE 4      0      0      0      0      0      0      0      0
BYTE 5      F      F      F      F      F      F      F      F
BYTE 6      0      0      0      0      0      0      0      0
BYTE 7      0      0      0      0      0      0      0      0

**FOLLOWING DATA PERTAINS TO LAST ERROR ONLY**

    FAILING PATH: 03A4

    SEEK ADDRESS: 000000880006    RECORD NO:  14

    VOLUME ID: 123456ABCDEF

    SENSE DATA

    0800 0000 0000 0000

    CHANNEL COMMAND WORD LIST
                              0702A53A 40000000
                              3102A53C 40000000  ***FAILING CCW
```

Figure 7. Statistical Data Recording, Task I/O

TYPES 28 AND 2B

Call type 28 (Solid Error Record-Paging) and call type 2B (Solid Error Record-Task) have printouts identical in form except for the title line. Figures 8 and 9 depict these two error records for the devices specified. The Channel Command Word list may contain up to 10 CCWs.

```
ERROR REPORT ID  000400

******SOLID PAGING I/O OUTBOARD ERROR CALL TYPE 28******

SYMBOLIC DEVICE ADDRESS: 0090

FAILING PATH: 0857

UNSUCCESSFUL AFTER 00(D) RETRIES

DEVICE TYPE: 1050

DATE AND TIME OF ERROR:  06/17/70  15:25:05

SENSE DATA:
4800 0000 0000 0000

CHANNEL STATUS WORD
KEY:00     STATUS:0E00   BYTE COUNT:007E

CHANNEL COMMAND WORD LIST
                              010358AA 60000003
                              020AB380 60000001
                              010AB3FF 60000006
                              080AB218 00000000
                              08570857 000337B8
                              020AB380 60000001
                              0103581F 60000003
                              0A0AB380 60000080  ***FAILING CCW
                              0103581E 20000001
```

Figure 8. Solid Paging Device Error

```
ERROR REPORT ID *000400

*******SOLID TASK I/O OUTBOARD ERROR CALL TYPE 2B*******

SYMBOLIC DEVICE ADDRESS: 0060

FAILING PATH: 0016

UNSUCCESSFUL AFTER 00(D) RETRIES

DEVICE TYPE: 2741

DATE AND TIME OF ERROR:  06/18/70  12:14:53

SENSE DATA:
4000 0000 0000 0000

CHANNEL STATUS WORD
KEY:00     STATUS:0E00    BYTE COUNT:00C9

CHANNEL COMMAND WORD LIST
                              03000000 60000003
                              01002993 60000019
                              01002992 60000001
                              0A002993 600000C9  ***FAILING CCW
                              01002991 20000001
```

Figure 9. Solid Task Device Error

TYPE 29

Call type 29 (External Machine Check) prints the identity of the CPU which took the machine check, the date and time, and the User ID. The three hex digits of the Prefix represent the 12 high order bits of the prefixed address. The Machine Check Old PSW and Interrupt Code of the external machine check are also presented, along with the I/O address and Symbolic Device Address of the device being used.

The next section of this error report shows the ch&nnel configuration and activity at the time of the error. The type of channel (selector or multiplex) assigned to each CCU is printed, and whether or not the channel was active when the error occurred. An example of this section is shown:

```
                    CCU0   01234567 CCU 1 01234567  CCU 2 01234567 CCU 3 0123456
CHAN TYPE S=SEL,M=MTPX  MSM           MMMSMS           SMSS           M S
CHAN ACTIVITY A=ACTIVE  AA            AAAAA            AAAA           A A
```

The next line of this report defines whether the failure was detected during an SIO sequence, the number of retries attempted, and whether retry was successful. Any of these messages, or all of them, may occur. (Figure 10 shows all of them.)

The Channel Status Word and the channel log are printed if they were stored as a result of the error. The CSW is printed as a hex double word. If a channel log is present, and it can be determined to be a selector or multiplex channel, the appropriate format is printed. The three double words of the channel log are printed in hex if the type of channel cannot be determined.

A call type 29 is shown in Figure 10.

```
ERROR REPORT ID 020416

           ***********EXTERNAL MACHINE CHECK CALL TYPE 29***********

CPU ID      2       DATE AND TIME OF ERROR   6/23/70   08.47.23

PREFIX       04D    MCOPSW      0304000000012345 INT CODE   8004

I/O PATH    010C    SYMB ADDRESS   002A

                    CCU0   01234567 CCU 1 01234567  CCU 2 01234567 CCU 3 01234567

CHAN TYPE S=SEL,M=MTPX  MSM            MMMSMS           SMSS           M S

CHAN ACTIVITY A=ACTIVE  AA             AAAAA            AAAA           A A

START I/O FAILURE RETRIES ATTEMPTED 48 RETRY SUCCESSFUL

CHANNEL STATUS WORD          00000000 00000000

                 **** 2870 CHANNEL LOGOUT ****

KEY    0  OPS WRITE   DATA ADDRESS 000000  BYTE COUNTER 0000

INCORRECT LENGTH 0  HALT I/O

BYTE CT OR COUNT PO-7 000

*FLAGS*
CDA     0   CC   0   SLT   0   SKIP   0   PCT   0

*STATUS*
PREFETCH     0  DATA ADDRESS PROG CK   0  CONTROL CK
DATA CK      0  PROTECTION CK          0  PROGRAM CK

KEY      0   COMMAND ADDRESS 000000  UCW PARITY   00000000

    RESIDUAL COMMAND ADDRESS 000000

CHAN/UNIT  ADR 000

*CONTROL TRIGGERS*
CAW              0   START I/O          0  MODE TRIGGERS 11
CCW REQ          0   TEST I/O           0       1234 67 901
CCW IN CHAN      0   HALT I/O           0       0000 00 000
MC BC PARITY     0   PSEUDO SIO         0
DATA REQ

*CHECKS*
WORD 0 UCW       0   LOCAL STORE ADDR   0  BYTE COUNT
WORD 2 UCW       0   STORAGE            0  TIME OUT
                                           PRIORITY

*SUB CHANNEL*
UNIT ADDR CK     0   INCORRECT SELECTION0  AD-1 CHECK
COMMAND CHECK    0   INCORRECT TEG SEQ.  0  ST-1 CHECK
BYTE COUNT CK    0   NO RESPONSE         0

*SELECTOR SUB CHANNEL*
  BC   P 4 2 1          ILI
                        DATA CHECK
       0 0 0 0          CHAIN CHECK
```

Figure 10. External Machine Check

TYPE 2C AND 2D

Channel Error - Task (2C) and Channel Error - Page (2D) have similar formats. A channel log may be present if, and only if, the CSW status indicates either 'channel data check' or 'interface control check'. If a channel log is not included and the CSW does not indicate 'channel control check', the other CSW status bit settings together with the device type being accessed, should aid in defining the source of the hardware problem.

If it can be determined whether the log is that of a multiplex channel or a selector channel, a formatted log is printed. Otherwise the three double-words are printed in hex.

The assignment of multiplex and selector channels to channel controllers is printed following the logout. This is followed by the CCW list in which the error occurred.

Examples of a task (2C) error without a channel log, and a paging (2D) error with a channel log are shown in Figures 11 and 12.

```
ERROR REPORT ID  000400

**************I/O INBOARD ERROR      CALL TYPE 2C******************

SYMBOLIC DEVICE ADDRESS 0044
FAILING PATH 03D4          DATE AND TIME OF ERROR:  06/16/70  07:39:50

CHANNEL STATUS WORD 0000000000040000          USER ID   SYSOPER0

CHANNEL LOG                00000000 00000000
                           00000000 00000000
                           00000000 00000000

                          CCU0 01234567 CCU1 01234567 CCU2 01234567 CCU3 012345E
CHAN TYPE  S SEL,M=MTPX

CHANNEL COMMAND WORD LIST      0100000020000050
```

Figure 11. Task Channel Failure

```
ERROR REPORT ID  0004C0

**********************I/O INBOARD ERROR     CALL TYPE 2D**********************

SYMBOLIC DEVICE ADDRESS 001A
FAILING PATH 0A42        DATE AND TIME OF ERROR:  03/02/00   07:01:09

CHANNEL STATUS WORD 3006B2D000040000          USER ID   SYSOPER0

                          **** 2860 CHANNEL LOGOUT ****

LOG WORD 1                     0000 0000 0000 0000

LOG WORD 2                     MARK B REG            00
                               COMMAND CODE          00
                               FLAGS-BINARY       00000
                               CHANNEL ADDRESS        0
                               UNIT ADDRESS          00
                               DATA ADDRESS      000000
                               SIM I.F. REG          00

LOG WORD 3

CONTROL TRIGGERS          I.F. TAGS                 REGISTER PARITIES
A REG FULL          0     OP-I                0     STORAGE PROTECT          0
B REG FULL          0     STOR CHECK          0     P0 COMMAND ADDR          0
CHAIN CMD LATCH     0     AD-O LATCH          0     P1 COMMAND ADDR          0
CCW VALID           0     SL-O LATCH          0     P2 COMMAND ADDR          0
RD                  0     SR-O LATCH          0     DATA BUS IN              0
WR                  0     CM-O                0     P0 COUNT                 0
SET UP              0     SIO LATCH           0     P1 COUNT                 0
TIC                 0     HALT I/O LATCH      0     P2 COUNT                 0
TIC  CYCLE          0                               UNIT ADDRESS             0
POLLING INTERRUPT   0                               P0 DATA ADDR             0
CDA LATCH           0                               P1 DATA ADDR             0
LAST WORD TGR       0                               P2 DATA ADDR             0
BC EQ. CTB TGR      0                               MARK B                   0
BC LATCH EQ. 0      0                               COMMAND                  0
BC EQ. 0            0                               FLAG                     0
BC REG PAR          0                               SIM I.F.                 0
BIT 3 BC REG        0
BIT 2 BC REG        0
BIT 1 BC REG        0
SEQ TGRS REG       00

                        CCU0 01234567 CCU1 01234567 CCU2 01234567 CCU3 01234567
CHAN TYPE  S=SEL,M=MTPS      MSSS          MSSS

CHANNEL COMMAND WORD LIST      0706B2A000000006
                               0706B2A040000006
                               3106B2A240000005
                               0806B2B800000000
```

Figure 12. Paging Channel Failure

TYPES 2E AND 2F

Intermittent Error Record-Paging (2E) and Intermittent Error Record-Task (2F) are similar in format. Sample printouts are shown in Figures 13 and 14. The Channel Command Word list may contain up to 10 CCWs.

```
ERROR REPORT ID 0202B6

**********INTERMITTENT PAGING I/O OUTBOARD ERROR CALL TYPE 2E**********

SYMBOLIC DEVICE ADDRESS: 0020

SEEK ADDRESS: 000000060001     RECORD NO. 02

FAILING PATH: 0A00

SUCCESSFUL  AFTER  01(D) RETRIES

DEVICE TYPE: 2311

VOLUME ID: DP0632

DATE AND TIME OF ERROR:  02/14/70  02:16:02

SENSE DATA:
0801 00C8 0006 0000

CHANNEL STATUS WORD
KEY: 30      STATUS:0E40    BYTE COUNT:0800

CHANNEL COMMAND WORD LIST
                              07061920 40000006
                              31061922 40000005
                              08061938 00000000
                              06072000 00001000    ***FAILING CCW
```

Figure 13. Intermittent I/O Outboard, Paging

```
ERROR REPORT ID

************INTERMITTENT TASK I/O OUTBOARD ERROR CALL TYPE 2F************

SYMBOLIC DEVICE ADDRESS: 0023

SEEK ADDRESS:  0000002A0012    RECORD NO: 3

FAILING PATH: 0290

SUCCESSFUL  AFTER  6(D) RETRIES

DEVICE TYPE:  2314

PHYSICAL ADDRESS C

VOLUME ID:  ABCDEF654321

DATE & TIME OF ERROR  01.28.69  07.10.56

SENSE DATA
0800 0000 0000 0000

CHANNEL STATUS WORD

KEY:30     STATUS:0E40    BYTE COUNT:0800

CHANNEL COMMAND WORD LIST
                                070063A8 40000006
                                310063AA 40000005  ***FAILING CCW
```

Figure 14. Intermittent I/O Outboard, Task

TYPE 41

System Error (41) is actually a combination of two reports which have been described previously in this section.

The Header is the same as that for all sections with an error ID and title. The User ID is also included. Call type 41 has two subsections, either one or both of which may be printed.

The first subsection is identical to the CPU/Memory Checkout report under 'SERR Module Reports' in the description of type 01 and 09 errors in this section.

The second subsection contains the date and time, identification of the failing CPU or SE, and the Failure Classification Code (FCC). The FCC is described in detail under 'IRE Report' in the description of type 01 and 09 errors in this section.

An example of this printout when no errors have been found is shown in Figure 15.

```
ERROR REPORT ID  000480

**********SYSTEM ERROR  CALL TYPE 41**********

USER ID      SYSOPER0

          ********SERR MODULE REPORTS********

IRE     TIME 22.36.57   NO FAILURES WERE FOUND BY SERR
```

Figure 15. 'No Failure' Report

Where more than one page reference is given, the major reference is first.

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This Technical Newsletter, a part of Version 8, Modification 1, of IBM System/360 Time Sharing System, provides replacement pages for the subject publication. Pages to be inserted and/or removed are as follows:

11-14
19-20

A change to the text is indicated by a vertical line to the left of the change.

Summary of Amendments

This TNL corrects two examples.

Please file this cover letter at the back of the manual to provide a record of change.

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A change to the text is indicated by a vertical line to the left of the change.

Summary of Amendments

A new CZATA diagnostic message has been added.

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