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# PROSA Version 4.0 Manual

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**ABSTRACT**

This report includes a comprehensive manual of the computer program PROSA which illustrates the handling and functioning of PROSA. The manual PROSA 4.0 describes the PC Version of PROSA including its Program Moduls. The PROSA program package is a statistical tool to decide on the basis of statistical assumptions whether in a given sequence of material balance periods a loss of material might have occurred. The evaluation of the material balance data is based on statistical test procedures. In the present PROSA Version 4.0 the three tests CUMUF test, PAGE's test and GEMUF test are applied to a sequence of material balances. PROSA Version 4.0 supports a real sequential evaluation. That means, PROSA is not only able to evaluate a series of MUF values sequentially after the campaign has finished, but also real sequentially during the campaign. PROSA Version 4.0 is a menu-guided computer program. Data input can be performed either by diskette or by key-enter. Result output is primarily an information whether or not an alarm is indicated. This information can be displayed either numerically or graphically. Therefore, a comfortable graphical output utility is attached to PROSA 4.0. PROSA Version 4.0 is written in FORTRAN 77 and the program moduls are compiled and linked with the Ryan Mc-Farland Compiler. The PROSA Graphical Utility uses the PLOT88 Library of Plotworks, Inc..

PROSA VERSION 4.0 HANDBUCH

ZUSAMMENFASSUNG

Dieser Bericht beinhaltet ein umfangreiches Handbuch des Computerprogramms PROSA, das die Handhabung und die Funktionsweise von PROSA erläutert. Das Handbuch PROSA 4.0 beschreibt die PC-Version von PROSA mit seinen Programmodulen. Das PROSA Programmpaket ist ein statistisches Werkzeug. Basierend auf statistischen Annahmen entscheidet es, ob in einer Folge von Bilanzperioden ein Materialverlust aufgetreten ist. Die Auswertung der Materialbilanzdaten basiert auf statistischen Testverfahren. In der vorliegenden Version von PROSA sind die drei Tests CUMUF-Test, PAGE's-Test und GEMUF-Test enthalten. PROSA Version 4.0 unterstützt eine tatsächlich sequentielle Auswertung. Das heißt, PROSA ist nicht nur in der Lage, eine Folge von MUF Werten sequentiell nach Abschluß der Kampagne auszuwerten, sondern auch echt sequentiell im Verlauf der Kampagne. PROSA Version 4.0 ist ein Menu-geführtes Computer Programm. Dateneingabe ist sowohl mittels Diskette als auch durch Tastatureingabe möglich. Ausgaberesultat ist in erster Linie eine Aussage darüber, ob ein Alarm aufgetreten ist oder nicht. Dieses Ergebnis kann numerisch wie auch graphisch abgerufen werden. PROSA Version 4.0 ist in FORTRAN 77 geschrieben. Die Programmodule sind mit dem Ryan Mc-Farland Compiler übersetzt und gebunden. Zur Graphikausgabe benutzt PROSA die PLOT88-Bibliothek von Plotworks, Inc..

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# Chapter 1:

## Introduction


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# 1. Introduction

## 1.1 PROSA Summary

The manual PROSA 4.0 describes the PC Program Moduls Version of PROSA.
The PROSA program package is a statistical tool to decide on the basis of statistical considerations whether in a given sequence of material balance periods a loss of material might have occurred or not. The evaluation of the material balance data (MUF values) is carried out with statistical test procedures based on the measurement model of the facility considered (dispersion matrix).
In the present PROSA Version 4.0 the three tests

- Truncated sequential CUMUF-Test
- CUSUM-Test according to PAGE
- Truncated sequential GEMUF-Test

are included.
PROSA Version 4.0 is a menu-guided computer program. Data input that means MUF values as well as dispersion matrix can be performed either by diskette or by key-enter. Output is primarily an information whether or not an alarm is indicated. This information can be displayed in detail either numerically or graphically. Therefore, a comfortable graphical output utility is attached to PROSA 4.0.
PROSA Version 4.0 supports a real sequential evaluation. That means, PROSA is not only able to evaluate a series of MUF values sequentially after the campaign has finished, but also real sequentially during the campaign.

## 1.2 GENERALITIES

PROSA Version 4.0 is written in FORTRAN 77 and the program moduls are compiled and linked with the Ryan Mc-Farland Compiler. The PROSA Graphical Utility uses the PLOT88 Library of Plotworks Lt.. The PROSA Menu Guide uses the 'Ask Utility' of NORTON Utilities.

## 1.3 System Support

The PROSA numerical program moduls and the included PROSA graphic utilities need a minimum of hardware system configuration.

a) a computer system ( AT-compatible ) with at least 256 kByte memory, including a mathematical coprocessor,
b) a Hard Disk drive
c) a Floppy Disk drive ( at least 360 kByte )
d) an EGA/VGA graphic adapter
e) a graphical display
f) an output device ( matrix printer/laser printer )
g) a PC-DOS Version 3.0 or higher.

## 1.4 Using this Manual

This manual is subdivided into eight chapters, and provides information for the users of PROSA Version 4.0.

**Chapter 1** is an introduction to the PROSA Version 4.0 and outlines the hardware and software configurations required.
**Chapter 2** is a short PROSA Manual with description of the installation procedure, the use of PROSA and the creation of a new subdirectory for statistical evaluations.
**Chapter 3** describes the handling of PROSA in a given subdirectory EXAMPLE with an example of MUF values in a data set called MUF and a dispersion matrix in a data set called COVA.
**Chapter 4** gives an overview of the PROSA Browse Utility for displaying or printing the statistical results.
**Chapter 5** describes PROSA Utilities for subdirectory maintenance.
**Chapter 6** describes the handling of data input of PROSA.
**Chapter 7** includes an exercise for a real sequential evaluation with PROSA.
**Chapter 8** describes the error messages from PROSA Version 4.0.
**Chapter 9** describes further aspects and possibilities.

## 1.5 Structure of the Prosa Version 4.0 Menu Architecture

An overview of the structure of the PROSA Menu architecture is shown below. From the MAIN MENU you can choose MENU 1 as far as MENU 5.

MAIN MENU

-MENU 1: Input of Data by - Diskette

- Key-enter

-MENU 1.1:

Key-enter of the MUF Values
and the COVARIANCE Matrix

-MENU 1.2:

Key-enter of the MUFRS Values
and the COVARIANCE Matrix

-MENU 2: Run PROSA;

- Select the Output Device;

-MENU 3: Run Authentication;

-MENU 4: Browse Results of PROSA Statistical Procedure;

-MENU 4.1: Browse Numerical Results;

- Select the Output Device;

-MENU 4.2: Browse the Results by Graphic;

- Select the Graphical Output Routine;
- Change the Plotparameter

-MENU 5: Thresholds;

# Chapter 2:

## Short PROSA Manual


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## 2. Short PROSA Manual

For optimization of the performance of the PROSA program moduls the PROSA program has to be installed on the hard disk of your computer system.

### 2.1 How to Install PROSA

To install the PROSA Version 4.0 on the hard disk within your PC system you can use the install utility on the floppy PROSA_DSK1. The install utility creates a directory called PROSA and a subdirectory called EXAMPLE on the hard disk. All program moduls will be installed in the directory PROSA and all data files will be installed in the subdirectory EXAMPLE. Therefore, follow the instructions below.

Insert PROSA_DSK1 in Drive A and type :

C:\>**A:** <CR> ( <CR> means, hit the return key )

A:\>**init a: c:** <CR>

If you use Drive B type :

C:\>**B:** <CR>

B:\>**init b: c:** <CR>

If you want to install PROSA not on Drive C, but for example on Drive D, then substitute

A:\>**init a: c:** <CR> by A:\>**init a: d:** <CR>

respectively

B:\>**init b: c:** <CR> by B:\>**init b: d:** <CR>

Next you will be prompted to insert PROSA_DSK2. Finally you have to insert PROSA_DSK1 again to complete the task.

In the following it is assumed that the program package PROSA is installed on Drive C.

When the install procedure is successfully terminated, the program package PROSA is on Drive C: and you will be prompted C:\PROSA\EXAMPLE>.

The completeness of the program moduls in the directory PROSA for the evaluation procedure and the graphical PROSA output routines can be controlled by typing:

C:\PROSA\EXAMPLE>**dir ..** <CR>.

The following files

- INSTALL.BAT
- ASK.EXE
- MUFIN.EXE
- AMUFIN.EXE
- AUTHEN.EXE
- COVIN.EXE
- SIMULA.EXE
- PSETUP.EXE
- BUILTUP.EXE
- MATRIX.EXE
- STATIST.EXE
- PLOTPARM.EXE
- RET.COM
- DEVICE.EXE
- CDEVICE.EXE,

the following two graphic files

- GCMF.EXE
- GSTAT.EXE

and the following subdirectory should be listed

- EXAMPLE <DIR>

In the subdirectory EXAMPLE are the BATCH and DATA files.

Check it by typing:

C:\PROSA\EXAMPLE>**dir** <CR>.

The following batch files

- PROSA.BAT
- NEWDIR.BAT
- DELDIR.BAT
- GOTODIR.BAT,

the following input data files

- MUF
- COVA,

and the following parameter input files

- PLOTPARM.INP

should be listed.

## 2.2 How to Use PROSA

PROSA is now in directory PROSA on Drive C. In subdirectory EXAMPLE is an example with a sequence of 20 balance results and a dispersion matrix according to this MUF sequence. This subdirectory is foreseen for demonstration and training purposes.

You can start the program by typing:

C:\PROSA\EXAMPLE>**PROSA** <CR>

and the MAIN MENU is displayed on the screen.
First of all the test thresholds have to be determined by choosing the option 'Thresholds of PAGE & GEMUF Test'. Next the PROSA evaluation can be started by choosing the option 'Run PROSA' (In this example the input data MUF and COVA already exist). When the evaluation procedure is successfully terminated, the results can be browsed by choosing the option 'Browse Results' either numerically or graphically.
Another option in the MAIN MENU is 'Run Authentication'. If there is no MUF sequence available but a sequence of standardized MUF residuals, this utility is able to compute the MUF sequence belonging to the MUF residuals sequence.

To end the PROSA evaluation procedure session choose the option

'Quit the PROSA-Session'.

## 2.3 How to Create Another Subdirectory

To evaluate another campaign it is necessary to create another subdirectory with a new name. This is possible by typing:

C:\PROSA\EXAMPLE>**newdir name** <CR>

The new prompt sign is

C:\PROSA\NAME>

and a new PROSA evaluation procedure can be started.

## 2.4 Input of Data

There are two possibilities for data input

a) by diskette (only from Drive A)
   In this case, a diskette with two data files named MUF and COVA must be prepared. In each of these data files the number of balance periods must be in the first line with 3 digits and right a lined, e.g. ' 20' or '  8', followed by the MUF data or covariance data in the next lines.
   To run Authentication a data file named MUFRS must be prepared, also with the number of balance periods in the first line as above.

b) by Key-enter
   With this utility a data file called MUF and a data file called COVA can be created or modified.

## 2.5 PROSA Enables a Real-Sequential Evaluation

The PROSA 4.0 program package supports a real-sequential evaluation. That means, PROSA is not only able to evaluate a series of MUF values sequentially after the campaign has finished, but also real sequentially during the campaign.

### 2.5.1 Example of a Short Campaign

To evaluate a campaign real sequentially, first of all a subdirectory with a new name should be created (see chapter 2.3). Enter the command PROSA to call the PROSA MAIN MENU and choose the option 'Thresholds of PAGE & GEMUF Test' to determine the thresholds for the whole campaign. At first the user will be prompted for description parameters and secondly for computation parameters. The computation parameters are the number of balance periods (in this example 5), for the false-alarm rate (in this example 0.05) and for the number of simulations (in this example 200). Then the thresholds for this short campaign will be simulated.

To continue this example, the option 'Input of Data' (see chapter 2.4) must be chosen to create the data file MUF and COVA with the values of the first period of the campaign. With the option 'RUN PROSA' the test procedure for the first period is performed. To investigate the further periods the options 'Input of Data' and 'Run PROSA' must be repeated.

Attention: The determination of the thresholds of PAGE's test and GEMUF test is fixed for the whole campaign. Changing the thresholds during the campaign may lead to incorrect results.

# Chapter 3:

## PROSA Evaluation Procedure


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## 3. PROSA Evaluation Procedure

This chapter describes a sample session of the PROSA evaluation procedure which is established in the subdirectory EXAMPLE. The subdirectory EXAMPLE is created in order to test the PROSA Version 4.0 within your computer system, based on given MUF values in a data file called MUF and a given dispersion (variance/covariance) matrix in a data file called COVA.

### 3.1 Tutorial for Using PROSA

This sample session gives outlines of using PROSA 4.0 and is also a tutorial. To start the program PROSA in subdirectory EXAMPLE type:

```
C:\PROSA4\EXAMPLE>PROSA
```

The following PROSA MAIN MENU appears on the screen:

```
 ************************************************************
*                                                            *
*      PPPPPP      RRRRRRR       OOOOOO       SSSSSS       AAAAAA     *
*     PP    PP     RR    RR     OO    OO     SS    SS     AA    AA    *
*     PP    PP     RR    RR     OO    OO      SS          AA    AA    *
*     PPPPPPP      RRRRRRR      OO    OO       SSSS       AAAAAAAA    *
*     PP           RR    RR     OO    OO          SS      AA    AA    *
*     PP           RR    RR     OO    OO     SS    SS     AA    AA    *
*     PP           RR    RR      OOOOOO       SSSSSS      AA    AA    *
*                                                            *
*     VERSION 4.0                                            *
 ************************************************************

   MAIN MENU :    Select the MAIN MENU Options by
                  Typing the Number of Your Choice.

              1 == Input of Data
              2 == Run PROSA
              3 == Run Authentication
              4 == Browse Results
              5 == Thresholds of PAGE & GEMUF Test
              Q == Quit the PROSA-Session
```

The MAIN MENU is the entry panel of using the options of the program package of PROSA 4.0.

## 3.2 Tutorial for Determination of the Thresholds

The determination of the thresholds has to be performed by choosing the option 'Thresholds of PAGE & GEMUF Test' in the MAIN MENU.
In the following, all key enter actions in the PROSA Menus are marked by a shadowed bar.

```
MAIN MENU :   Select the MAIN MENU Options by
              typing the Number of your Choice.

          1 == Input of Data
          2 == Run PROSA
          3 == Run Authentication
          4 == Browse Results
          5 == Thresholds of PAGE & GEMUF Test
          Q == Quit the PROSA-Session
```

The following MENU 5 is displayed:

```
 MENU 5: Thresholds;
    Determination of the Thresholds of PROSA

    Select the PROSA-Thresholds-Option by
    Typing the Number of Your Choice.

          1 == Enter/Change the Parameters
          E == End and Go to MAIN MENU
```

To start the program the option 'Enter/Change the Parameters' has to be chosen. The working program gives a short announcement of its task and asks for description parameters and computation parameters.

```
PROSA VERSION 4.0
PROGRAM TASK :
SIMULATION PROGRAM FOR DETERMINATION
THE THRESHOLDS OF
- CUSUM-TEST ACCORDING TO PAGE
- SEQUENTIAL GEMUF-TEST

Input of description Parameter:


Enter the Date :
( yy-mm-dd )
 ===> 90-03-29
```

```
 Input of computation parameters:

 Enter the False Alarm Probability Alpha :
 [ Default Intervall = min:0.005,max:1.0 ]
  ===> .05

Enter the Expected Number of Balances :
 [ Default Intervall = min:1,max:50 ]
  ===> 20

Enter the Number of MONTE-CARLO-RUNS :
 [ Default Intervall = min:200,max:10000 ]
  ===> 200
```

After the input procedure the program asks for confirmation of the parameters:

```
 The Parameters of the Threshold Determination:

- Date          (yy-mm-dd)          ===> 90-03-29
- False Alarm Probability           ===>    0.050
- Number of Expected Balances       ===>        5
- Number of Monte-Carlo-Runs        ===>      200

 Do You Confirm the Parameters Above ?
  [ (Y)es/(N)o ] ===>
```

In the case of non confirmation it is possible to start the input procedure anew by entering 'N'. In the case of confirmation enter 'Y' or hit the 'Return Key' to continue. The simulation procedure to determine the thresholds of Page's test and GEMUF test starts and the results of the iteration steps are scrolling up on the screen.

```
 Begin of Simulation
 1. ITERATION  RESULTS :
     PAGES TEST >> PALPHA =  0.030
     GEMUF TEST >> GALPHA =  0.060
 2. ITERATION  RESULTS :
     PAGES TEST >> PALPHA =  0.030
     GEMUF TEST >> GALPHA =  0.020
 3. ITERATION  RESULTS :
     PAGES TEST >> PALPHA =  0.060
     GEMUF TEST >> GALPHA =  0.025
 4. ITERATION  RESULTS :
     PAGES TEST >> PALPHA =  0.065
     GEMUF TEST >> GALPHA =  0.040
 5. ITERATION  RESULTS :
     PAGES TEST >> PALPHA =  0.050
     GEMUF TEST >> GALPHA =  0.065
 6. ITERATION  RESULTS :
     GEMUF TEST >> GALPHA =  0.055
 Threshold Values are Calculated.

 Execution terminated : Successfully
```

After this program message the thresholds MENU appears. To continue the PROSA procedure enter 'E'.

## 3.3 Tutorial for Using the PROSA Statistical Procedure.

To continue the tutorial choose the option 'Run PROSA' in the MAIN MENU.

```
   MAIN MENU :   Select the MAIN MENU Options by
                 Typing the Number of Your Choice.

            1 == Input of Data
            2 == Run PROSA
            3 == Run Authentication
            4 == Browse Results
            5 == Thresholds of PAGE & GEMUF Test
            Q == Quit the PROSA-Session
```

The following MENU 2 asks for the PROSA output options 'Display' or 'Printer'. In the description of this tutorial the 'Display' option is selected.

```
    MENU 2: Run PROSA;
     PROSA Statistical Procedure

     Select the PROSA-Output-Option by
     Typing the Number of Your Choice.

            1 == Display
            2 == Printer
            E == End and Go to MAIN MENU
```

The 'Run PROSA' procedure consists of four program moduls and each modul gives a short announcement of the program task. The first program modul asks for the description parameters.

```
 PROSA VERSION 4.0
 PROGRAM TASK :
 SETUP UTILITY FOR INITIAL PARAMETERS OF PROSA.
 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

 THE IDENTIFICATIONS OF PROSA
 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~

INSPECTOR NAME     :
FACILITY NAME      :
REPORT NUMBER      :
DATE               :

 Do You Confirm the Identification Above ?
 [ (Y)es/(N)o ] ===>
```

In the case of non confirmation enter 'N' and enter the description parameters in the same manner as demonstrated.

```
 INPUT OF THE IDENTIFICATIONS FOR PROSA
 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

 Enter the INSPECTOR NAME
 (Max. 30 Characters)
===> Inspector

 Enter the Facility Name
 (Max.  4 Characters)
===> KfK

 Enter the Report Number
 (Max.  6 Characters)
===> 001
```

```
 Enter the Date
 ( yy-mm-dd )
===> 90-02 -23

 THE IDENTIFICATIONS OF PROSA
 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~

INSPECTOR NAME     :Inspector
FACILITY NAME      :KfK
REPORT NUMBER      :001
DATE               :90-02-23

 Do You Confirm the Identification Above ?
 [ (Y)es/(N)o ] ===>

Enter 'Y' or hit the 'Return Key' to get the next informations.

 THE THRESHOLD DATA FILE EXISTS
 THE MUF-VECTOR DATA FILE EXISTS
 THE COVARIANCE-MATRIX DATA FILE EXISTS


 PROSA VERSION 4.0
 PROGRAM TASK :
 BUILT UP THE INPUT DATA SETS FOR PROSA
 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~


 COVARIANCE MATRIX
 ~~~~~~~~~~~~~~~~~
 (MAX. FIRST 5 ROWS OF THE MATRIX)
   0.2720E-01
  -0.1900E-01  0.3570E-01
   0.3000E-02 -0.1670E-01  0.4590E-01
   0.0000E+00  0.0000E+00 -0.2900E-01  0.5420E-01
   0.5000E+01  0.9000E+01  0.8000E+01  0.7000E+01  0.1000E+01

 Execution terminated : Successfully


 PROSA VERSION 4.0
 PROGRAM TASK :
 COMPUTATION OF TRANSFORMATION MATRIX AND ITS INVERSE
 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

 Execution terminated : Successfully
```

```
PROSA VERSION 4.0
PROGRAM TASK :
EVALUATION OF STATISTICS
~~~~~~~~~~~~~~~~~~~~~~~~
The Calculation of CUMUF-Threshold Runs.


Cumulated False Alarm Rate till Period
      0.001                       1
      0.007                       2
      0.012                       3
      0.014                       4
      0.019                       5
      0.023                       6
      0.029                       7
      0.031                       8
      0.034                       9
      0.040                      10
      0.043                      11
      0.046                      12
      0.050                      13
False Alarm Rate Reached
THRESHOLD VALUES ARE CALCULATED

Execution terminated : Successfully
```

Now all four program moduls are successfully terminated. The results of the PROSA evaluation will be displayed ( and stored on the hard disk for further use ).

RESULTS OF STATISTIC EVALUATION

INSPECTOR NAME :Inspector
FACILITY NAME :KfK
REPORT NUMBER :001
DATE :89-11-10

**** CUSUM-TEST ACCORDING TO PAGE ****

| BALANCE PERIODS | MUF VALUES | THRES HOLD | STATISTICS POSITIV | STATISTICS NEGATIV | SIGNIFICANT REMARKS |
|---|---|---|---|---|---|
| 1 | 0.1090E+00 | 0.1058E+02 | 0.6609E+00 | 0.0000E+00 | |
| 2 | 0.2480E+00 | 0.1058E+02 | 0.2825E+01 | 0.0000E+00 | |
| 3 | -0.2890E+00 | 0.1058E+02 | 0.2543E+01 | -0.2824E+00 | |
| 4 | 0.3330E+00 | 0.1058E+02 | 0.4228E+01 | 0.0000E+00 | |
| 5 | -0.2880E+00 | 0.1058E+02 | 0.4004E+01 | -0.2239E+00 | |
| 6 | 0.1820E+00 | 0.1058E+02 | 0.4491E+01 | 0.0000E+00 | |
| 7 | -0.5800E+00 | 0.1058E+02 | 0.2865E+01 | -0.1626E+01 | |
| 8 | -0.1670E+00 | 0.1058E+02 | 0.9500E+00 | -0.3541E+01 | |
| 9 | 0.1542E+01 | 0.1058E+02 | 0.4040E+01 | -0.4508E+00 | |
| 10 | 0.2590E+00 | 0.1058E+02 | 0.7850E+01 | 0.0000E+00 | |
| 11 | -0.4880E+00 | 0.1058E+02 | 0.9574E+01 | 0.0000E+00 | |
| 12 | 0.2930E+00 | 0.1058E+02 | 0.1191E+02 | 0.0000E+00 | <--- |
| 13 | 0.8800E-01 | 0.1058E+02 | 0.1438E+02 | 0.0000E+00 | <--- |
| 14 | -0.5130E+00 | 0.1058E+02 | 0.1510E+02 | 0.0000E+00 | <--- |
| 15 | -0.4130E+00 | 0.1058E+02 | 0.1474E+02 | -0.3538E+00 | <--- |
| 16 | -0.3330E+00 | 0.1058E+02 | 0.1371E+02 | -0.1386E+01 | <--- |
| 17 | 0.3630E+00 | 0.1058E+02 | 0.1335E+02 | -0.1743E+01 | <--- |
| 18 | 0.2960E+00 | 0.1058E+02 | 0.1349E+02 | -0.1609E+01 | <--- |
| 19 | 0.2350E+00 | 0.1058E+02 | 0.1401E+02 | -0.1089E+01 | <--- |
| 20 | 0.9900E-01 | 0.1058E+02 | 0.1467E+02 | -0.4233E+00 | <--- |

**** SEQUENTIAL GEMUF-TEST ****

| BALANCE PERIODS | MUF VALUES | THRES HOLD | STATISTICS | SIGNIFICANT REMARKS |
|---|---|---|---|---|
| 1 | 0.1090E+00 | 0.9155E+01 | 0.4367E+00 | |
| 2 | 0.2480E+00 | 0.1053E+02 | 0.5121E+01 | |
| 3 | -0.2890E+00 | 0.1190E+02 | 0.5201E+01 | |
| 4 | 0.3330E+00 | 0.1328E+02 | 0.8040E+01 | |
| 5 | -0.2880E+00 | 0.1465E+02 | 0.8090E+01 | |
| 6 | 0.1820E+00 | 0.1603E+02 | 0.8327E+01 | |
| 7 | -0.5800E+00 | 0.1740E+02 | 0.1097E+02 | |
| 8 | -0.1670E+00 | 0.1878E+02 | 0.1464E+02 | |
| 9 | 0.1542E+01 | 0.2015E+02 | 0.2418E+02 | <--- |
| 10 | 0.2590E+00 | 0.2153E+02 | 0.3870E+02 | <--- |
| 11 | -0.4880E+00 | 0.2290E+02 | 0.4167E+02 | <--- |
| 12 | 0.2930E+00 | 0.2428E+02 | 0.4712E+02 | <--- |
| 13 | 0.8800E-01 | 0.2565E+02 | 0.5322E+02 | <--- |
| 14 | -0.5130E+00 | 0.2703E+02 | 0.5373E+02 | <--- |
| 15 | -0.4130E+00 | 0.2840E+02 | 0.5386E+02 | <--- |
| 16 | -0.3330E+00 | 0.2978E+02 | 0.5492E+02 | <--- |
| 17 | 0.3630E+00 | 0.3115E+02 | 0.5505E+02 | <--- |
| 18 | 0.2960E+00 | 0.3253E+02 | 0.5507E+02 | <--- |
| 19 | 0.2350E+00 | 0.3390E+02 | 0.5534E+02 | <--- |
| 20 | 0.9900E-01 | 0.3528E+02 | 0.5578E+02 | <--- |

**** TRUNCATED SEQUENTIAL CUMUF-TEST ****

| BALANCE PERIODS | MUF VALUES | THRES HOLD | STATISTICS | SIGNIFICANT REMARKS |
|---|---|---|---|---|
| 1 | 0.1090E+00 | 0.4250E+00 | 0.1090E+00 | |
| 2 | 0.2480E+00 | 0.4067E+00 | 0.3570E+00 | |
| 3 | -0.2890E+00 | 0.5024E+00 | 0.6800E-01 | |
| 4 | 0.3330E+00 | 0.4766E+00 | 0.4010E+00 | |
| 5 | -0.2880E+00 | 0.4972E+00 | 0.1130E+00 | |
| 6 | 0.1820E+00 | 0.7228E+00 | 0.2950E+00 | |
| 7 | -0.5800E+00 | 0.7673E+00 | -0.2850E+00 | |
| 8 | -0.1670E+00 | 0.8403E+00 | -0.4520E+00 | |
| 9 | 0.1542E+01 | 0.8591E+00 | 0.1090E+01 | <--- |
| 10 | 0.2590E+00 | 0.8377E+00 | 0.1349E+01 | <--- |
| 11 | -0.4880E+00 | 0.9372E+00 | 0.8610E+00 | |
| 12 | 0.2930E+00 | 0.9764E+00 | 0.1154E+01 | <--- |
| 13 | 0.8800E-01 | 0.9681E+00 | 0.1242E+01 | <--- |
| 14 | -0.5130E+00 | 0.1096E+01 | 0.7290E+00 | |
| 15 | -0.4130E+00 | 0.1190E+01 | 0.3160E+00 | |
| 16 | -0.3330E+00 | 0.1481E+01 | -0.1700E-01 | |
| 17 | 0.3630E+00 | 0.1555E+01 | 0.3460E+00 | |
| 18 | 0.2960E+00 | 0.1583E+01 | 0.6420E+00 | |
| 19 | 0.2350E+00 | 0.1588E+01 | 0.8770E+00 | |
| 20 | 0.9900E-01 | 0.1579E+01 | 0.9760E+00 | |

The last column 'SIGNIFICANT REMARKS' indicates whether the test statistic has crossed the test threshold that means whether an alarm is indicated.
In this example the PAGE's test gives an alarm in period 12 for the first time, the GEMUF test in Period 9 and the CUMUF test also in period 9.

To terminate 'Run PROSA' enter 'E'.

```
MENU 2: Run PROSA;
 PROSA Statistical Procedure

 Select the PROSA-Output-Option by
 Typing the Number of Your Choice.

        1 == Display
        2 == Printer
        E == End and  Go to MAIN MENU
```

**Additional:** The printer option in MENU 2 directs the output of PROSA results to an attached printer.

## 3.4 Tutorial for Using the PROSA Authentication Procedure.

The option 'Run Authentication' in the MAIN MENU computes the MUF vector from a given vector of standardized MUF residuals based on the given dispersion (variance-covariance) matrix.

```
MAIN MENU :   Select the MAIN MENU Options by
              typing the Number of your Choice.

          1 == Input of Data
          2 == Run PROSA
          3 == Run Authentication
          4 == Browse Results
          5 == Thresholds
          Q == Quit the PROSA-Session
```

MENU 3 is displayed on the screen by choosing the option 'Run Authentication'.

```
MENU 3: Run Authentication;


Select the PROSA-Output-Option by
Typing the Number of Your Choice.

       1 == Run Authentication on Display
       E == End and Go to MAIN MENU
```

To run authentication a MUFRS vector is needed. But in the directory EXAMPLE no MUFRS vector is available. How to load a MUFRS vector, either by key-enter or by diskette, see chapter 6.2.3.. Enter 'E' to come back to the MAIN MENU.

# Chapter 4:

## Browse Results


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## 4. BROWSE RESULTS

The results of the PROSA evaluation are written on data files in the subdirectory under consideration. With the option 'Browse Results' in the MAIN MENU it is possible to show the results numerically or graphically. In the following tutorial it is described how to use the PROSA browse utilities based on the example of the PROSA evaluation procedure in chapter 3.
Choose the option 'Browse Results' in the MAIN MENU:

```
 ************************************************************
*                                                            *
*      PPPPPP      RRRRRRR       OOOOOO       SSSSSS       AAAAAA     *
*     PP    PP     RR    RR     OO    OO     SS    SS     AA    AA    *
*     PP    PP     RR    RR     OO    OO      SS          AA    AA    *
*     PPPPPPP      RRRRRRR      OO    OO       SSSS       AAAAAAAA    *
*     PP           RR    RR     OO    OO          SS      AA    AA    *
*     PP           RR    RR     OO    OO     SS    SS     AA    AA    *
*     PP           RR    RR      OOOOOO       SSSSSS      AA    AA    *
*                                                            *
*     VERSION 4.0                                            *
 ************************************************************

   MAIN MENU :    Select the MAIN MENU Options by
                  Typing the Number of Your Choice.

             1 == Input of Data
             2 == Run PROSA
             3 == Run Authentication
             4 == Browse Results
             5 == Thresholds of PAGE & GEMUF Test
             Q == Quit the PROSA-Session
```

### 4.1 Browse Numerical Results

Choose the option 'Browse the Numerical Results' in the MENU 4 as shown below:

```
   MENU 4:
   Browse Results of PROSA Statistical Procedure;

   Select the PROSA-Output-Option by
   Typing the Number of Your Choice.

          1 == Browse the Numerical Results
          2 == Browse the Results by Graphic
          E == End and Go to MAIN MENU
```

and in the following MENU 4.1 choose the direction of the output on the screen or on the attached printer.

```
MENU 4.1:
Browse Numerical Results of PROSA Statistical Procedure

Select the PROSA-Output-Option by
Typing the Number of Your Choice.

        1 == Display
        2 == Printer
        E == End and Go to Previous Menu
```

After this the numerical results of statistical evaluation (see chapter 3, page 23) are listed on the screen or will be printed.

## 4.2 Browse the Results by Graphic

In this chapter the handling of the PROSA graphic utilities is given. The PROSA graphic utilities support the graphical output to the most distributed devices with graphic options.
Choose the option 'Browse the Result by Graphic' in the MENU 4 as shown below:

```
MENU 4:
   Browse Results of PROSA Statistical Procedure;

   Select the PROSA-Output-Option by
   Typing the Number of Your Choice.

        1 == Browse the Numerical Results
        2 == Browse the Results by Graphic
        E == End and Go to MAIN MENU
```

The following MENU 4.2 offers two options of PROSA graphic output utilities to browse either the MUF and CUMUF vector or the statistical results of the sequential test procedures. The third option gives the possibility to change and modify the Plot-Parameters.

Further on, the default setup of current output device 'D) COLOR-DISPLAY (EGA/VGA)' is displayed in the MENU 4.2 panel.

```
MENU 4.2:
   Browse the Results by Graphic

THE CURRENT OUTPUT DEVICE:     D) COLOR-DISPLAY  (EGA/VGA)

    Select the Graphical-Output-Routine by
    Typing the Number of Your Choice.

          1 == MUF-Vector and CUMUF-Vector
               with Two-Standard-Deviation
          2 == PAGES-, GEMUF- and CUMUF-Test
          3 == Change Plot-Parameters
          E == End and Go to PREVIOUS MENU

   Your Choice:
```

### 4.2.1 Output on a Graphical Display

With the current output device option continue the tutorial by choosing one PROSA graphic utility. In this example the option 'MUF-Vector and CUMUF-Vector with Two-Standard-Deviation'is selected.

```
MENU 4.2:
   Browse the Results by Graphic

THE CURRENT OUTPUT DEVICE:     D) COLOR-DISPLAY  (EGA/VGA)

    Select the Graphical-Output-Routine by
    Typing the Number of Your Choice.

          1 == MUF-Vector and CUMUF-Vector
               with Two-Standard-Deviation
          2 == PAGES-, GEMUF- and CUMUF-Test
          3 == Change Plot-Parameters
          E == End and Go to PREVIOUS MENU

   Your Choice:
```

The next menu as shown below from the program modul of the PROSA graphic utility asks for the output of the 'MUF-Values' or the 'CUMUF-Values'. The last key-enter action activates the graphic utility to display the line graph on the color display.

```
   PROSA 4.0
   GRAPHIC UTILITY:

 THE CURRENT OUTPUT DEVICE:     D) COLOR-DISPLAY   (EGA/VGA)

   DRAWS A DATA POINT GRAPH OF MUF/CUMUF VALUES
   WITH TWO STANDARD DEVIATIONS (2-SIGMA):

    [M]UF-Values
    [C]UMUF-Values
    [Q]uit

   ENTER ONE CHARACTER GIVEN IN []
   ==>

READY TO DISPLAY DRAWING.
Strike any key to continue.
```

To browse the statistical results, choose option 2 in MENU 4.2 and follow the instruction as described above.

### 4.2.1 Output on a Graphical Printer

The Menu 4.2 below presents the current output device setup. To change the graphical output device to a graphical printer, continue this tutorial and choose the option 3 as marked below.

```
  MENU 4.2:
     Browse the Results by Graphic

 THE CURRENT OUTPUT DEVICE:     D) COLOR-DISPLAY   (EGA/VGA)

     Select the Graphical-Output-Routine by
     Typing the Number of Your Choice.

            1 == MUF-Vector and CUMUF-Vector
                 with Two-Standard-Deviation
            2 == PAGES-, GEMUF- and CUMUF-Test
            3 == Change Plot-Parameters
            E == End and Go to PREVIOUS MENU

    Your Choice:
```

Select the graphic device by entering the number '11' in the parameter list below:

```
 MODIFY THE PLOTTING PARAMETER
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
 1 LENGHT OF X-AXIS ===>        7.00
 2 LENGHT OF Y-AXIS ===>        5.00
 3 REORIGIN X-COORD.===>        1.00
 4 REORIGIN Y-COORD.===>        1.50
 5 FACTOR           ===>        1.00
 6 LINE WIDTH       ===>  1
 7 AXIS COLOR       ===>  1
 8 BOX COLOR        ===>  7
 9 STATISTIC COLOR  ===>  1
10 BOUNDARY COLOR   ===>  4
11 GRAPHIC-DEVICE   ===> D
     A) NEC/EPSON/LQ1500/IBMPROprinter
     B) HP-LASER-JET & HP-DESK-JET
     C) HP-INKJET
     D) COLOR-DISPLAY   (EGA/VGA)
     E) GRAPHIC DATA FILE (HPGL)
 TYPE THE NUMBER 1...11, OR Q FOR QUIT
  ===> 11
```

The current output device is displayed.

```
11 GRAPHIC-DEVICE   ===> D
     D) COLOR-DISPLAY   (IBM-EGA)
```

Enter 'B' to select the graphic device support 'HP-LASER-JET & HP-DESK-JET'.

```
 CHOOSE YOUR GRAPHIC-DEVICE [ A/B/C/D ] ;
     A) NEC/EPSON/LQ1500/IBMPROprinter
     B) HP-LASER-JET & HP-DESK-JET
     C) HP-INKJET
     D) COLOR-DISPLAY   (IBM-EGA)
     E) GRAPHIC DATA FILE (HPGL)
11 GRAPHIC-DEVICE   ===> B
```

To save this input in the parameter data file of the graphic output utility quit the modify procedure and enter 'Y'.

```
 TYPE THE NUMBER 1...11, OR Q FOR QUIT
 ===> Q
 DO YOU WANT TO SAVE THIS PLOTTING PARAMETER? [Y/N]
 ===> Y
```

The new MENU 4.2 presents the new current output device:

```
  MENU 4.2:
     Browse the Results by Graphic

 THE CURRENT OUTPUT DEVICE:     B) HP-LASER-JET & HP-DESK-JET

     Select the Graphical-Output-Routine by
     Typing the Number of Your Choice.

              1 == MUF-Vector and CUMUF-Vector
                   with Two-Standard-Deviation
              2 == PAGES-, GEMUF- and CUMUF-Test
              3 == Change Plot-Parameters
              E == End and Go to PREVIOUS MENU

    Your Choice:
```

Continue this tutorial and choose the option as marked above. The next menu from the program modul of the PROSA graphic utility asks for the output of the 'MUF-Values' or the 'CUMUF-Values'.

```
   PROSA 4.0
   GRAPHIC UTILITY:

 THE CURRENT OUTPUT DEVICE:     B) HP-LASER-JET & HP-DESK-JET

   DRAWS A DATA POINT GRAPH OF MUF/CUMUF VALUES
   WITH TWO STANDARD DEVIATIONS (2-SIGMA):

    [M]UF-Values
    [C]UMUF-Values
    [Q]uit

   ENTER ONE CHARACTER GIVEN IN []
   ==>
```

In chapter 4.4, page 42 and 43, the graphical output of MUF values and CUMUF values are printed with the HP Laserjet option.
By selecting the statistical results of 'PAGE's, GEMUF and CUMUF-Test' in MENU 4.2 :

```
    MENU 4.2:
     Browse the Results by Graphic

 THE CURRENT OUTPUT DEVICE:     B) HP-LASER-JET & HP-DESK-JET

     Select the Graphical-Output-Routine by
     Typing the Number of Your Choice.

            1 == MUF-Vector and CUMUF-Vector
                 with Two-Standard-Deviation
            2 == PAGES-, GEMUF- and CUMUF-Test
            3 == Change Plot-Parameters
            E == End and Go to PREVIOUS MENU
```

The next menu of the program modul of the PROSA graphic utility asks for the output of the 'PAGE's-Test', the 'GEMUF-Test' or the 'CUMUF-Test'.

```
   PROSA 4.0
   GRAPHIC UTILITY:

 THE CURRENT OUTPUT DEVICE:     B) HP-LASER-JET & HP-DESK-JET

   DRAW A LINE GRAPH OF TEST PROCEDURES

    [P]AGE's-Test
    [G]EMUF-Test
    [C]UMUF-Test
    [Q]uit

   ENTER ONE CHARACTER GIVEN IN []
   ==>
```

In chapter 4.4, page 44, 45 and 46, the graphical output of PAGE's test, GEMUF test and CUMUF test are printed with the HP Laserjet option.

## 4.3 Change Plot Parameters

With the option 'Change Plot-Parameters' in the MENU 4.2, it is possible to change the default plotting parameters for drawing the graphical output.

```
  MENU 4.2:
     Browse the Results by Graphic

 THE CURRENT OUTPUT DEVICE:     D) COLOR-DISPLAY   (EGA/VGA)

     Select the Graphical-Output-Routine by
     Typing the Number of Your Choice.

            1 == MUF-Vector and CUMUF-Vector
                 with Two-Standard-Deviation
            2 == PAGES-, GEMUF- and CUMUF-Test
            3 == Change Plot-Parameters
            E == End and Go to PREVIOUS MENU

    Your Choice:
```

This utility displays a list of 11 parameters with the default plotting parameters on the display as shown below:

```
 MODIFY THE PLOTTING PARAMETER
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
 1 LENGHT OF X-AXIS ===>        7.00
 2 LENGHT OF Y-AXIS ===>        5.00
 3 REORIGIN X-COORD.===>        1.00
 4 REORIGIN Y-COORD.===>        1.50
 5 FACTOR           ===>        1.00
 6 LINE WIDTH       ===>  1
 7 AXIS COLOR       ===>  2
 8 BOX COLOR        ===>  7
 9 STATISTIC COLOR  ===>  1
10 BOUNDARY COLOR   ===>  4
11 GRAPHIC-DEVICE   ===> D
     A) NEC/EPSON/LQ1500/IBMPROprinter
     B) HP-LASER-JET & HP-DESK-JET
     C) HP-INKJET
     D) COLOR-DISPLAY   (EGA/VGA)
     E) GRAPHIC DATA FILE (HPGL)
 TYPE THE NUMBER 1...11, OR Q FOR QUIT
 ===>

 DO YOU WANT TO SAVE THIS PLOTTING PARAMETER? [Y/N]
```

With the parameters 1, 2 and 5 you can control the size of the line graph in the graphical output.
With the parameters 3 and 4 you can determine the position of the line graph in the graphical output.
With the parameter 6 you can determine the line width of the line graph.

With the parameters 7-10 you can select the colors of the graphical output for graphical devices with color options.
With the parameter 11 you can select the graphical output device.
The default values as shown in the parameter list above should be used as long as possible.

### 4.3.1 Change the Parameter of Output Device Support

The explanation shows how to modify the parameter of Graphic-Device options. Select the parameter of graphic device by entering the number '11' in the parameter list below:

```
 MODIFY THE PLOTTING PARAMETER
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
 1 LENGHT OF X-AXIS ===>        7.00
 2 LENGHT OF Y-AXIS ===>        5.00
 3 REORIGIN X-COORD.===>        1.00
 4 REORIGIN Y-COORD.===>        1.50
 5 FACTOR           ===>        1.00
 6 LINE WIDTH       ===>  1
 7 AXIS COLOR       ===>  1
 8 BOX COLOR        ===>  7
 9 STATISTIC COLOR  ===>  1
10 BOUNDARY COLOR   ===>  4
11 GRAPHIC-DEVICE   ===> D
     A) NEC/EPSON/LQ1500/IBMPROprinter
     B) HP-LASER-JET & HP-DESK-JET
     C) HP-INKJET
     D) COLOR-DISPLAY    (EGA/VGA)
     E) GRAPHIC DATA FILE (HPGL)
 TYPE THE NUMBER 1...11, OR Q FOR QUIT
  ===> 11
```

With the choosen parameter the current device driver support is displayed and five possible device driver options are listed.
This parameter offers at first three options of the most important printers with graphical features. The fourth option includes the device driver for color display. The fifth option saves the graphical output on a HPGL data file for further applications (see chapter 9.3).

```
11 GRAPHIC-DEVICE    ===> D
     D) COLOR-DISPLAY    (IBM-EGA)

 CHOOSE YOUR GRAPHIC-DEVICE [ A/B/C/D ] ;
     A) NEC/EPSON/LQ1500/IBMPROprinter
     B) HP-LASER-JET & HP-DESK-JET
     C) HP-INKJET
     D) COLOR-DISPLAY    (IBM-EGA)
     E) GRAPHIC DATA FILE (HPGL)
11 GRAPHIC-DEVICE    ===> B
```

Enter one of the given characters in the brackets, e.g. 'B', to select the new graphic device. To save this input in the parameter data file of the graphic output utility quit the modify procedure and enter 'Y'.

```
 TYPE THE NUMBER 1...11, OR Q FOR QUIT
 ===> Q
 DO YOU WANT TO SAVE THIS PLOTTING PARAMETER? [Y/N]
 ===> Y
```

ATTENTION:

If the selected graphical printer (option A,B or C) **is not switched on or not attached**, a meassage in the MENU 4.2 is displayed as shown below and the output device is reset to the option 'COLOR-DISPLAY'!

If the selected graphical printer **does not agree** with the attached graphical printer, garbage appears on the printer!

```
  MENU 4.2:
     Browse the Results by Graphic

  Printer is not switched on or not attached!
  Reset Graphic Device Support!

 THE CURRENT OUTPUT DEVICE:     D) COLOR-DISPLAY   (EGA/VGA)

     Select the Graphical-Output-Routine by
     Typing the Number of Your Choice.

            1 == MUF-Vector and CUMUF-Vector
                 with Two-Standard-Deviation
            2 == PAGES-, GEMUF- and CUMUF-Test
            3 == Change Plot-Parameters
            E == End and Go to PREVIOUS MENU

    Your Choice:
```

### 4.3.2 Change the Parameter of Size and Position

This utility offers six options to modify the lenght of x or y axis, the size factor, the position (reorigin of the x or y coordinate) and the line width of the drawing line graph. Select one of the parameter in the list below and modify the parameter as neccessary.

```
 MODIFY THE PLOTTING PARAMETER
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
 1 LENGHT OF X-AXIS ===>        7.00
 2 LENGHT OF Y-AXIS ===>        5.00
 3 REORIGIN X-COORD.===>        1.00
 4 REORIGIN Y-COORD.===>        1.50
 5 FACTOR           ===>        1.00
 6 LINE WIDTH       ===>  1
 7 AXIS COLOR       ===>  1
 8 BOX COLOR        ===>  7
 9 STATISTIC COLOR  ===>  1
10 BOUNDARY COLOR   ===>  4
11 GRAPHIC-DEVICE   ===> D
     A) NEC/EPSON/LQ1500/IBMPROprinter
     B) HP-LASER-JET & HP-DESK-JET
     C) HP-INKJET
     D) COLOR-DISPLAY   (EGA/VGA)
     E) GRAPHIC DATA FILE (HPGL)
 TYPE THE NUMBER 1...11, OR Q FOR QUIT
 ===>
```

If a strange parameter input is detected, messages appear and ask for a new input (A and B) or a hint of automatic parameter correction is given (C and D).

```
A)  LINE WIDTH OUT OF RANGE! (1,2,...5,6)
    5 LINE WIDTH      =====> *
    5 LINE WIDTH      =====>

B)  FACTOR OUT OF RANGE! (0.1,....,1.0)
    10 FACTOR      =====>      3.0
    10 FACTOR      =====>

C)  DEFAULT X-WINDOW SIZE EXEEDED!
    XMAX = 9.9
    SIZE FACTOR IS CORRECTED!

D)  DEFAULT Y-WINDOW SIZE EXEEDED!
    YMAX = 7.7
    SIZE FACTOR IS CORRECTED!
```

```
E)  DEFAULT X-WINDOW SIZE EXEEDED!
    XMAX = 9.9
    REORIGIN X-COORD. IS CORRECTED!
```

### 4.3.3 Change the Parameter of Color Options

This utility offers four options to modify the color of the axis and the titel, the box color, the statistic color and the boundary color of the drawing line graph.
To modify the color options choose one of the possible color parameters in the parameter list below. In this example select the box color option by entering the number '8' in the parameter list below:

```
 MODIFY THE PLOTTING PARAMETER
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
 1 LENGHT OF X-AXIS ===>        7.00
 2 LENGHT OF Y-AXIS ===>        5.00
 3 REORIGIN X-COORD.===>        1.00
 4 REORIGIN Y-COORD.===>        1.50
 5 FACTOR           ===>        1.00
 6 LINE WIDTH       ===>  1
 7 AXIS COLOR       ===>  1
 8 BOX COLOR        ===>  7
 9 STATISTIC COLOR  ===>  1
10 BOUNDARY COLOR   ===>  4
11 GRAPHIC-DEVICE   ===> D
     A) NEC/EPSON/LQ1500/IBMPROprinter
     B) HP-LASER-JET & HP-DESK-JET
     C) HP-INKJET
     D) COLOR-DISPLAY   (EGA/VGA)
     E) GRAPHIC DATA FILE (HPGL)
 TYPE THE NUMBER 1...11, OR Q FOR QUIT
 ===> 8
```

With the choosen parameter the current box color is displayed and the possible color options are listed:

```
 8 BOX COLOR        ===> 7
 BLUE   [1]/GREEN [2]/CYAN [3]/RED [4]
 MAGENTA[5]/BROWN [6]/WHITE[7]/GREY[8]
 LIGHT BLUE [9]/YELLOW [14]/BLACK [15]
 8 BOX COLOR         ===>

 TYPE THE NUMBER 1...11, OR Q FOR QUIT
 ===> Q
 DO YOU WANT TO SAVE THIS PLOTTING PARAMETER? [Y/N]
 ===> Y
```

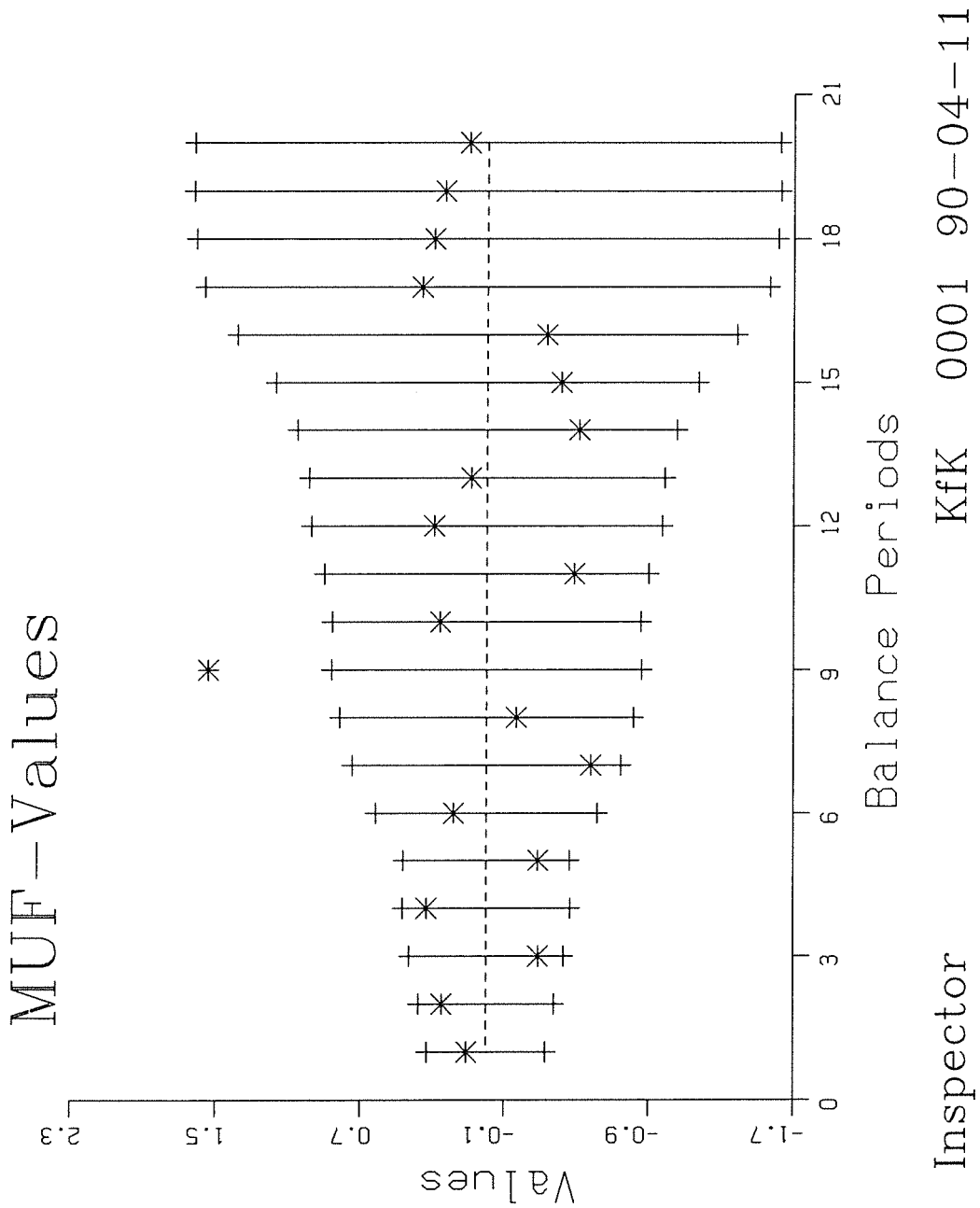
Enter one of the given number in the brackets to select the new box color. Then quit the modify procedure and enter 'Y' to save this input in the parameter data file of the graphic output utility.
To modify the axis color, the statistic color or the boundary color you can proceed in the same manner as in example above.
The following meassages appears by strange input of plotting parameters and ask for a new parameter input:

```
A)  COLOR NUMBER OUT OF RANGE! (1,2,...14,15)
    7 COLOR NUMBER       =====> *
    7 COLOR NUMBER       =====>
```

## 4.4 Graphical Output Examples

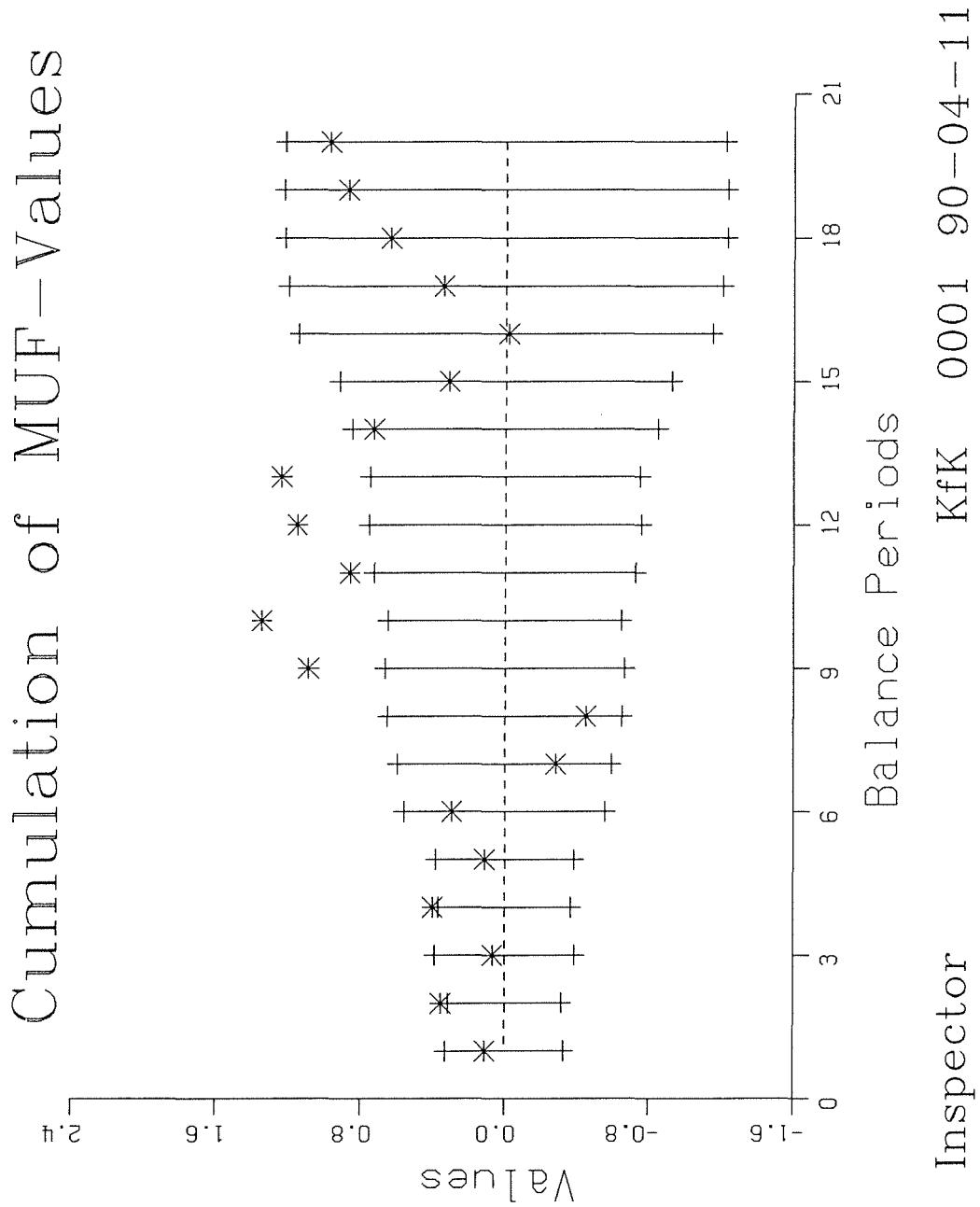
**Graphical Output Example 1:**

Values of the MUF vector with Two-Sigma-Deviation;



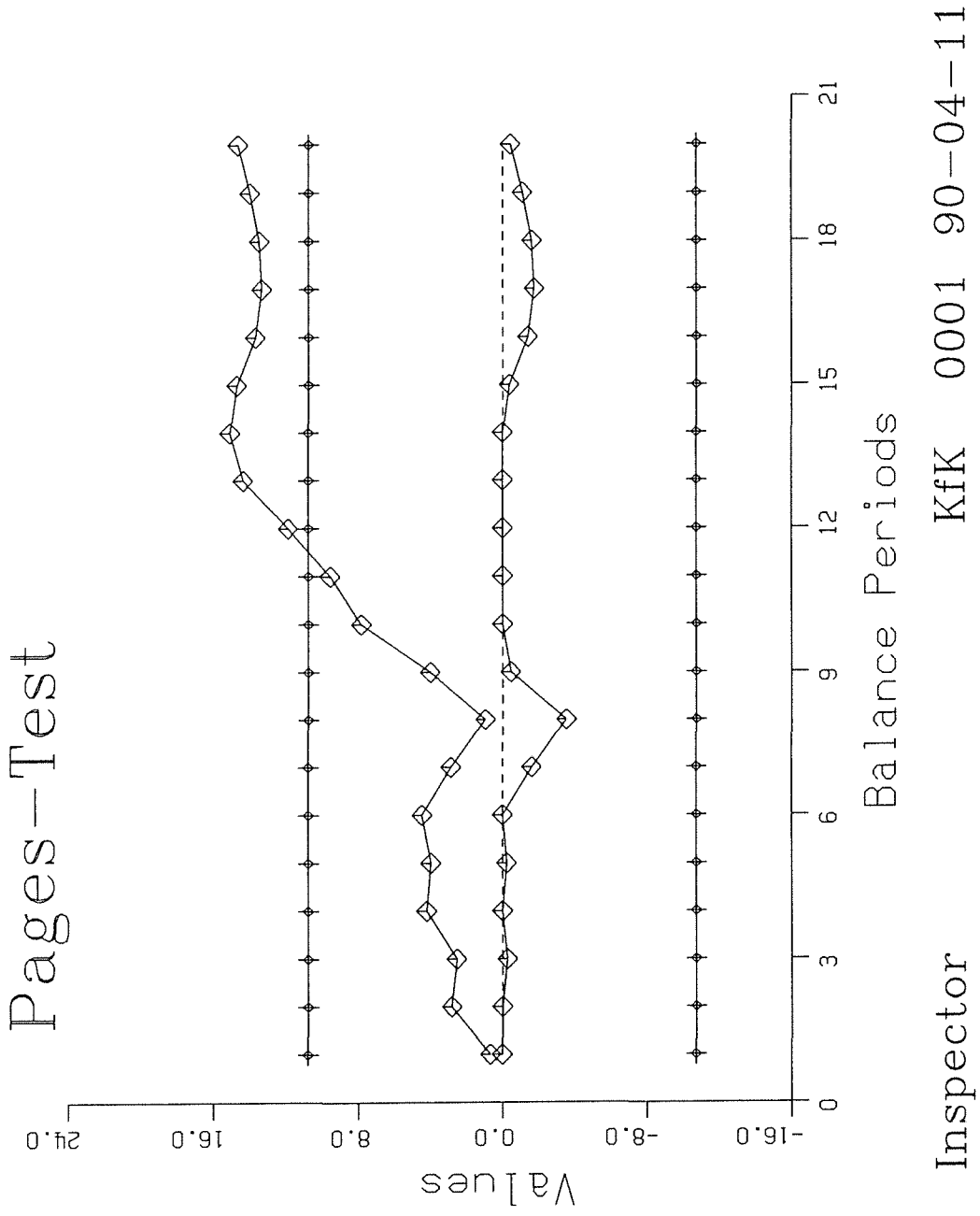
**Graphical Output Example 2:**

Values of the CUMUF vector with Two-Sigma-Deviation;



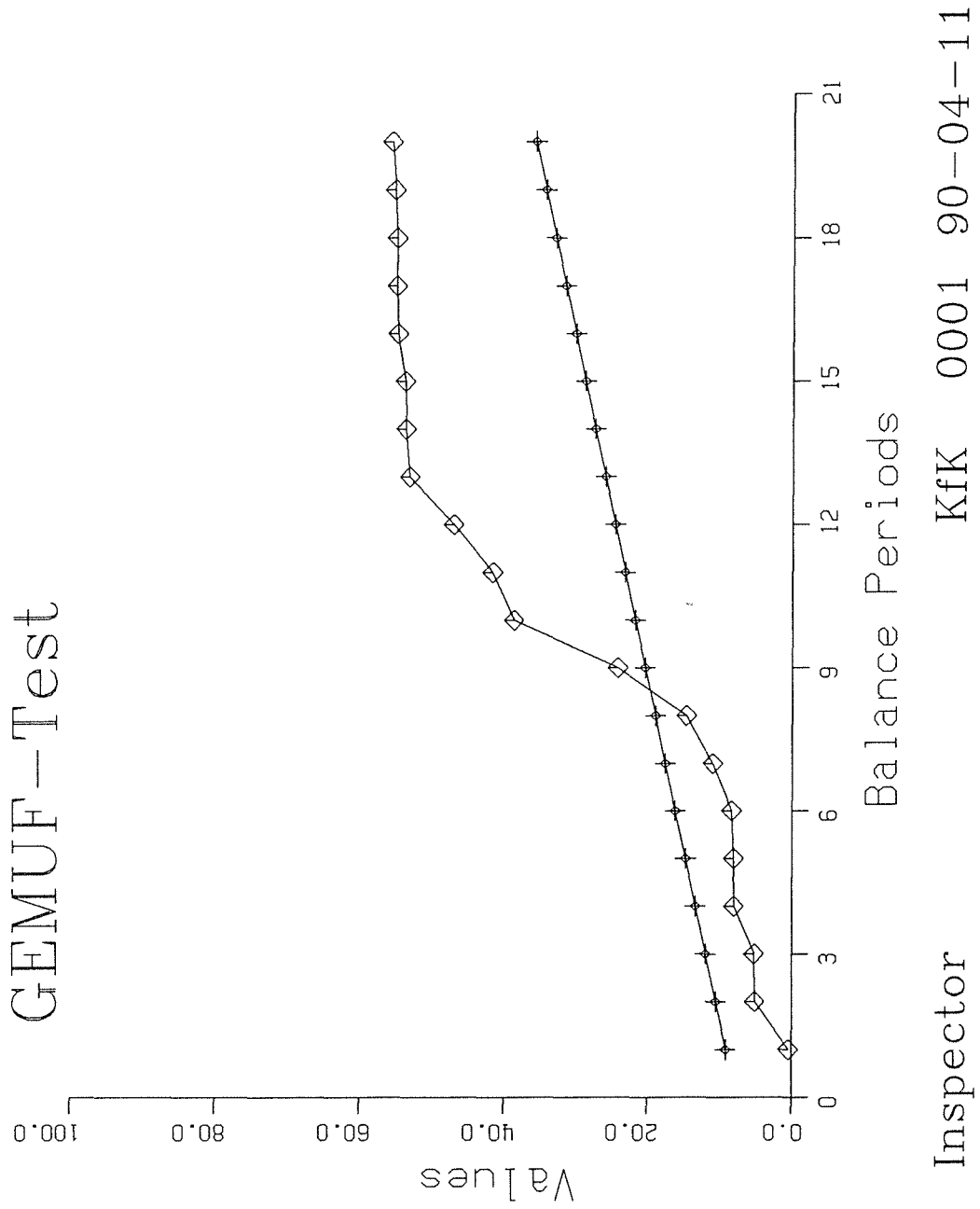
**Graphical Output Example 3:**

Line Graph of the Two-Sided-PAGE's-Test;



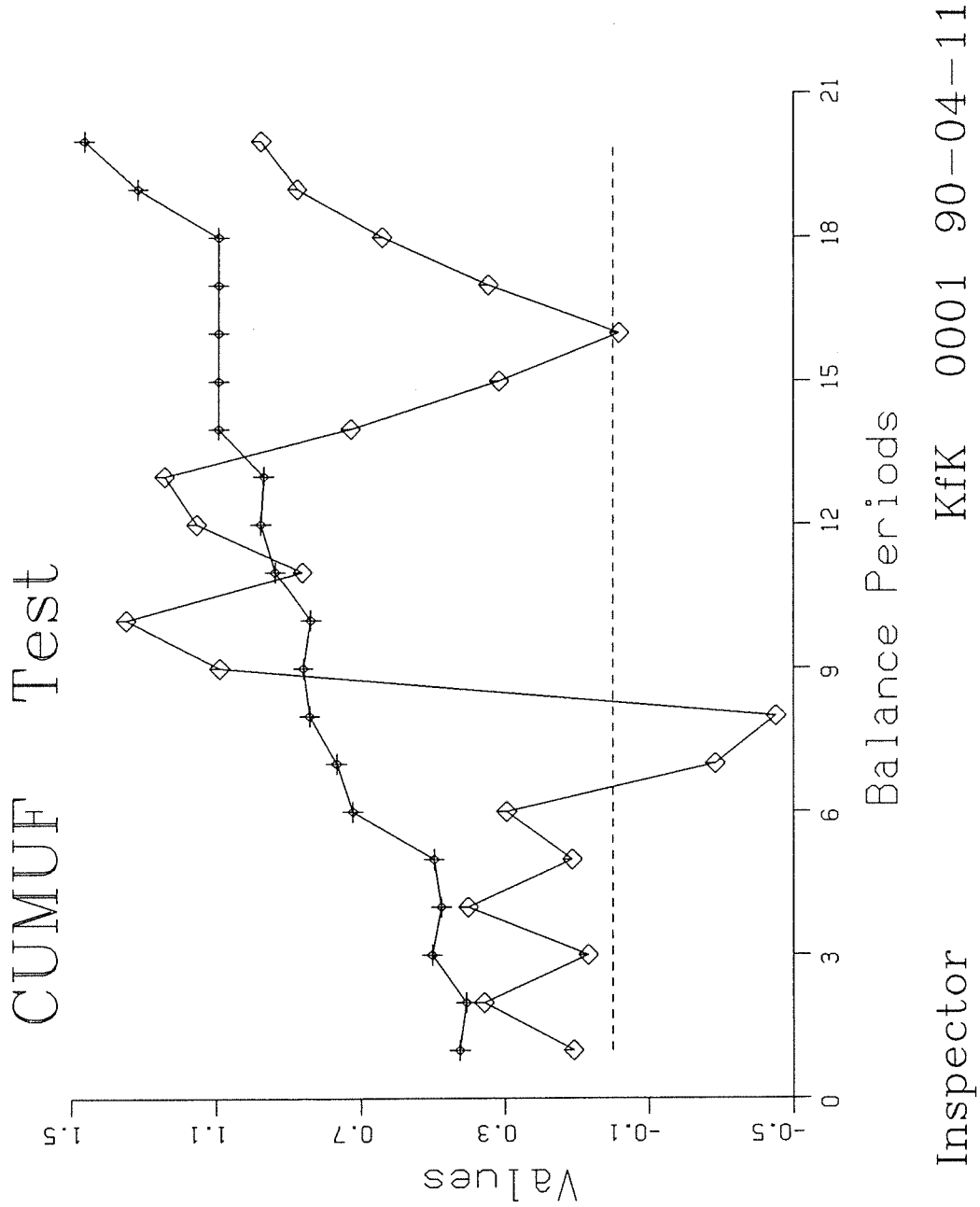
**Graphical Output Example 4:**

Line Graph of the GEMUF-Test;



**Graphical Output Example 5:**

Line Graph of the CUMUF-Test;



# Chapter 5:

## PROSA Utilities for Subdirectory Maintenance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## 5. PROSA Utilities for Subdirectory Maintenance

The PROSA data evaluation procedures are placed in subdirectories and it is very helpful to use the PROSA utilities for the maintenance of PROSA-Subdirectories. In the following three chapters the application of the utilities is described.

### 5.1 Create a New Subdirectory

When the user of PROSA intends to evaluate another campaign it is useful to create another subdirectory. This is possible with the NEWDIR utility. The user can call this utility in any existing PROSA-Subdirectory.
If you are in subdirectory EXAMPLE, for instance, a new subdirectory called TEST can be created by typing:

C:\PROSA\EXAMPLE>**NEWDIR TEST** <CR>

The announcement of the NEWDIR function tells that a new subdirectory called TEST is successfully installed.

```
UTILITY TO INSTALL A NEW SUBDIRECTORY


          THE NEW SUBDIRECTORY :
          **** TEST ****
          is installed.

          Enter the Command PROSA and use the
          Menu Option [1] for Input Data.
```

An error message appears whenever a name is used which already exists:

```
THE NAME OF THE SUBDIRECTORY TEST ALREADY EXISTS!
TYPE : NEWDIR [OTHER NAME]
```

Using the NEWDIR utility without the parameter name the following message gives outlines of correct use:

```
THE NAME OF THE NEW SUBDIRECTORY IS MISSING !
TYPE : NEWDIR [NEW NAME]
```

When a new subdirectory is installed, enter 'PROSA' to start the PROSA evaluation procedure in this subdirectory. But, of course, in contrary to subdirectory EXAMPLE, no MUF or COVA data file is included in this new created subdirectory TEST. How to load these input data, see Chapter 6.

## 5.2 Change into Another Subdirectory

The GOTODIR utility is useful to change quickly the subdirectories in the PROSA environment. The user can call up the GOTODIR utility in every subdirectory of PROSA.
Being in subdirectory EXAMPLE, for instance, a change into subdirectory TEST can be performed by typing:

C:\PROSA\EXAMPLE>**GOTODIR TEST** <CR>

The new operating prompt sign is:

C:\PROSA\TEST>

By using the GOTODIR utility without any name the following message gives outlines of correct use:

```
THE NAME OF THE SUBDIRECTORY IS MISSING !
TYPE : GOTODIR [EXISTING NAME]
```

By using the GOTODIR utility with a name of a not existing subdirectory the operating system gives a self-explanatory message.

## 5.3 Delete a Subdirectory

The DELDIR utility is useful for elimination of unnecessary subdirectories in the PROSA environment. The user can call up the DELDIR utility only in subdirectory EXAMPLE of PROSA.
Being in subdirectory EXAMPLE an existing subdirectory TEST can be deleted by typing:

C:\PROSA\EXAMPLE>**DELDIR TEST** <CR>

A hint for careful use of this utility is given by the following announcement.

```
CAUTION!!
If You Confirm the DELDIR Option, the Subdirectory
***** TEST *****
will be deleted!

          [Y]es  == Confirm the DELDIR Option
          [Q]uit == Cancel the DELDIR Option
```

If the user confirms the DELDIR option by typing 'Y' the following announcement appears:

```
THE SUBDIRECTORY TEST IS SUCCESSFULLY DELETED.
```

**ATTENTION**: The subdirectory EXAMPLE cannot be deleted with this DELDIR utility.
The following message is displayed:

```
CANNOT DELETE THE SUBDIRECTORY EXAMPLE !
```

By using the DELDIR utility without any name the following message gives outlines of correct use:

```
THE NAME OF THE SUBDIRECTORY IS MISSING !
TYPE : DELDIR [EXISTING NAME]
```

By using the DELDIR utility with a name of a not existing subdirectory the operating system gives a self-explanatory message.

# Chapter 6:

## Input of Data


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## 6. Input of Data

Before a PROSA evaluation procedure is started in a new subdirectory, the input data files with MUF values and with the dispersion (variance-covariance) matrix must be created. This can be done by choosing the option 'Input of Data' in the MAIN MENU.

```
 ************************************************************
*                                                            *
*      PPPPPP      RRRRRRR       OOOOOO       SSSSSS       AAAAAA     *
*     PP    PP     RR    RR     OO    OO     SS    SS     AA    AA    *
*     PP    PP     RR    RR     OO    OO      SS          AA    AA    *
*     PPPPPPP      RRRRRRR      OO    OO       SSSS       AAAAAAAA    *
*     PP           RR    RR     OO    OO          SS      AA    AA    *
*     PP           RR    RR     OO    OO     SS    SS     AA    AA    *
*     PP           RR    RR      OOOOOO       SSSSSS      AA    AA    *
*                                                            *
*     VERSION 4.0                                            *
 ************************************************************

   MAIN MENU :    Select the MAIN MENU Options by
                  Typing the Number of Your Choice.

                  1 == Input of Data
                  2 == Run PROSA
                  3 == Run Authentication
                  4 == Browse Results
                  5 == Thresholds of PAGE & GEMUF Test
                  Q == Quit the PROSA-Session
```

MENU 1 for 'Input of Data' offers two procedures for reading the data files from a diskette or by key-enter as shown below.

```
MENU 1: Input of Data;
Data Input Procedure of MUF and COVA Data-Set

Select the PROSA-Input-Option by
Typing the Number of Your Choice.

Input Data to Run PROSA:
       1 == IFSS Diskette
       2 ==      Key Enter

Input Data to Run Authentication:
       3 == AAVS Diskette
       4 ==      Key Enter

       E == End and Go to MAIN MENU
```

The abbreviations 'IFSS' and 'AAVS' are special marks for IAEA applications.

## 6.1 Input of Data by Diskette

To load data by diskette for PROSA evaluation procedure choose the option 'IFSS-Diskette':

```
     Input Data to Run PROSA:
              1 == IFSS Diskette
              2 ==       Key Enter
```

The following announcement gives a request to insert a diskette in Drive A with the MUF and COVA data sets.

```
Insert IFSS-Diskette in Drive A
with MUF and COVA Data Set.
```

The MUF data file and the COVA data file as well will be copied into the subdirectory in use.
To load data by diskette for the authentication procedure ( see chapter 3.4 ) choose the option 'AVSS-Diskette':

```
     Input Data to Run Authentication:
              3 == AAVS Diskette
              4 ==       Key Enter
```

The following announcement gives a request to insert a diskette in Drive A with the MUFRS and COVA data sets.

```
Insert AVSS-Diskette in Drive A
with MUFRS and COVA Data Set.
```

The MUFRS data file and the COVA data file as well will be copied into the subdirectory in use.

**IMPORTANT REMARKS:**

- Data Input by diskette is only possible from Drive A.
- The names of the input data files on the diskette must be MUF and COVA (Run PROSA) or MUFRS and COVA (Run Authentication).

- In all input data files the number of balance periods must be written in the first line with 3 digits and right aligned, e.g. ' 20' or '  8'.

## 6.2 Input of Data by Key-enter

To create data files for PROSA evaluation procedure choose the option 'Key-Enter' in MENU 1 as below.

```
     Input Data to Run PROSA:
            1 == IFSS Diskette
            2 ==      Key Enter
```

### 6.2.1 Input of MUF Vector

To create a data file with MUF values choose the option 'MUF-Values' in MENU 1.1.

```
  MENU 1.1: Input of Data;
     Key Enter Procedure of MUF-Values and
     Covariance-Matrix

     Select the PROSA-Input-Option by
     Typing the Number of Your Choice.

            1 == MUF-Values
            2 == Covariance-Matrix
            E == End and Go to PREVIOUS MENU
```

The use of the input utility for the MUF vector is described by a short tutorial. The first request of the input utility is the number of balance periods. For instance enter '5'.

```
INPUT UTILITY FOR THE MUF  -VECTOR

 NUMBER OF BALANCE PERIODS :
 [ MAX. 50 PERIODS ]
 ===> 5
```

The input utility asks for the MUF values of the '5' periods. After having entered the values the MUF vector is shown. If the MUF vector is correct enter 'Q'. If the MUF vector is incorrect it can be modified (see chapter 6.2.4.1).

```
MUF  -VALUE OF THE PERIOD :        1
 ===> 1
MUF  -VALUE OF THE PERIOD :        2
 ===> 2
MUF  -VALUE OF THE PERIOD :        3
 ===> 3
MUF  -VALUE OF THE PERIOD :        4
 ===> 4
MUF  -VALUE OF THE PERIOD :        5
 ===> 5
THIS IS THE MUF  -VECTOR
    1  0.1000E+01     2  0.2000E+01
    3  0.3000E+01     4  0.4000E+01
    5  0.5000E+01


MODIFYING THE MUF  -VECTOR:

 [D]ELETE LAST MUF  -VALUE;
 [C]HANGE A MUF  -VALUE;
 [A]DD A MUF  -VALUE;
 [Q]UIT;

ENTER A CHARACTER GIVEN IN [] ==> Q
THE MUF    -VECTOR IS WRITTEN ON DATA SET
```

### 6.2.2 Input of Dispersion Matrix

To create a data file with values of the covariance matrix choose the option 'Covariance-Matrix' in MENU 1.1.

```
  MENU 1.1: Input of Data;
     Key Enter Procedure of MUF-Values and
     Covariance-Matrix

     Select the PROSA-Input-Option by
     Typing the Number of Your Choice.

            1 == MUF-Values
            2 == Covariance-Matrix
            E == End and Go to PREVIOUS MENU
```

The use of the input utility for the covariance matrix is described by a short tutorial. The first request of the input utility is the number of balance periods. For instance enter '5'.

```
INPUT UTILITY FOR COVARIANCE MATRIX
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

NUMBER OF BALANCE PERIODS
[ MAX. 50 PERIODS ]
===> 5
```

The input utility asks for the variance/covariance values of the '5' periods. After having enter the values the covariance matrix is shown. If the covariance matrix is correct enter 'Q'. If the covariance matrix is incorrect it can be modified (see chapter 6.2.4.2).

```
ENTER THE ELEMENTS OF COVARIANCE-MATRIX

ENTER ELEMENT(S)              1
[Separated by blanks]
IN ROW                        1
===> 1

ENTER ELEMENT(S)              2
[Separated by blanks]
IN ROW                        2
===> .1 2

ENTER ELEMENT(S)              3
[Separated by blanks]
IN ROW                        3
===> .1 .2 3

ENTER ELEMENT(S)              4
[Separated by blanks]
IN ROW                        4
===> .1 .2 .3 4

ENTER ELEMENT(S)              5
[Separated by blanks]
IN ROW                        5
===> .1 .2 .3 .4 5
```

```
 THIS IS THE COVARIANCE-MATRIX

  1
0.1000E+01
  2
0.1000E+00   0.2000E+01
  3
0.1000E+00   0.2000E+00   0.3000E+01
  4
0.1000E+00   0.2000E+00   0.3000E+00   0.4000E+01
  5
0.1000E+00   0.2000E+00   0.3000E+00   0.4000E+00   0.5000E+01


 MODIFYING OF THE COVARIANCE-MATRIX:

    [D]ELETE LAST ROW OF THE COVARIANCE-MATRIX;
    [C]HANGE VALUES OF THE COVARIANCE-MATRIX;
    [A]DD A ROW IN THE COVARIANCE-MATRIX;
    [Q]UIT;
```

ENTER A CHARACTER GIVEN IN [] ==> **Q**

```
 THE COVARIANCE-MATRIX IS WRITTEN ON DATA SET.
```

**NOTICE:** The key-enter input utility of 'Covariance-Matrix' only asks for the lower triangular matrix. PROSA determines then the whole matrix. The covariance matrix for 'Run Authentication' is the same as for 'Run PROSA'.

### 6.2.3 Input of MUFRS Vector

To create a MUFRS vector choose the option 'MUFRS-Values' in MENU 1.2 and follow the instructions of chapter 6.2.1.

```
     MENU 1.2: Input of Data;
     Key Enter Procedure of MUFRS-Values and
     Covariance-Matrix

     Select the PROSA-Input-Option by
     Typing the Number of Your Choice.
```

```
           1 == MUFRS-Values
           2 == Covariance-Matrix
           E == End and Go to PREVIOUS MENU
```

### 6.2.4 Edit the Input Data Sets

The input utility includes possibilities to edit the values in the data files named MUF, MUFRS and COVA. To load a data file is the same procedure as described in the chapters above.

**Attention:** After modifying elements in the input data files with the options 'add' or 'delete' control the number of periods. To run PROSA evaluation procedure successfully the number of periods in the data files MUF and COVA, resp. MUFRS and COVA, must be equal!

#### 6.2.4.1 Edit the Values of MUF Vector

After loading the data file named MUF the input utility shows the existing MUF vector and asks for an option for the modifying task.

```
INPUT UTILITY FOR THE MUF  -VECTOR

THIS IS THE MUF  -VECTOR
    1  0.1000E+01      2  0.2000E+01
    3  0.3000E+01      4  0.4000E+01
    5  0.5000E+01


MODIFYING THE MUF  -VECTOR:

 [D]ELETE LAST MUF  -VALUE;
 [C]HANGE A MUF  -VALUE;
 [A]DD A MUF  -VALUE;
 [Q]UIT;

ENTER A CHARACTER GIVEN IN [] ==>
```

Choose the option for the modifying task concerned and follow the instructions of the input utility. The announcements of the options are given below.

a) [D]ELETE LAST MUF -VALUE;

```
ENTER A CHARACTER GIVEN IN [] ==>
THE LAST MUF  -VALUE ===>

CONFIRM THE DELETE OPTION [Y]ES/[N]O ===>

THIS IS THE MUF  -VECTOR
```

b) [C]HANGE A MUF -VALUE;

```
ENTER A CHARACTER GIVEN IN [] ==>
ENTER NUMBER OF MUF -VECTOR ELEMENT ===>
CURRENT MUF -VALUE ===>
ENTER THE NEW MUF -VALUE ===>

THIS IS THE MUF -VECTOR
```

c) [A]DD A MUF -VALUE;

```
ENTER A CHARACTER GIVEN IN [] ==>
LAST MUF -VALUE ===>
ADD THE NEW MUF -VALUE ===>

THIS IS THE MUF -VECTOR
```

d) [Q]UIT;

```
ENTER A CHARACTER GIVEN IN [] ==>
THE MUF -VECTOR IS WRITTEN ON DATA SET
```

### 6.2.4.2 Edit the Values of Dispersion Matrix

After loading the data file named COVA the input utility shows the existing covariance matrix and asks for an option for the modifying task.

```
INPUT UTILITY FOR COVARIANCE MATRIX
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~


THIS IS THE COVARIANCE-MATRIX

 1
0.1000E+01
 2
0.1000E+00  0.2000E+01
 3
0.1000E+00  0.2000E+00  0.3000E+01
 4
0.1000E+00  0.2000E+00  0.3000E+00  0.4000E+01
 5
0.1000E+00  0.2000E+00  0.3000E+00  0.4000E+00  0.5000E+01

MODIFYING OF THE COVARIANCE-MATRIX:

  [D]ELETE LAST ROW OF THE COVARIANCE-MATRIX;
  [C]HANGE VALUES OF THE COVARIANCE-MATRIX;
  [A]DD A ROW IN THE COVARIANCE-MATRIX;
  [Q]UIT;

ENTER A CHARACTER GIVEN IN [] ==>
```

Choose the option for the modifying task concerned and follow the instructions of the input utility. The announcements of the options are given below.

a) [D]ELETE LAST ROW OF THE COVARIANCE-MATRIX;

```
ENTER A CHARACTER GIVEN IN [] ==>
LAST ROW OF THE COVARIANCE-MATRIX:

CONFIRM THE DELETE OPTION [Y]ES/[N]O ===>

THIS IS THE COVARIANCE-MATRIX
```

b) [C]HANGE VALUES OF THE COVARIANCE-MATRIX;

```
ENTER A CHARACTER GIVEN IN [] ==>
ENTER ROW AND COLUMN OF THE ELEMENT:
(Separated by a Blank)
===>
CURRENT MATRIX ELEMENT ==>
ENTER THE NEW MATRIX ELEMENT ===>

THIS IS THE COVARIANCE-MATRIX
```

c) [A]DD A ROW IN THE COVARIANCE-MATRIX;

```
ENTER A CHARACTER GIVEN IN [] ==>
LAST ROW OF THE COVARIANCE-MATRIX:

ENTER ELEMENT(S)
[Separated by blanks]
IN ROW
===>


THIS IS THE COVARIANCE-MATRIX
```

d) [Q]UIT;

```
ENTER A CHARACTER GIVEN IN [] ==>
THE COVARIANCE-MATRIX IS WRITTEN ON DATA SET.
```

#### 6.2.4.3 Edit the Values of MUFRS Vector

After loading the data file named MUFRS the input utility shows the existing MUFRS vector and asks for an option for the modifying task. For more details see chapter 6.2.4.1.

# Chapter 7:

## Real Sequential Evaluation with PROSA


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# 7. Real Sequential Evaluation with PROSA

The PROSA 4.0 program package enables a real sequential evaluation. That means, PROSA 4.0 is not only able to evaluate a series of MUF values sequentially after the campaign has finished, but also real sequentially during the campaign. In the following a real sequential evaluation of a campaign is demonstrated by a tutorial. In this tutorial the input of data procedure is performed by the 'Key-Enter' option as described in chapter 6.2.

## 7.1 To Start a New Campaign

To evaluate a campaign real sequentially, first of all create a new subdirectory by using the function 'NEWDIR' (see chapter 5.1). The following activities take place in this new subdirectory.
At the beginning of the campaign (before the end of the first balance period) the determination of the thresholds of PAGE's test and GEMUF test for the whole campaign has to be performed. (The thresholds of the CUMUF test will be determined sequentially in 'Run PROSA' of MAIN MENU.)
Choose the option 'Thresholds of PAGE & GEMUF Test' in the MAIN MENU:

```
MAIN MENU :   Select the MAIN MENU Options by
              Typing the Number of Your Choice.

          1 == Input of Data
          2 == Run PROSA
          3 == Run Authentication
          4 == Browse Results
          5 == Thresholds of PAGE & GEMUF Test
          Q == Quit the PROSA-Session
```

Choose the option 'Enter/Change the Parameters' in MENU 5.

```
MENU 5: Threshold;
   Evaluate the Thresholds of PROSA

   Select the PROSA-Threshold-Option by
   Typing the Number of Your Choice.

          1 == Enter/Change the Parameters
          E == End and Go to MAIN MENU
```

The working program gives a short announcement of its task and asks for description parameters and computation parameters. For the handling of these input parameters see chapter 3.2.

```
Begin of Simulation
1. ITERATION  RESULTS :
    PAGES TEST >> PALPHA =  0.030
    GEMUF TEST >> GALPHA =  0.060
2. ITERATION  RESULTS :
    PAGES TEST >> PALPHA =  0.030
    GEMUF TEST >> GALPHA =  0.020
3. ITERATION  RESULTS :
    PAGES TEST >> PALPHA =  0.060
    GEMUF TEST >> GALPHA =  0.025
4. ITERATION  RESULTS :
    PAGES TEST >> PALPHA =  0.065
    GEMUF TEST >> GALPHA =  0.040
5. ITERATION  RESULTS :
    PAGES TEST >> PALPHA =  0.050
    GEMUF TEST >> GALPHA =  0.065
6. ITERATION  RESULTS :
    GEMUF TEST >> GALPHA =  0.055
Threshold Values are Calculated.
```

## 7.2 To Perform a New Campaign

After the first balance period the first MUF value and the according disperion matrix (consisting of one value, namely variance of MUF) is available. Let's say, MUF= 1.1 and COVA= 0.9. Either these data are on diskette (see chapter 6.1) or they have to be key-entered (see chapter 6.2).
After the input of the data is performed the PROSA evaluation procedure has to be started with the option 'Run PROSA' in the MAIN MENU and the numerical results scroll up on the display:

```
PROSA VERSION 4.0
PROGRAM TASK :
BUILT UP THE INPUT DATA SETS FOR PROSA
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

COVARIANCE MATRIX
~~~~~~~~~~~~~~~~~
(MAX. FIRST 5 ROWS OF THE MATRIX)
  0.9000E+00
```

```
 PROSA VERSION 4.0
 PROGRAM TASK :
 COMPUTATION OF TRANSFORMATION MATRIX AND ITS INVERSE
 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

 PROSA VERSION 4.0
 PROGRAM TASK :
 EVALUATION OF STATISTICS
 ~~~~~~~~~~~~~~~~~~~~~~~~
 The Calculation of CUMUF-Threshold Runs.

 Cumulated False Alarm Rate till Period
       0.040                      1
 THRESHOLD VALUES ARE CALCULATED

  RESULTS OF STATISTIC EVALUATION
  ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
   INSPECTOR NAME     :Inspector
   FACILITY NAME      :KfK
   REPORT NUMBER      :001
   DATE               :90-11-07


   ****  CUSUM-TEST ACCORDING TO PAGE ****

   BALANCE      MUF           THRES           STATISTICS
SIGNIFICANT
   PERIODS      VALUES        HOLD        +            -
REMARKS
       1      0.1100E+01   0.4833E+01   0.1159E+01   0.0000E+00

       **** SEQUENTIAL GEMUF-TEST ****

   BALANCE      MUF           THRES      STATISTICS  SIGNIFICANT
   PERIODS      VALUES        HOLD                     REMARKS
       1      0.1100E+01   0.6607E+01   0.1344E+01

   **** TRUNCATED SEQUENTIAL CUMUF-TEST ****

   BALANCE      MUF           THRES      STATISTICS  SIGNIFICANT
   PERIODS      VALUES        HOLD                     REMARKS
       1      0.1100E+01   0.1949E+01   0.1100E+01
```

For all further balance periods, repeat the input of data procedure to add a new MUF value and a new row of the dispersion matrix. After each new input of data the PROSA evaluation procedure has to be started. The following example shows the results after the input of the second balance period.

```
 PROSA VERSION 4.0
 PROGRAM TASK :
 BUILT UP THE INPUT DATA SETS FOR PROSA
 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

 COVARIANCE MATRIX
 ~~~~~~~~~~~~~~~~~
 (MAX. FIRST 5 ROWS OF THE MATRIX)
   0.9000E+00
   0.1000E+00  0.1900E+01

 PROSA VERSION 4.0
 PROGRAM TASK :
 COMPUTATION OF TRANSFORMATION MATRIX AND ITS INVERSE
 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

 PROSA VERSION 4.0
 PROGRAM TASK :
 EVALUATION OF STATISTICS
 ~~~~~~~~~~~~~~~~~~~~~~~~
 The Calculation of CUMUF-Threshold Runs.

 Cumulated False Alarm Rate till Period
       0.030                        1
       0.043                        2
 THRESHOLD VALUES ARE CALCULATED

  RESULTS OF STATISTIC EVALUATION
  ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
   INSPECTOR NAME     :Inspector
   FACILITY NAME      :KfK
   REPORT NUMBER      :001
   DATE               :90-11-07


  ****  CUSUM-TEST ACCORDING TO PAGE ****

  BALANCE      MUF           THRES           STATISTICS
SIGNIFICANT
  PERIODS      VALUES        HOLD        +            -
REMARKS
       1     0.1100E+01  0.4833E+01  0.1159E+01  0.0000E+00
       2     0.2100E+01  0.4833E+01  0.2598E+01  0.0000E+00

       **** SEQUENTIAL GEMUF-TEST ****

  BALANCE      MUF           THRES      STATISTICS  SIGNIFICANT
  PERIODS      VALUES        HOLD                     REMARKS
       1     0.1100E+01  0.6607E+01  0.1344E+01
       2     0.2100E+01  0.7826E+01  0.3415E+01

  **** TRUNCATED SEQUENTIAL CUMUF-TEST ****

  BALANCE      MUF           THRES      STATISTICS  SIGNIFICANT
  PERIODS      VALUES        HOLD                     REMARKS
       1     0.1100E+01  0.1949E+01  0.1100E+01
       2     0.2100E+01  0.3558E+01  0.3200E+01
```

NOTICE: By exceeding the expected number of balance periods (in this example: 5), a warning message is given. The thresholds of the test procedures are set from this period on (in this example: 6) to values related to a threshold determination of 50 balance periods. Nevertheless, the total false-alarm probability increases. But it is still tolerable, if the expected number of balance periods is exceeded by not more than 10 percent.

# Chapter 8:

## Error Messages and Error Handling


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## 8. Error Messages and Error Handling

The PROSA Version 4.0 provides error messages whenever program moduls or input data files are missing, when strange input parameters caused by key-enter procedures are found or when data do not compare. The error messages will be given from the PROSA menu guide or from the program moduls.

### 8.1 Error Messages from PROSA Menu Guide

The PROSA menu guide provides error messages whenever program moduls or data set files are missing or gives an announcement of the printer status within the computer system. For example, the MUF or COVARIANCE input data set file is not loaded into the current subdirectory or the sequence in the use of MAIN MENU is incorrect. The error messages and warnings are self-explainatory.

**List of Error Messages from the PROSA Menu Guide:**

```
!! The PROSA-Program-Moduls are not complete !!
!! Please read PROSA Manual, chapter 2.1 !!

!! The Graphic-Program-Moduls are not complete !!
!! Please read PROSA Manual, chapter 2.1 !!

!! The Results Data File does not exist !!
!! Please go to MENU 2 and Run PROSA   !!

!! The Statistical Data File does not exist !!
!! Please go to MENU 2 and Run PROSA !!

!! The Graphical Output Device File does not exist !!
!! Please read PROSA Manual, chapter 2.1 !!

!! The Threshold Data File does not exist !!
!! Please go to MENU 5 and determine the Thresholds !!
```

!! The Input Data File MUF on IFSS-Diskette does not exist !!

!! The Input Data File COVA on IFSS-Diskette does not exist !!

!! The Input Data File MUFRS on AAVS-Diskette does not exist !!

!! The Input Data File COVA on AAVS-Diskette does not exist !!

!! The Input Data File MUF does not exist !!
!! Please go to MENU 1 and load MUF !!

!! The Input Data File COVA does not exist !!
!! Please go to MENU 1 and load COVA !!

!! The Input Data File MUFRS does not exist !!
!! Please go to MENU 1 and load MUFRS !!

!! The Printer is not ready !!
!! The Printer is not switched on or not attached !!

## 8.2 Error Messages from PROSA Program Moduls

When the PROSA program moduls are started, all input parameters created by key-enter will be checked for plausibility. Furthermore, the examination of compability of the parameters in the input data sets will also be controlled. The PROSA program moduls error messages are distinguishable in general error messages and error messages by each PROSA program task.
Each program task of the PROSA program moduls gives a short announcement of its identity. For example, the identification header of program modul SIMULA:

```
PROSA VERSION 4.0
PROGRAM TASK :
SIMULATION PROGRAM FOR DETERMINATION
THE THRESHOLDS OF
- CUSUM-TEST ACCORDING TO PAGE
- SEQUENTIAL GEMUF-TEST
```

The announcement of the program task is very helpful to locate the error.

In contrary to warnings, error messages are disastrous and cause a program stop by error! General error messages are given when input data files are missing :

```
Open Error on   :  File name
Data file does not exist!
```

when reading the incorrect end of input data file:

```
End  Error on   :  File name
Line            :  Line number
```

or when reading an incorrect format in the input data file:

```
Format Error on :  File name
Line            :  Line number
```

In the following subchapters the possible error messages and warnings of each program modul of PROSA are listed.

### 8.2.1 Error Messages from PROSA Program Modul Simula

The following message appears on screen, if the data set of the threshold already exists:

```
          ====> Attention! <====
  Are You Sure that Parameter Should be Changed?
  This Would Mean that New Threshold Simulations
  Will Be Performed !
```

The following messages appear on screen, if the input of computing parameters is not correct.

```
Enter the False Alarm Probability Alpha :
[ Default Intervall = min:0.005,max:1.0 ]
===>  1.5
The Value of Alpha is not in the Interval!

Enter the Expected Number of Balances :
[ Default Intervall = min:1,max:50 ]
===>  66
The Expected Number of Balances is not in the Interval!

Enter the Number of MONTE-CARLO-RUNS :
[ Default Interval = min:200,max:10000 ]
===>  100
The Number of MONTE-CARLO-RUNS is not in the Interval!

Enter the Number of MONTE-CARLO-RUNS :
[ Default Interval = min:200,max:10000 ]
===>  600
Caution ! The Number of MONTE-CARLO-RUNS
is Greater than 500 ! The Simulation of
the Thresholds Needs a Very Long Time.
```

### 8.2.2 Error Messages from Program Modul SETUP

The program modul **Setup** provides error messages whenever the plausibility check control has found strange informations and/or strange parameters in the input data set. The error messages are self-explainatory.

The possible error messages are listed in the following:

```
Error in MUF-Vector!
Number of Balance Periods = 0 ??

Error in MUF-Vector!
Number of Balance Periods
exceeds the Dimension Limit !
```

If one of the above error messages appear, the number of balance periods is either zero or exceeds the dimension limit of the program modul. The maximum number of balance periods in the PROSA Version 4.0 is limited to 50 periods.

```
Error in COVARIANCE-Matrix!
Number of Balance Periods is 0 ??
```

```
Error in COVARIANCE-Matrix!
Number of Balance Periods
Exceeds the Dimension Limit !
```

If one of the above error messages appear, the number of balance periods is either zero or exceeds the dimension limit of the program modul. The maximum number of balance periods in the PROSA Version 4.0 is limited to 50 periods.

The following error message appears, when the number of balance periods in the data set of the MUF vector and in the data set of the covariance matrix are incompatible:

```
Error Message!

Number of Balance Periods in MUF  data set =  5
Number of Balance Periods in COVA data set =  6
Number of Balance Periods are incompatible!
```

Furthermore, a warning message is possible:

```
Warning!

Number of Balance Periods ===>  5
Expected Number of Balance Periods by
Threshold calculation was ===>  4
```

### 8.2.3 Error Messages from PROSA Program Modul Builtup

An error message appears, when a diagonal element in the covariance matrix is negative:

```
ERROR IN COVARIANCE MATRIX!
DIAGONAL ELEMENT HAS TO BE POSITIVE!
DIAGONAL ELEMENT IN PERIOD  I
IS NEGATIVE!
```

### 8.2.4 Error Messages from PROSA Program Modul Matrix

An error message appears, when the covariance matrix is not positive definit:

```
Matrix not positive definit
```

### 8.2.5 Error Messages from PROSA Program Modul Statist

An error messages appears, when computation parameters are incompatible:

```
ERROR MESSAGE ERROR MESSAGE ERROR MESSAGE
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

MATERIAL BALANCE PERIOD MISSMATCH !
===>  File name
THIS DATA FILE   ===>   5
SETUP DATA FILE  ===>   7


ERROR MESSAGE ERROR MESSAGE ERROR MESSAGE
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

THE FALSE ALARM PROBABILITIES ARE DIFFERENT!
===>  File name
THIS DATA FILE   ===>   .05
SETUP DATA FILE  ===>   .10
```

The following possible warnings are given by the program modul **STATIST** and a short message is written in the result data set file:

```
      !!!! WARNING !!!!
      ~~~~~~~~~~~~~~~~~
 FACILITY NAME MISMATCH !
 ===>  File name
 THIS DATA FILE   ===>   Facility1
 SETUP DATA FILE  ===>   Facility2

      !!!! WARNING !!!!
      ~~~~~~~~~~~~~~~~~
 MATERIAL BALANCE PERIODS ARE GREATER
 THAN THE NUMBER OF MAXIMUM BALANCES !
 ===>  File name
 Np          ===>  6
 Nmax        ===>  5

 WARNING! FACILITY NAME MISCELLANEOUS.

 WARNING! THRESHOLD (Nmax) EXEEDS!
```

# Chapter 9:

## Further Aspects and Possiblities


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# 9. Further Aspects and Possibilities

In this chapter some further activities and possibilities are described.

## 9.1 Maximum Number of Balance Periods

In the procedure of determination of the test thresholds you are asked for the number of expected balance periods. The possible range is between 1 and 50. Up to now this range was sufficient for all evaluations in practice. But if you have any problems with this restriction that means you need more than 50 balance periods, please do not hesitate to contact us. We will provide you a version of PROSA with your desired number of balance periods.

## 9.2 Data File with the Thresholds and False-Alarm Rates

If you start the programme PROSA for the first time in a special subdirectory a data file named @_thrhld.dat is created in this subdirectory.

After the determination of the current test thresholds these values are written on this data file. Also the cumulated false-alarm rates of the test procedures are written on the same file.

Let's consider for example the subdirectory EXAMPLE.

```
C:\PROSA\EXAMPLE>
```

You can browse the thresholds and the according false-alarm rates of the three tests either by

```
C:\PROSA\EXAMPLE> more <@_thrhld.dat
```

on your screen or by

```
C:\PROSA\EXAMPLE> print @_thrhld.dat
```

on your attached printer.

@_THRHLD.DAT
90-04-11
20
0.5000E-01
200
2.00

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 0.1075E+02 | 0.0000E+00 | 0.9110E+01 | 0.0000E+00 | 0.4250E+00 | 0.5000E-02 |
| 2 | 0.1075E+02 | 0.0000E+00 | 0.1052E+02 | 0.5000E-02 | 0.4067E+00 | 0.5000E-02 |
| 3 | 0.1075E+02 | 0.0000E+00 | 0.1192E+02 | 0.1000E-01 | 0.5024E+00 | 0.1500E-01 |
| 4 | 0.1075E+02 | 0.0000E+00 | 0.1333E+02 | 0.1500E-01 | 0.4766E+00 | 0.2000E-01 |
| 5 | 0.1075E+02 | 0.0000E+00 | 0.1474E+02 | 0.1500E-01 | 0.4972E+00 | 0.3000E-01 |
| 6 | 0.1075E+02 | 0.0000E+00 | 0.1614E+02 | 0.2000E-01 | 0.7228E+00 | 0.3500E-01 |
| 7 | 0.1075E+02 | 0.0000E+00 | 0.1755E+02 | 0.2500E-01 | 0.7673E+00 | 0.4500E-01 |
| 8 | 0.1075E+02 | 0.0000E+00 | 0.1895E+02 | 0.4000E-01 | 0.8403E+00 | 0.4500E-01 |
| 9 | 0.1075E+02 | 0.0000E+00 | 0.2036E+02 | 0.4000E-01 | 0.8591E+00 | 0.4500E-01 |
| 10 | 0.1075E+02 | 0.0000E+00 | 0.2177E+02 | 0.4000E-01 | 0.8377E+00 | 0.4500E-01 |
| 11 | 0.1075E+02 | 0.0000E+00 | 0.2317E+02 | 0.4000E-01 | 0.9372E+00 | 0.4500E-01 |
| 12 | 0.1075E+02 | 0.5000E-02 | 0.2458E+02 | 0.4500E-01 | 0.9764E+00 | 0.4500E-01 |
| 13 | 0.1075E+02 | 0.1500E-01 | 0.2599E+02 | 0.4500E-01 | 0.9681E+00 | 0.5000E-01 |
| 14 | 0.1075E+02 | 0.2000E-01 | 0.2739E+02 | 0.5000E-01 | 0.1093E+01 | 0.5000E-01 |
| 15 | 0.1075E+02 | 0.2000E-01 | 0.2880E+02 | 0.5000E-01 | 0.1093E+01 | 0.5000E-01 |
| 16 | 0.1075E+02 | 0.2500E-01 | 0.3020E+02 | 0.5000E-01 | 0.1093E+01 | 0.5000E-01 |
| 17 | 0.1075E+02 | 0.3000E-01 | 0.3161E+02 | 0.5000E-01 | 0.1093E+01 | 0.5000E-01 |
| 18 | 0.1075E+02 | 0.3500E-01 | 0.3302E+02 | 0.5000E-01 | 0.1093E+01 | 0.5000E-01 |
| 19 | 0.1075E+02 | 0.4000E-01 | 0.3442E+02 | 0.5000E-01 | 0.1316E+01 | 0.5000E-01 |
| 20 | 0.1075E+02 | 0.4500E-01 | 0.3583E+02 | 0.5000E-01 | 0.1464E+01 | 0.5000E-01 |
| 21 | 0.1625E+02 | 0.0000E+00 | 0.3793E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 22 | 0.1625E+02 | 0.0000E+00 | 0.3928E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 23 | 0.1625E+02 | 0.0000E+00 | 0.4064E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 24 | 0.1625E+02 | 0.0000E+00 | 0.4199E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 25 | 0.1625E+02 | 0.0000E+00 | 0.4335E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 26 | 0.1625E+02 | 0.0000E+00 | 0.4470E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 27 | 0.1625E+02 | 0.0000E+00 | 0.4605E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 28 | 0.1625E+02 | 0.0000E+00 | 0.4741E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 29 | 0.1625E+02 | 0.0000E+00 | 0.4876E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 30 | 0.1625E+02 | 0.0000E+00 | 0.5012E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 31 | 0.1625E+02 | 0.0000E+00 | 0.5147E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 32 | 0.1625E+02 | 0.0000E+00 | 0.5282E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 33 | 0.1625E+02 | 0.0000E+00 | 0.5418E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 34 | 0.1625E+02 | 0.0000E+00 | 0.5553E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 35 | 0.1625E+02 | 0.0000E+00 | 0.5689E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 36 | 0.1625E+02 | 0.0000E+00 | 0.5824E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 37 | 0.1625E+02 | 0.0000E+00 | 0.5959E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 38 | 0.1625E+02 | 0.0000E+00 | 0.6095E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 39 | 0.1625E+02 | 0.0000E+00 | 0.6230E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 40 | 0.1625E+02 | 0.0000E+00 | 0.6366E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 41 | 0.1625E+02 | 0.0000E+00 | 0.6501E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 42 | 0.1625E+02 | 0.0000E+00 | 0.6636E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 43 | 0.1625E+02 | 0.0000E+00 | 0.6772E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 44 | 0.1625E+02 | 0.0000E+00 | 0.6907E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 45 | 0.1625E+02 | 0.0000E+00 | 0.7043E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 46 | 0.1625E+02 | 0.0000E+00 | 0.7178E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 47 | 0.1625E+02 | 0.0000E+00 | 0.7313E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 48 | 0.1625E+02 | 0.0000E+00 | 0.7449E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 49 | 0.1625E+02 | 0.0000E+00 | 0.7584E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |
| 50 | 0.1625E+02 | 0.0000E+00 | 0.7720E+02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 |

The structure of the data file is the following:

On the top of this file the following parameters are listed

```
     line 1:  name of data set           = @_THRHLD.DAT
     line 2:  date of evaluation         = 90-04-11
     line 3:  number of balance periods =   50
     line 4:  false-alarm rate           = 0.05
     line 5:  number of simulations      = 1000
     line 6:  internal factor            =    2
```

This parameter listing is followed by 7 columns

```
     column 1:  balance periods
     column 2:  thresholds of Page's test
     column 3:  cumulated false-alarm rates of Page's test
     column 4:  thresholds of GEMUF test
     column 5:  cumulated false-alarm rates of GEMUF test
     column 6:  thresholds of CUMUF test
     column 7:  cumulated false-alarm rates of CUMUF test
```

In this example the results according to this evaluation are written in balance periods 1 to 20. For example, The threshold of GEMUF test in the 11th period is 23.17 and the cumulated false-alarm rate of this test after the 11th period is 0.04.
The values from period 21 to 50 are not simulated according to the parameters above, because the expected number of balance periods was 20.
The values in these balance periods are related to a simulation based on 50 balance periods, 1000 Monte-Carlo simulations and a false-alarm rate of 0.05. If the expected number of balance periods is exceeded, these threshold values are taken for the evaluation (see chapter 9.1).

## 9.3 GRAPHICAL DATA FILE WITH HPGL-FORMAT.

The possibility to choose the 'Graphical Data File' option in the MENU 4.2.1 (see chapter 4.2.1, page 31) enables the user of PROSA to create graphical data files in HPGL-Format (Hewlett-Packard Graphic Language).

The HPGL data files are stored in the subdirectory under consideration with name:

- MUF.HPG includes MUF-Vector;
- CMUF.HPG includes Cumulation of MUF-Values;
- PAGE.HPG includes PAGES-Test;
- GEMUF.HPG includes GEMUF-Test;
- CUMUF.HPG includes CUMUF-Test;

These HPGL data files can be imported to the text editor 'WordPerfect 5.1' for further wordprocessing applications.
Furthermore, these HPGL data files can be sent with the DOS copy command to the port (lpt1:, com1:) were a Hewlett-Packard plotter (HP7475A; HP7470A) is connected.