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Idaho National Engineering Laboratory

SWEPP Assay System Version 2.0 Software Test Plan and Report

MASTER

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Lockheed
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SWEPP Assay System
Version 2.0
Software Test Plan and Report

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1. INTRODUCTION

The Idaho National Engineering Laboratory (INEL) Stored Waste Examination Pilot Plant (SWEPP) operations staff use nondestructive analysis methods to characterize the radiological contents of contact-handled waste containers. Containers of waste from Rocky Flats Environmental Technology Site and other DOE sites are currently stored at SWEPP. Before these containers can be shipped to the Waste Isolation Pilot Plant (WIPP), SWEPP must verify compliance with storage, shipping, and disposal requirements. This program has been in operation since 1985 at the INEL Radioactive Waste Management Complex (RWMC).

One part of the SWEPP program measures neutron emissions from the containers and estimates the mass of plutonium and other transuranic (TRU) isotopes present. A Passive/Active Neutron (PAN) assay system developed at the Los Alamos National Laboratory [1][1] is used to perform these measurements. A computer program named NEUT2 was originally used to perform the data acquisition and reduction functions for the neutron measurements. This program was originally developed at Los Alamos and was extensively modified by a commercial vendor of PAN systems and by personnel at the INEL. NEUT2 uses the analysis methodology outlined in [1], but no formal documentation exists on the software itself. The SWEPP Assay System (SAS) computer program replaced the NEUT2 software in early 1994. The SAS software was developed using an "object model" approach and is documented in accordance with ANSI/IEEE standards. The new software incorporates the basic analysis algorithms found in NEUT2. Additional functionality and improvements include a much improved user interface, the ability to change analysis parameters without having to modify the code, and other features designed for flexibility and maintainability.

This document supersedes the original SAS Software Test Plan and report (STP) [5]. This document contains the testing requirements and results for the SAS computer program (Version 2.0). Companion documents include a software requirements specification [2], a software design description [3], a software verification and validation plan [4], and a software configuration management plan [6]. Following the release of the SAS Version 2.0, subsequent work is anticipated in order to continue developing this assay technology.

Version 1.0 of the SAS was developed by staff from the INEL Scientific Computing unit under the technical direction of the Nuclear and Radiation Physics unit. Version 2.0 is under development by staff from the INEL Nuclear Physics and Radiation

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[1] References cited in this document are listed in Section 1.4.

Chemistry Department, with documentation and testing assistance provided by personnel from the Software and Electronics and the Engineering Analysis departments. Funding for this work has been provided through the INEL Transuranic (TRU) Waste Programs department.

1.1 Purpose

The primary purpose of this test plan and report is to document the test process and to verify that the requirements for the SAS are implemented correctly. It is guided by the format and content guideline suggested by the ANSI/IEEE software engineering standards [8]. This test plan and report satisfies the testing requirements of ASME NQA-1-1994 Supplement 11S-2 [10] for a Quality Level 2 application.

The intended audiences for this test plan are the developers and verification and validation analysts for the SAS.

1.2 Scope

This document specifies the software tests to be performed by the SAS at the INEL.

1.3 Definitions, Acronyms, and Abbreviations

Reference [12] provides, in general, definitions, acronyms, and abbreviations typical to the life cycle approach to software development. The following are specific to this document:

CAMAC	computer aided measurement and control
DMS	data management system
GPIB	general purpose interface bus
INEL	Idaho National Engineering Laboratory
RWMC	Radioactive Waste Management Complex
SAS	SWEPP Assay System, the name of the computer program
SGRS	SWEPP Gamma-Ray Spectrometer [13]
SWEPP	Stored Waste Examination Pilot Plant
WIPP	Waste Isolation Pilot Plant

1.4 Overview

Section 2 provides the list of references. Section 3 identifies the items required to conduct the testing. Section 4 lists the features to be tested, and section 5 lists the individual tests to be conducted. Section 6 lists the features that are not to be tested. Section 7 describes the approach to testing. Section 8 specifies the suspension criteria and the resumption requirements for the testing. Section 9 describes the environmental needs. Section 10 provides a detailed description for each test. Section 11 provides the requirements traceability matrix. Regarding the execution of the test plan, Section 12

describes the results, Section 13 discusses the anomalous events, Section 14 provides a summary, and Section 15 gives an evaluation.

2. REFERENCES

[1]   J. T. Caldwell et. al., *The Los Alamos Second-Generation System for Passive and Active Neutron Assays of Drum-Size Containers*, LA-10774-MS, Los Alamos National Laboratory, September 1986.

[2]   S. D. Matthews, L. V. East, E. S. Marwil, and J. J. Ferguson, *SWEPP Assay System Version 2.0 Software Requirements Specification*, INEL-96/0046, Lockheed Idaho Technologies Co., March 1996.

[3]   L. V. East and E. S. Marwil, *SWEPP Assay System Software Version 2.0 Design Description*, INEL-96/0057, Lockheed Idaho Technologies Co., May 1996.

[4]   S. D. Matthews, *SWEPP Nondestructive Assay Software Verification and Validation Plan*, INEL-96/0008, Lockheed Idaho Technologies Co., March 1996.

[5]   S. D. Matthews, E. S. Marwil, and B. G. Gilbert, *SWEPP Assay System Software Test Plan and Report*, EGG-RAAM-10425, EG&G Idaho, Inc., September 1993.

[6]   J. J. Ferguson, K. D. Boyd, and E. S. Marwil, *SWEPP Assay System Version 2.0 Software Configuration Management Plan*, INEL-96/0007, Lockheed Idaho Technologies Co., March 1996.

[7]   *Quality Assurance Management Manual*, PDD-1, Lockheed Idaho Technologies Co., November 1995.

[8]   ANSI/IEEE Std. 829-1983, *IEEE Standard for Software Test Documentation*, Institute of Electrical and Electronic Engineers, Inc.

[9]   ANSI/IEEE Std. 610.12-1990, *IEEE Standard Glossary of Software Engineering Terminology*, Institute of Electrical and Electronic Engineers, Inc.

[10]   ASME NQA-1-1994 Supplement 11S-2, "Supplementary Requirements for Computer Program Testing," American Society for Mechanical Engineers.

[11]   RWMC QPP-130, Revision 3.

[12]   ANSI/IEEE Std. 610.12-1990, *IEEE Standard Glossary of Software Engineering Terminology*, Institute of Electrical and Electronic Engineers, Inc.

[13]   T. E. Curry, *SWEPP Gamma-Ray Spectrometer System Software Requirements Specification*, EG&G Idaho, Inc. internal document ES-51544, September 1994.

[14]   L. V. East, *System Change Request for PAN Software Upgrade*, Lockheed Idaho Technologies Co. internal document 13623, February 1996.

[15]   *DOE Carlsbad Area Office (CAO) Quality Assessment Program Description (QAPD)*, Revision 1, Interim Issue, May 22, 1995, Section 6 - Quality Assurance Software Requirements.

3. TEST ITEMS

This test will address SAS Version 2.0. The SAS executable code must reside on the hard disk of the platform connected to the CAMAC crate. The software requirements specification document [2] must be available prior to testing. Specific environmental needs are described in Section 9.

4. FEATURES TO BE TESTED

This test plan will address the following:

- Ensure that no problems were introduced in moving from Version 1.0 to Version 2.0.
- Determine that the concerns outlined in the System Change Request (SCR) [14] covering the Version 2.0 revisions were properly addressed.

Version 2.0 of the SAS includes the following additional functionality which must be tested:

- Reporting of individual plutonium isotopic masses.
- Implementation of ^{235}U corrections to active assay results using SGRS and reporting ^{235}U mass based on SGRS results.
- Use SGRS results, if available, to determine ^{241}Am mass.
- Ability to reanalyze saved data using new calibration, matrix or SGRS data.
- Calculation of TRU activity, total activity, plutonium equivalent Curies and fissile gram equivalent (FGE).
- Assay results and other information needed during data reviews added to data files.
- Additional "data integrity" checks added to minimize the possibility of performing assays when the system hardware is not functioning properly.

5. TEST IDENTIFICATION

The following outline lists the major test categories. Subsections are provided for both valid and invalid test cases. The individual test cases are listed here for reference. Specific details for each test are provided in Section 10.

User Access
  VALID

Operator login	UA.1
Operator logout	UA.2
Physicist login	UA.3
Physicist logout	UA.4
Administrator login	UA.5
Administrator logout	UA.6
Close chamber window and log out	UA.7

  INVALID

Invalid user ID	UA.8
Valid user ID, invalid password	UA.9

Administrator Functions

VALID

Log file manipulation	AF.1
Add operator	AF.2
Add physicist	AF.3
Add administrator	AF.4
Change operator's user ID	AF.5
Change operator's user password	AF.6
Change operator's access level	AF.7
Change physicist's user ID	AF.8
Change physicist's user password	AF.9
Change physicist's access level	AF.10
Change current administrator's user ID	AF.11
Change administrator's user ID	AF.12
Change current administrator's password	AF.13
Change administrator's password	AF.14
Change administrator's level	AF.15
Delete operator	AF.16
Delete physicist	AF.17
Delete administrator	AF.18

INVALID

Adding duplicate operator ID	AF.19
Adding duplicate physicist ID	AF.20
Adding duplicate administrator ID	AF.21
Changing current administrator's access level	AF.22
Debating current administrator's user ID	AF.23

Container List
VALID

Adding container	CL.1
Changing container	CL.2
Deleting container	CL.3

INVALID

Adding duplicate container	CL.4
Adding container, volume = 0	CL.5
Adding container, volume < 0	CL.6
Adding container, volume > 10,000	CL.7
Adding container, then canceling	CL.8
Changing container, volume = 0	CL.9
Changing container, volume < 0	CL.10

Changing container, volume > 10,000	CL.11
Changing container, then canceling	CL.12

Matrix List
  VALID
Adding matrix, not sludge	ML.1
Adding matrix, sludge, not Americium sludge	ML.2
Adding matrix, Americium sludge	ML.3
Deleting matrix	ML.4
Setting matrix attributes	ML.5

  INVALID
Adding duplicate matrix	ML.6
Setting invalid matrix attributes	ML.7 - 9

Chamber Calibration
  VALID
Chamber calibration parameters	CC.1
Mass fractions	CC.2

  INVALID
Chamber calibration parameters	CC.3
Mass fractions, negative value	CC.4
Mass fractions, sum different from 1.0	CC.5

Waste Attributes
  VALID
File name (alpha)	WA.1
File name (numeric)	WA.2
File name (special characters)	WA.3
Valid matrix codes	·WA.4 - 7
Valid container net weight	WA.4 - 7
Run/New Assay	WA.8
Switch between windows	WA.9

  INVALID
File name (invalid special characters)	WA.10 - 14
Invalid net weight	WA.15 - 19

Toggle Switches
  VALID
Auto Summary Report on, Auto Data Save on	TS.1
Auto Summary Report off	TS.2
Auto Summary Report on, Background Correction on	TS.3
Auto Summary Report off	TS.4
Auto Summary Report on, Background Correction off	TS.5

INVALID
    none

Processing Options
    VALID

Background Count Time = 10 sec	CP.1
Background Count Time = 200 sec	CP.2
Background Count Time = 300 sec	CP.3
Active Pulse Verification = 100 counts	CP.4
Passive Count Time Verification = 10 sec	CP.4
Active Pulse Verification = 2,000 counts	CP.5
Passive Count Time Verification = 200 sec	CP.5
Active Pulse Production = 100 counts	CP.6
Passive Count Time Production = 10 sec	CP.6
Active Pulse Production = 5,000 counts	CP.7
Passive Count Time Production = 300 sec	CP.7

    INVALID

No options file present	CP.8
Invalid background count time	CP.9 - 11
Invalid active pulse verification	CP.12 - 14
Invalid active pulse production	CP.15 - 17
Invalid passive count time verification	CP.18 - 20
Invalid passive count time production	CP.21 - 23

CAMAC Interface
    VALID

CAMAC operational	CI.1

    INVALID

No CAMAC power	CI.2
No active CAMAC configuration	CI.3
No passive CAMAC configuration	CI.4
No controller	CI.5

Time and Date of Data Acquisition
    VALID

Time and date of passive assay	TDDA.1
Time and date of active assay	TDDA.2

    INVALID
        none

Passive Signals
    VALID

Passive data acquisition	PS.1

INVALID
    Invalid passive counts   PS.2 - 4

Active Signals
    VALID
        Active data acquisition   AS.1
    INVALID
        Invalid active counts   AS.2 - 3

Data Reduction
    VALID
        Measurement computation   DR.1 - 2
    INVALID
        none

Chi-square
    VALID
        Normal chi-square   CS.1
    INVALID
        Chi-square parameter file not available   CS.2

DMS Interface
    VALID
        Receive request from DMS to perform new assay   DMS.1
        Acknowledge DMS data   DMS.1
        Send results to DMS   DMS.1
        Receive acknowledgment from DMS   DMS.1
        Receive request from DMS to perform recalculation   DMS.2
        Receive request from DMS to perform recalculation   DMS.3
        Verification of current data during remote recalculation   DMS.37
    INVALID
        none

Version 2.0 Modifications
    VALID
        Corrupted data file   VM.1
        Background data with passive assay   VM.2
        Missing passive background data   VM.3
        Window placement and color information   VM.4
        Reanalyzing saved data   VM.5
        Background data integrity   VM.6
        Closing windows after aborting assay   VM.7
        "Keyboard accelerators"   VM.8
    INVALID
        none

6. FEATURES NOT TO BE TESTED

This test plan will not address the following items:

- DMS. DMS is a separate software system that transmits requests to, and receives responses from SAS and, thus, will not be tested. Only the interface will be tested.

- SGRS. SGRS is a separate software system that transmits requests to, and receives responses from SAS and, thus, will not be tested. Only the interface will be tested.

- CAMAC crate. The test will address the CAMAC crate only insofar as it interfaces with SAS. No additional testing will be performed.

- DOS 6.0, Windows 3.1, or the Microsoft Visual C++ 1.51 development environment. SAS testing will not directly address the operating system or compiler environment.

- Equation validity. Testing will not address whether the equations are valid for the application. The methodology used is as described in reference [1].

- Portability to other IBM compatible platforms. Because present plans call for the SAS to be installed on an IBM compatible 486 platform, all testing will be for the target environment. Because there is no present need for portability, testing will not address portability.

7. APPROACH

The SAS testing will address the functions formally provided by NEUT2, as well as improvements from SAS Version 1.0. The following paragraphs describe the testing approach for each of these functional areas.

7.1 Data Acquisition and Data Reduction

The SAS acquires passive and active assay data through the CAMAC crate system. For the passive assay, neutron detectors on all six sides of the assay chamber count the neutrons emitted from the waste container. A neutron generator injects neutrons into the container for the active assay, and the detectors count neutrons from induced fissions. The detectors are connected to a CAMAC crate. The SAS controls the CAMAC crate during the acquisition process and requests the counts needed to perform the assay at the completion of the data acquisition. The CAMAC crate interface with SAS shall be tested by (a) not having any power to the CAMAC crate and (b) not having controller access to SAS. The corresponding data reduction of the counts will be tested by a combination of valid and invalid count data.

7.2 Calculated Quantities

The SAS estimates the masses of both plutonium (Pu) and americium (247) contained in a waste drum, and computes the thermal power, thermal power error, thermal

power density, thermal power density error, total alpha activity, total alpha activity error, activity concentration error, total Pu mass and error, individual plutonium isotopic masses (238, 239, 240 and 241), the mass of ^{235}U when its presence is indicated by gamma ray measurement results, TRU activity, TRU activity concentration, total activity, plutonium equivalent curies, and fissile gram equivalent. These tests will also test the assay recalculation from existing signal data and the production of the measurement summary. The test cases will address combinations of valid/invalid content matrixes.

7.3 Remote and Local Modes of Operation

The test cases will address both remote and local modes of operation of SAS.

7.4 DMS Interface

The SAS receives assay requests from the DMS. To test the DMS interface, all the acknowledgments and transmissions between the SAS and DMS will be tested.

7.5 SGRS Interface

The SWEPP Gamma-Ray Spectroscopy System (SGRS) will be tested separately, and the results will be stored in files which will be utilized by the SAS system during testing.

7.6 Administrative Control/Modification of Parameters

All administrative functions in the SAS must be tested. Both the list of available container types and the list of available matrix types must be tested to ensure that they can be modified successfully.

8. SUSPENSION CRITERIA AND RESUMPTION REQUIREMENTS

If SAS failure occurs as a result of a test, all testing should be suspended until the defect is corrected or evaluated. If testing reveals an error in the SAS, but the SAS continues to respond, testing can continue until completion. Any anomalies should be recorded in the Test Execution Log, Appendix A.

If a CAMAC crate error is encountered, all testing should be suspended until the CAMAC crate error can be eliminated.

9. ENVIRONMENTAL NEEDS

The SAS must execute on an IBM compatible PC using at least an INTEL 386 CPU. A mouse, VGA color monitor, HP LaserJet III compatible printer, at least DOS 5.0, and Windows 3.1 are also required. At least 8 megabytes of memory, a floppy disk

(either a 5.25-inch or 3.5-inch) and a hard disk (120 megabytes capacity, minimum) are needed.

The SAS program accesses signal data from a CAMAC crate. The required crate, modules, and controller are specified in Table 1.

Table 1. CAMAC crate module configuration.

Station	Module type	Module name
01-02	2323	LeCroy 2323A Gate Generator
03-04	2323	LeCroy 2323A Gate Generator
05	2551	LeCroy 2551 Scaler
06	2551	LeCroy 2551 Scaler
07-08	2323	LeCroy 2323A Gate Generator
09-10	2323	LeCroy 2323A Gate Generator
11	2551	LeCroy 2551 Scaler
12	2551	LeCroy 2551 Scaler
13	450	DSP 450 Gated Quad Scaler
14-15	2323	LeCroy 2323A Gate Generator
16-17	2323	LeCroy 2323A Gate Generator
18	2551	LeCroy 2551 Scaler
19	2551	LeCroy 2551 Scaler
20	450	DSP 450 Gated Quad Scaler
21	217	Jorway 217 Gated Clock Generator
22	202	Jorway 202 Dataway Display
23	2551	LeCroy 2551 Scaler
24-25	8901	LeCroy 8901A GPIB Interface

10. TEST PROCEDURE

The test analyst should have a working knowledge of a windows environment, including push buttons, radio buttons, and scrolling lists. Familiarity with Microsoft Windows is desirable, as is facility in using a mouse. All procedure steps are described in terms of the mouse input device, although it is possible to operate the SAS program without using a mouse. All tests shall be documented in the Test Execution Log, Appendix A, identified by test category and test case number.

The SAS supports the drum assay chamber. For clarity in most screen images, the windows for the drum assay chamber are not shown.
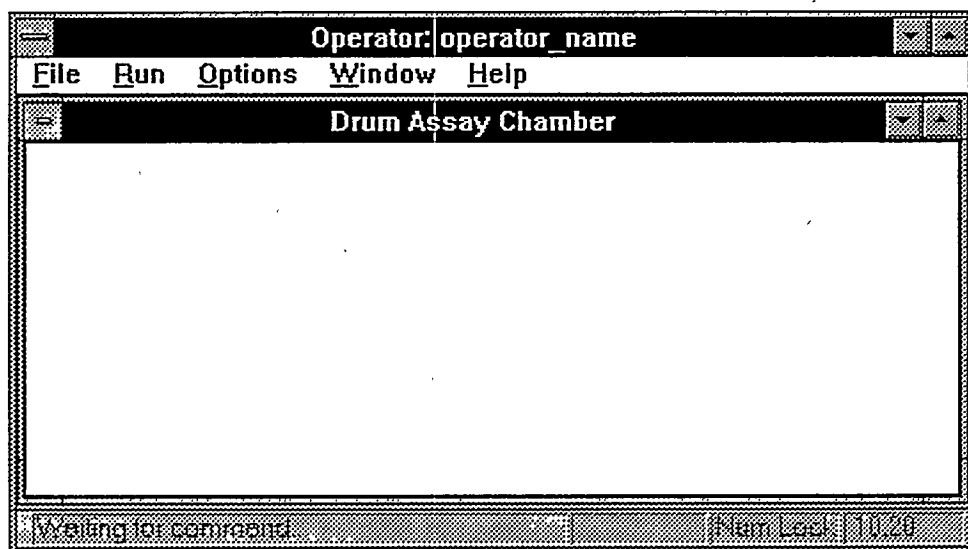
The SAS root directory is defined in the file AS.INI. This file is located in the working directory for the program. The working directory can be located using the Properties function in Windows.

10.1 User Access

10.1.1 Introduction and Description

These tests address operator, physicist, and administrator login and logout capability of SAS.

10.1.2 Special Requirements

Windows shall be operating. The SWEPP Assay System icon or main window must be visible.

10.1.3 Procedure Steps

1) Double click on the SWEPP Assay System icon with the left mouse button.

SWEPP Assay
System,
Version 2.0

2) The login dialog is displayed.

SWEPP Assay System, Version 2.0

E_xit   L_og In...   _Help

Login

User ID:

Password:

OK   Cancel
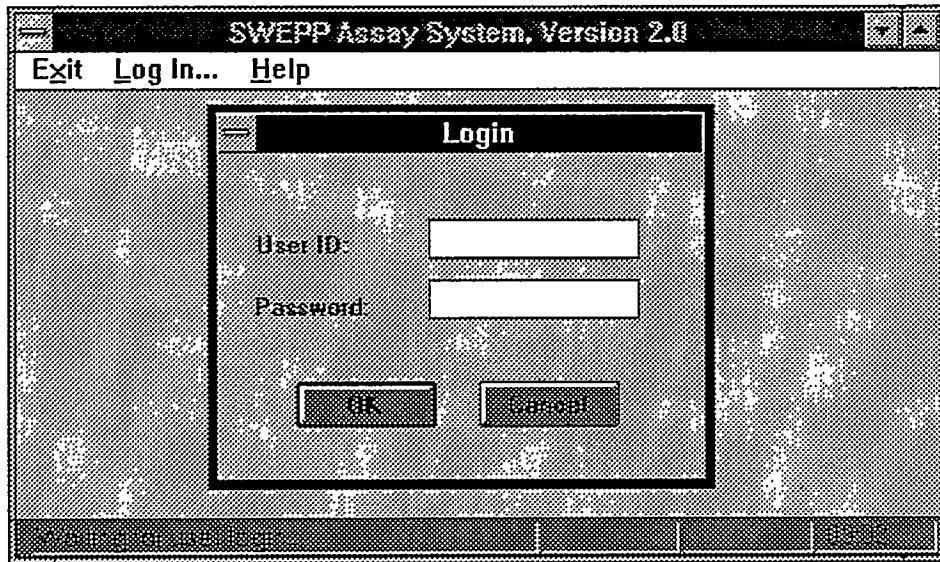
3) After logging in, inspect the menu items to confirm that all menu choices shown in the following figures are displayed. For each item in the menu bar, pull down the menu by clicking the mouse button. These menus will be used throughout the remainder of the tests.

10.1.4 Valid Test Cases

UA.1

Purpose

This test addresses operator login requirements, 3.1.2.2 M.1 and 3.1.2.2 M.2.

Input Description

1) In the login dialog, enter valid operator ID and password.
2) Click on OK.
3) Confirm the archive disk reminder window by clicking the OK button.
4) Pull down the File, Run, Options, Window, and Help menus.

Expected Results

The archive disk reminder window is displayed. (The actual archive drive is specified in the file AS.INI.)
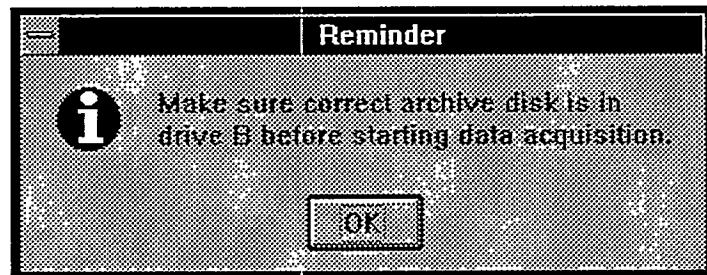
The Operator window and menu items are displayed.
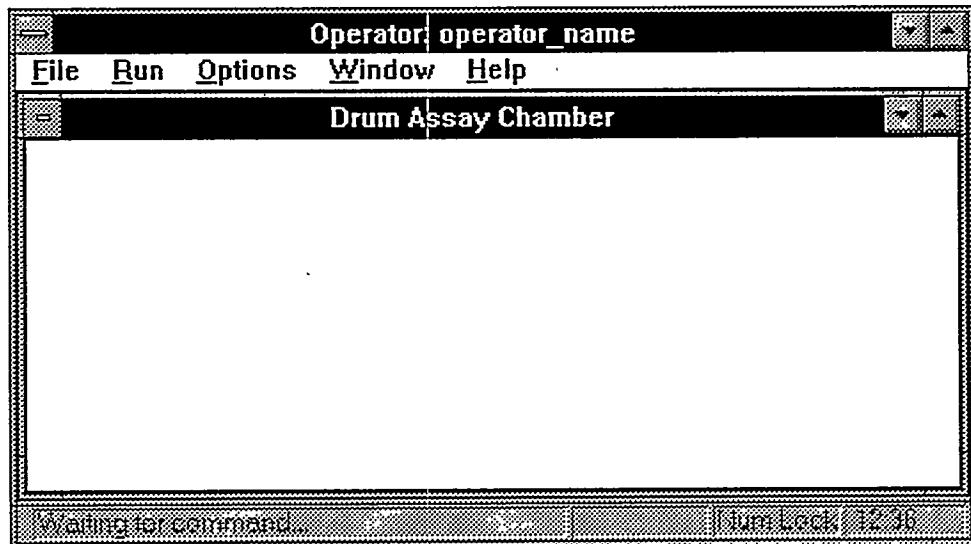
The Operator's File menu is displayed as shown.
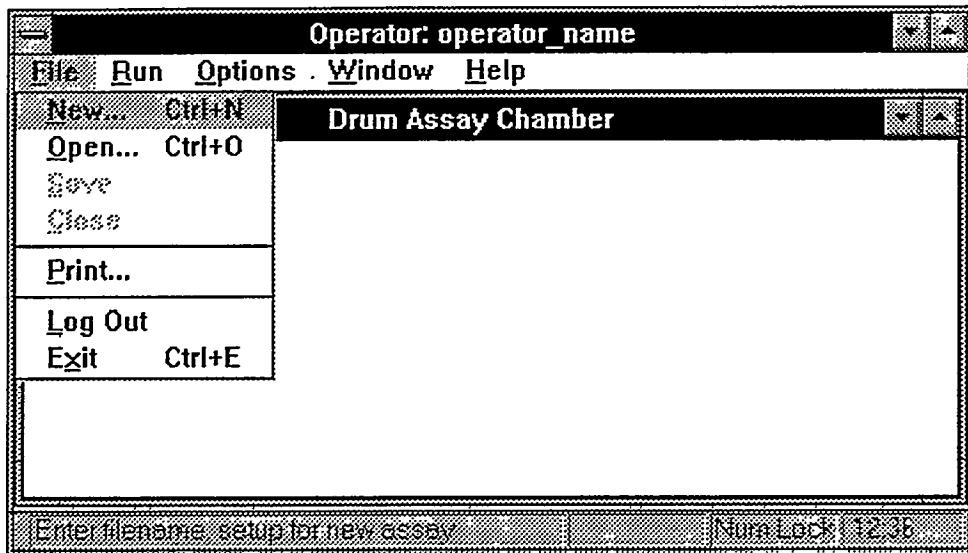
The Operator's Run menu is displayed as shown.
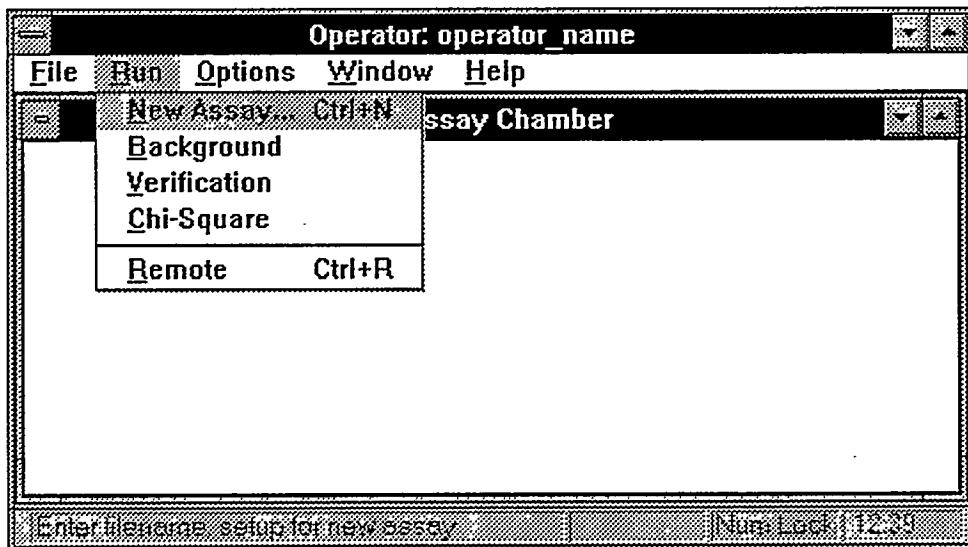
The Operator's Options menu is displayed as shown.
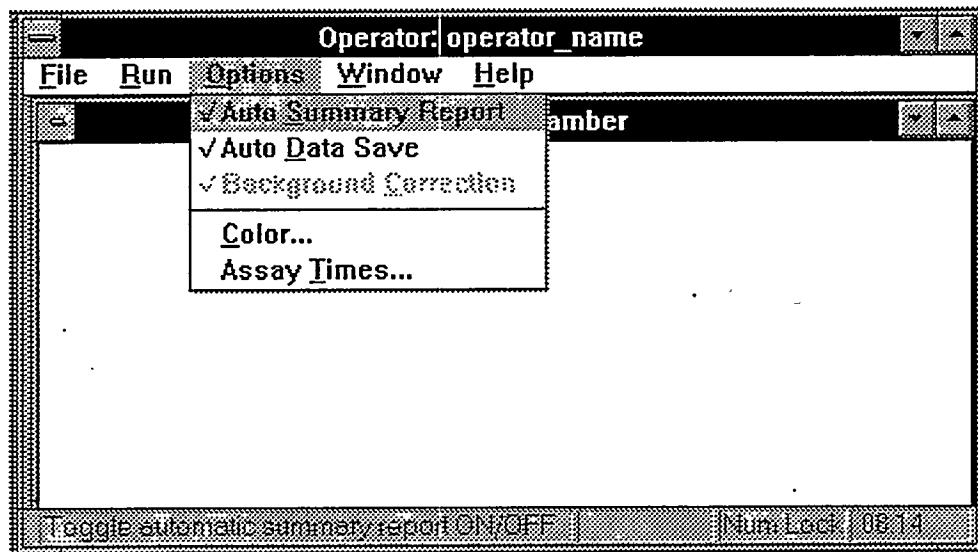
The Operator's Window menu is displayed as shown.
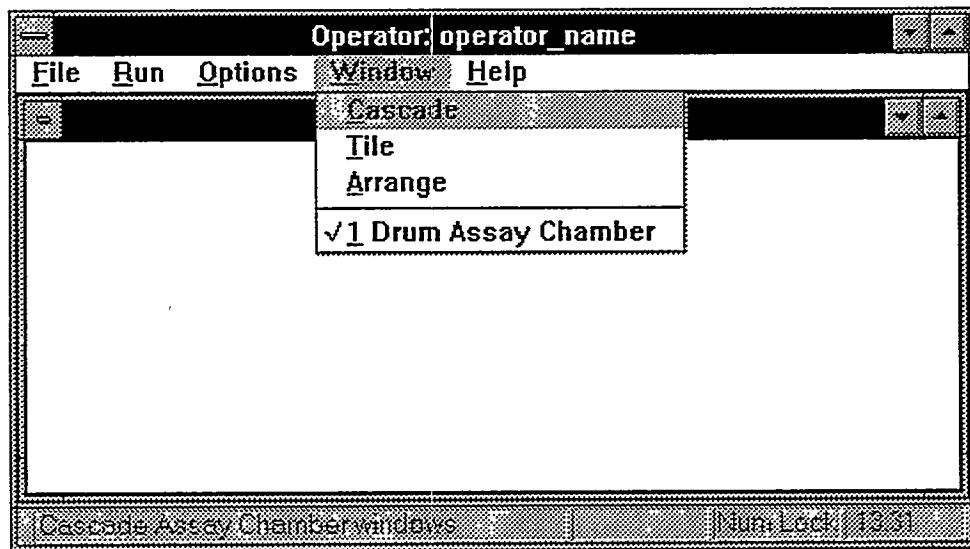
The Operator's Help menu is displayed as shown.

Operator: operator_name				
File	Run	Options	Window	Help

Drum Ass   About...   F1

Show information about program   Num Lock   13:32
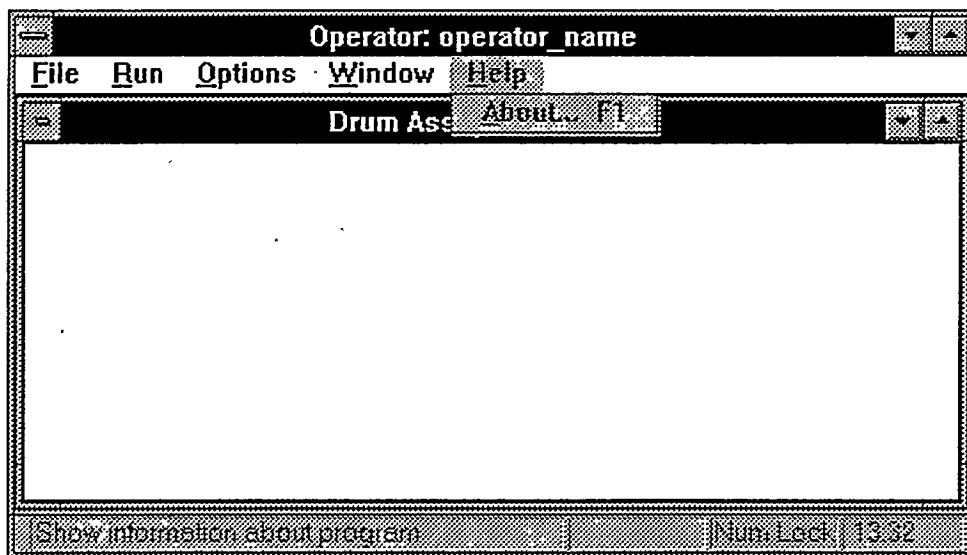
Pass/Fail Criteria
Test passes if the operator menus are displayed as indicated.

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UA.2

Purpose

This test addresses the operator logout requirement, 3.1.2.2 M.3.

Input Description

1) If not logged in, log in to the SAS as an operator.
2) Pull down the File menu.
3) Select Log Out.

Expected Results

The initial SAS window is displayed. This window provides functions to log in as another user and to exit the SAS program.
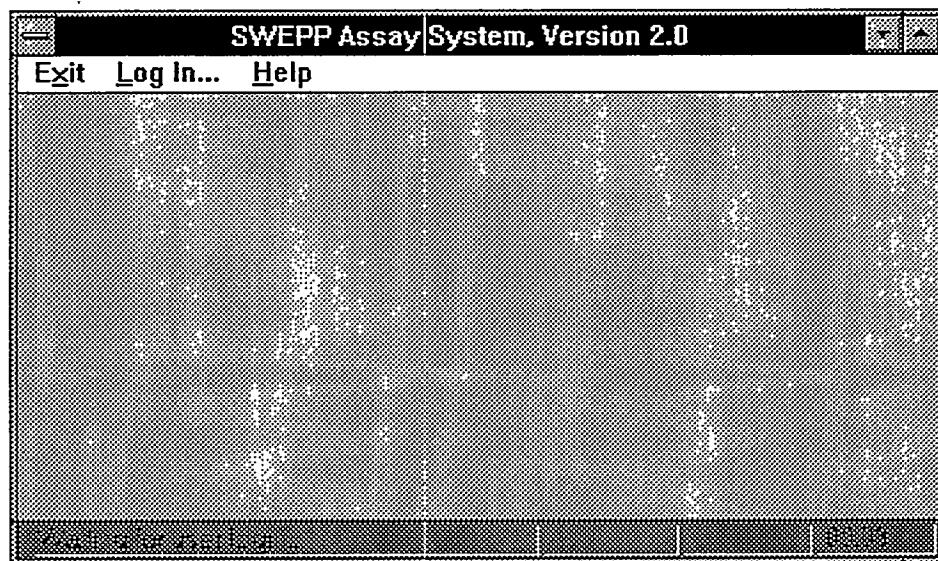
Pass/Fail Criteria

Test passes if the initial SAS window is displayed.

UA.3

Purpose

This test addresses physicist login requirements, 3.1.2.2 M.1 and 3.1.2.2 M.2.

Input Description

1) In the login dialog, enter valid physicist ID and password.
2) Click on OK.
3) Confirm the archive disk reminder window by clicking the OK button.
4) Pull down the File, Run, Options, Window, and Help menus.

Expected Results

The archive disk reminder window is displayed.
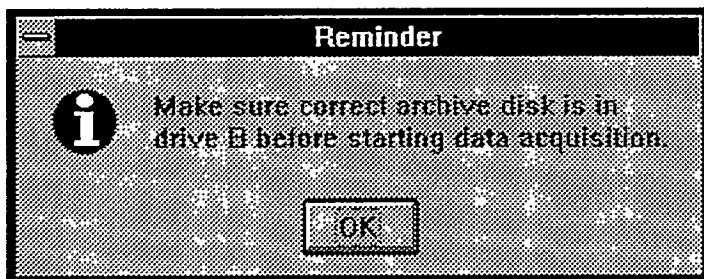
The Physicist window and menu items are displayed.
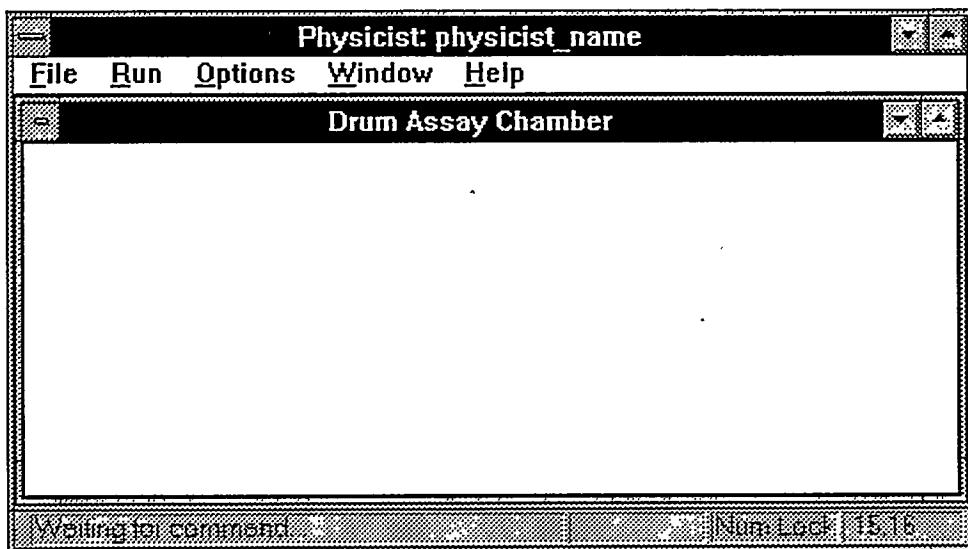
The Physicist's File menu is displayed as shown.

```
┌─────────────────────────────────────────────────────────────┐
│ ─        Physicist: physicist_name                      ▼ ▲  │
├─────────────────────────────────────────────────────────────┤
│ File   Run   Options · Window   Help                          │
├────────────────────────┬──────────────────────────────────┐  │
│ New...      Ctrl+N      │  Drum Assay Chamber          ▼ ▲ │  │
│ Open...     Ctrl+O      │                                  │  │
│ Save                    │                                  │  │
│ Close                   │                                  │  │
│ ────────────────────    │                                  │  │
│ Print...                │                                  │  │
│ ────────────────────    │                                  │  │
│ Log Out                 │                                  │  │
│ Exit        Ctrl+E      │                                  │  │
│                                                               │
├─────────────────────────────────────────────────────────────┤
│ Enter filename setup for new assay           Num Lock  15:16 │
└─────────────────────────────────────────────────────────────┘
```
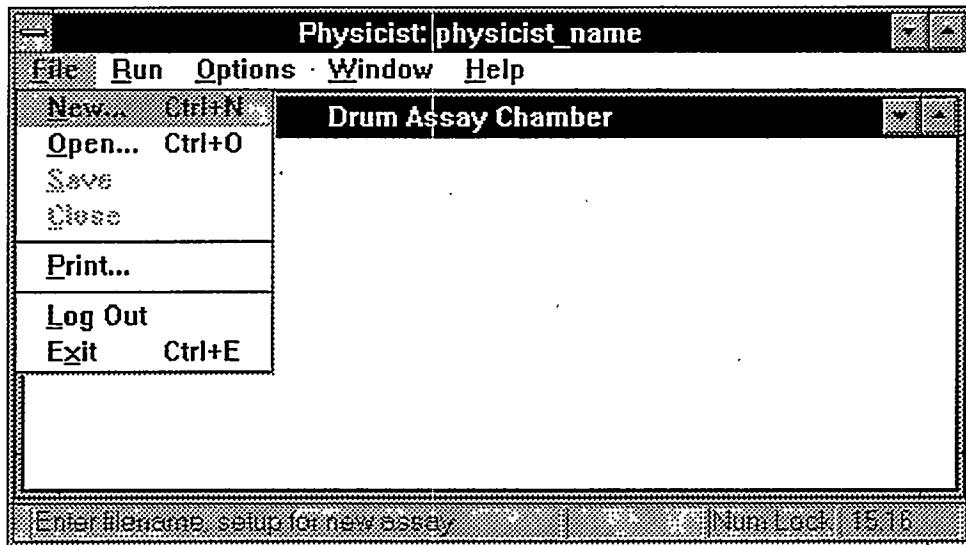
The Physicist's Run menu is displayed as shown.

```
┌─────────────────────────────────────────────────────────────┐
│ ─        Physicist: physicist_name                      ▼ ▲  │
├─────────────────────────────────────────────────────────────┤
│ File   Run   Options   Window   Help                          │
├───┬────────────────────────────┬────────────────────────┐    │
│ ─ │ New Assay... Ctrl+N        │ ssay Chamber      ▼ ▲  │    │
│   │ Background                 │                        │    │
│   │ Verification               │                        │    │
│   │ Chi-Square                 │                        │    │
│   │ ─────────────────────      │                        │    │
│   │ Remote       Ctrl+R        │                        │    │
│   └────────────────────────────┘                        │    │
│                                                               │
├─────────────────────────────────────────────────────────────┤
│ Enter filename setup for new assay           Num Lock  15:17 │
└─────────────────────────────────────────────────────────────┘
```

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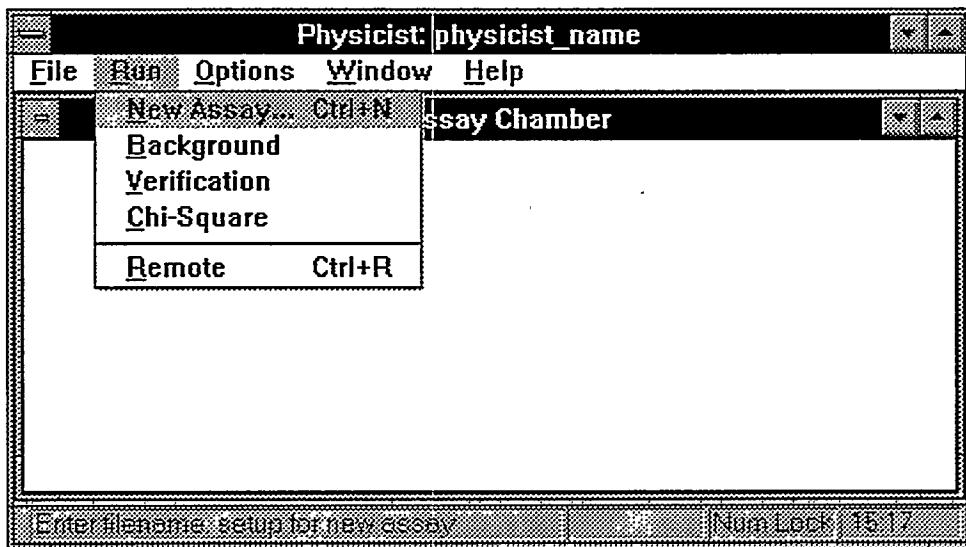
The Physicist's Options menu is displayed as shown.

```
Physicist: physicist_name
File   Run   Options   Window   Help

                        amber
   √ Auto Summary Report
   √ Auto Data Save
   √ Background Correction

     Color...
     Assay Times...

     Calibration...
     Matrix List...
     Container List...



Toggle automatic summary report ON/OFF        Num Lock  08:14
```
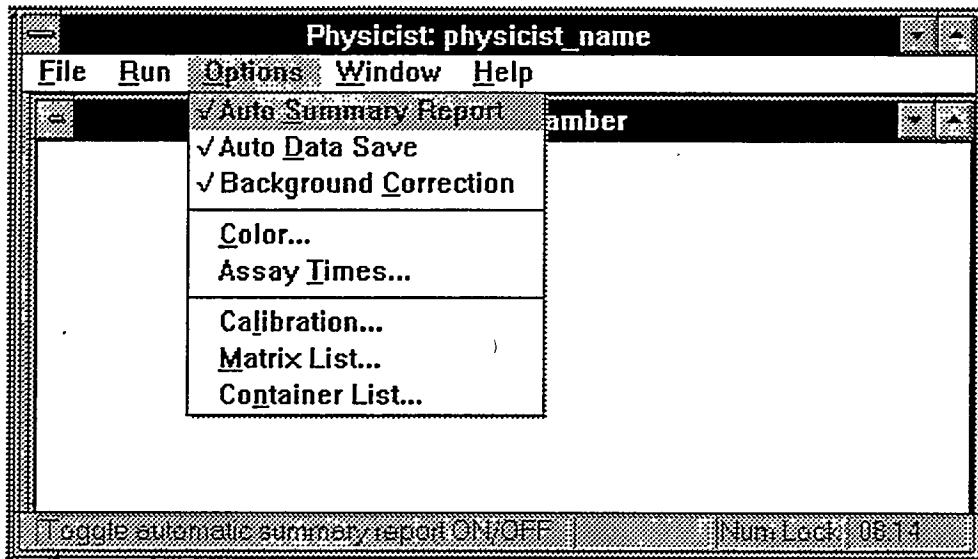
The Physicist's Window menu is displayed as shown.

```
Physicist: physicist_name
File   Run   Options   Window   Help

     Cascade
     Tile
     Arrange

   √ 1 Drum Assay Chamber




Cascade Assay Chamber windows        Num Lock  15:16
```

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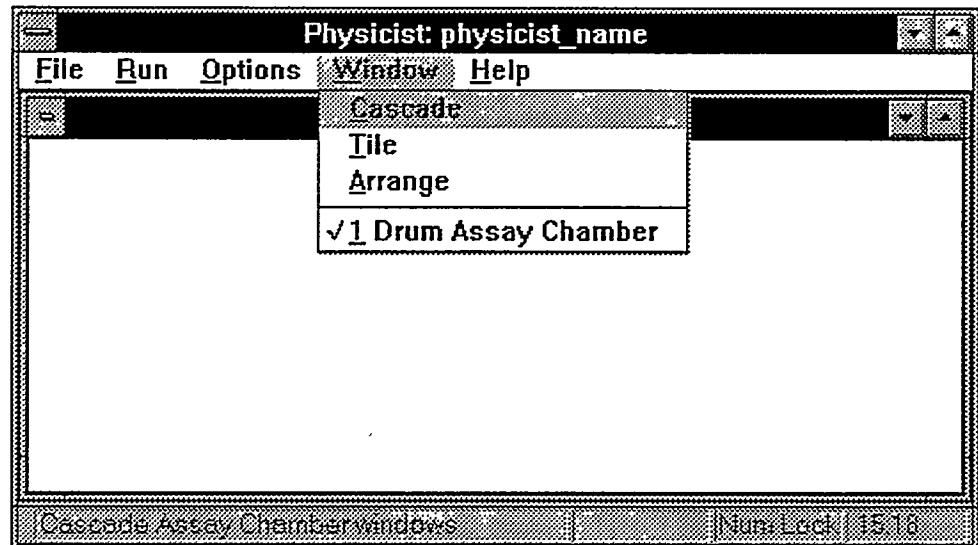
The Physicist's Help menu is displayed as shown.
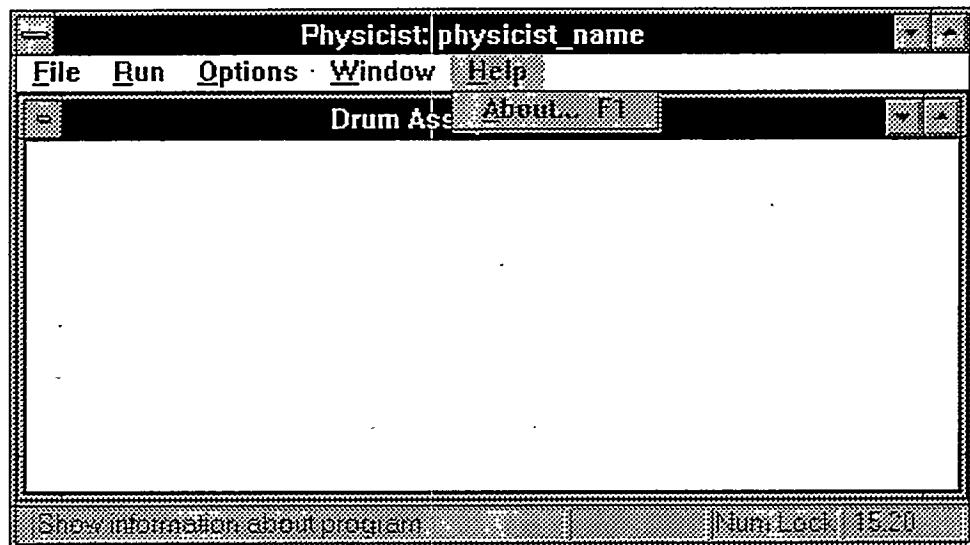
Pass/Fail Criteria
The test passes if the physicist menu is displayed.

UA.4

Purpose

This test addresses the physicist logout requirement, 3.1.2.2 M.3.

Input Description

1) If not logged in, log in to the SAS as a physicist.
2) Pull down the File menu.
3) Select Log Out.

Expected Results

The initial SAS window is displayed. This window provides functions to log in as another user and to exit the SAS program.
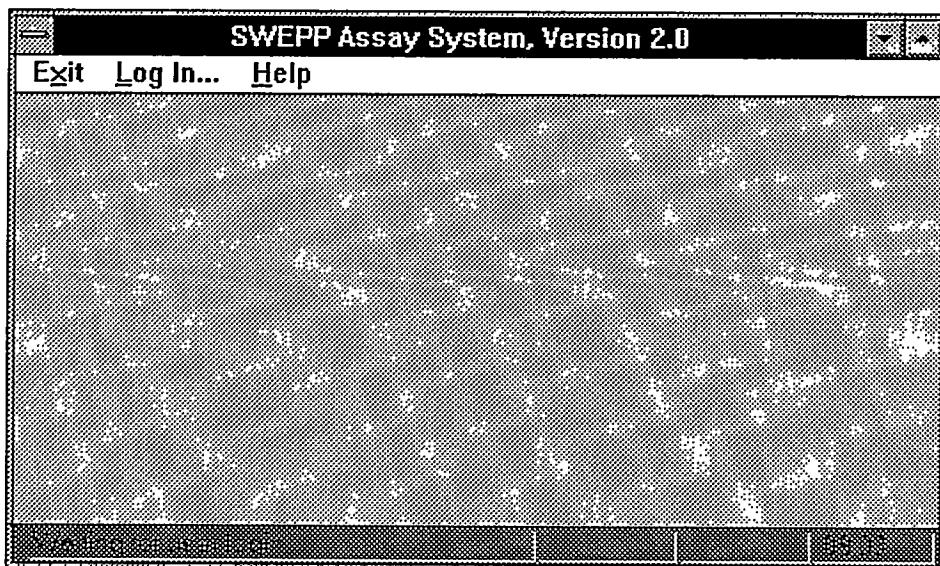
Pass/Fail Criteria

Test passes if the initial SAS window is displayed.

UA.5

Purpose

This test addresses administrator login requirements, 3.1.2.2 M.1 and 3.1.2.2 M.2.

Input Description

1) In the login dialog, enter valid administrator ID and password.
2) Click on OK.
3) Pull down the File and Help menus.

Expected Results

The Administrator window and menu items are displayed.
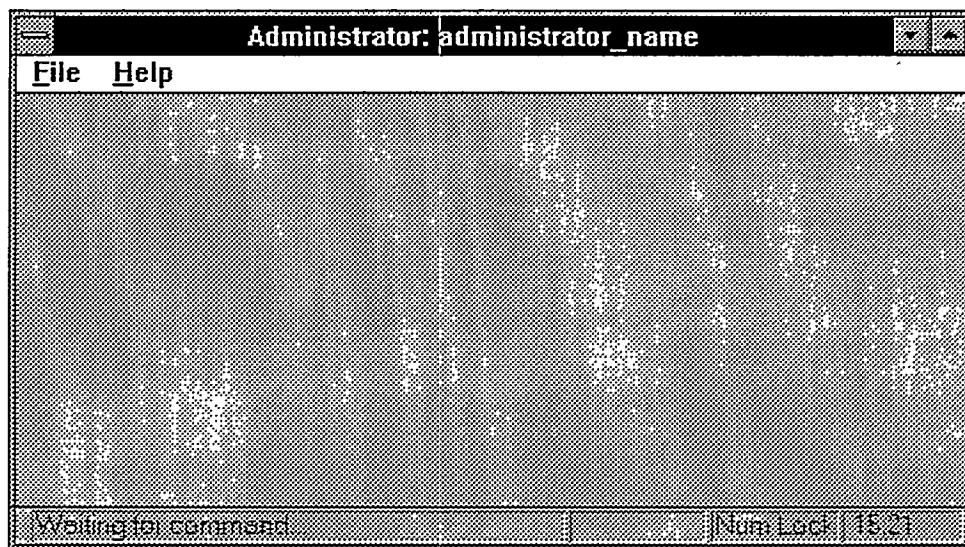
The Administrator's File menu is displayed as shown.
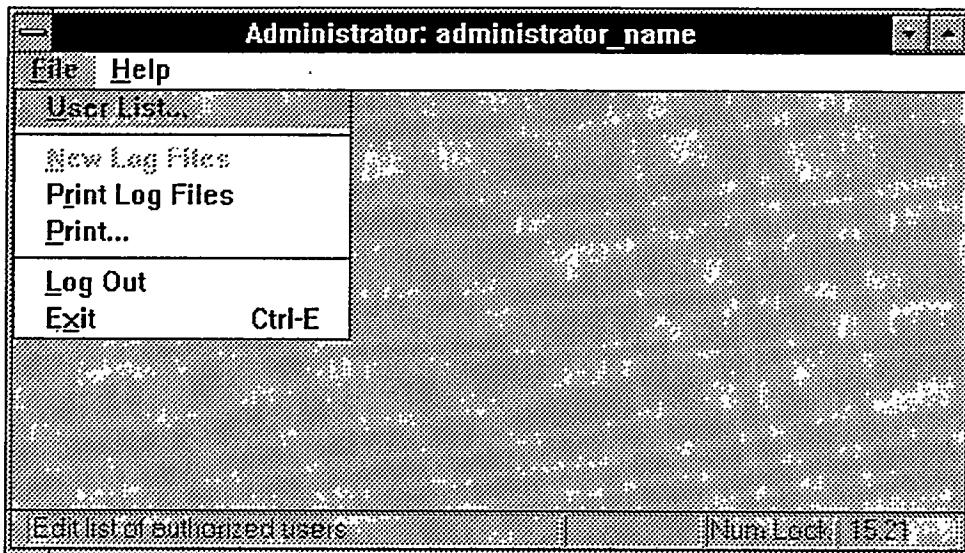
The Administrator's Help menu is displayed as shown.
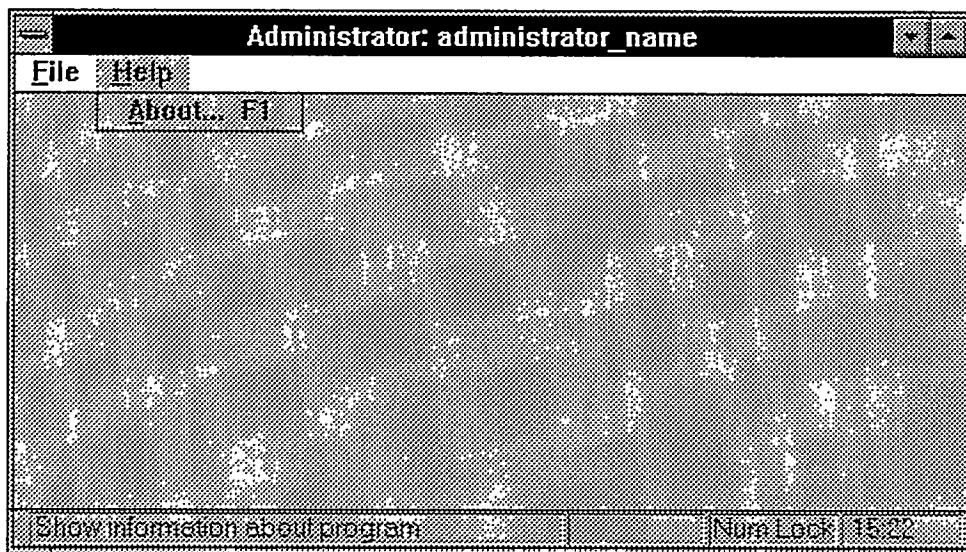
Pass/Fail Criteria

The test passes if the administrator menu is displayed as indicated.

UA.6

Purpose

This test addresses the administrator logout requirement, 3.1.2.2 M.3.

Input Description

1) If not logged in, log in to the SAS as an administrator.
2) Pull down the File menu.
3) Select Log Out.

Expected Results

The initial SAS window is displayed. This window provides functions to log in as another user and to exit the SAS program.

```
┌─────────────────────────────────────────────────────────────┐
│ ☰        SWEPP Assay│System, Version 2.0          ▼ ▲        │
├─────────────────────────────────────────────────────────────┤
│ E_xit   _Log In...   _Help                                   │
├─────────────────────────────────────────────────────────────┤
│                                                               │
│                                                               │
│                                                               │
│                                                               │
│                                                               │
│                                                               │
│                                                               │
│                                                               │
└─────────────────────────────────────────────────────────────┘
```
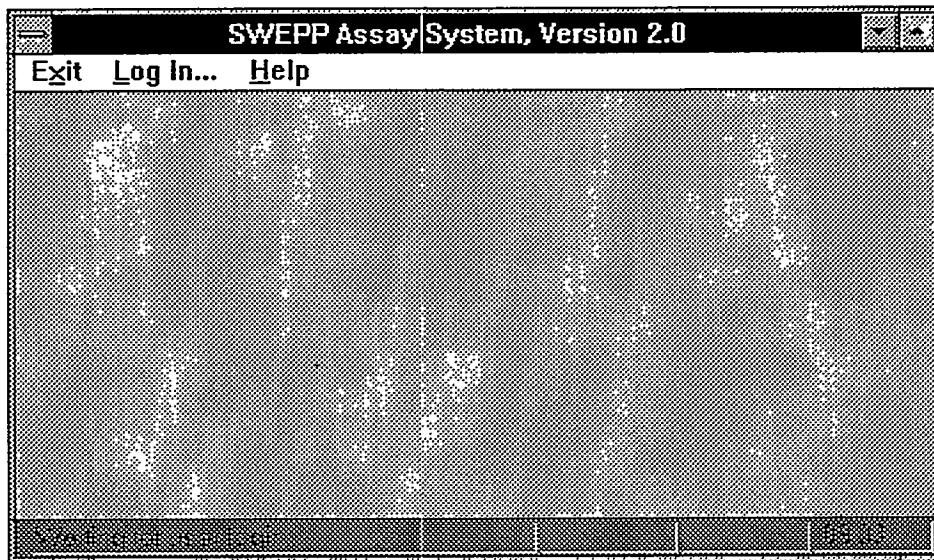
Pass/Fail Criteria

Test passes if the initial SAS window is displayed.

UA.7

Purpose

This test addresses the logout requirement, SCR User Interface Problems, Item 6 [14], to ensure that the "Chamber Window" can not be closed without first performing a user logout operation.

Input Description

1) Log in to the SAS as an operator.
2) Close the "Chamber Window."
3) Click on Yes.
4) Log in to the SAS as a physicist.
5) Close the "Chamber Window."
6) Click on Yes.

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Expected Results

"Do you really want to..." dialog is displayed each time the user attempts to close the chamber window.
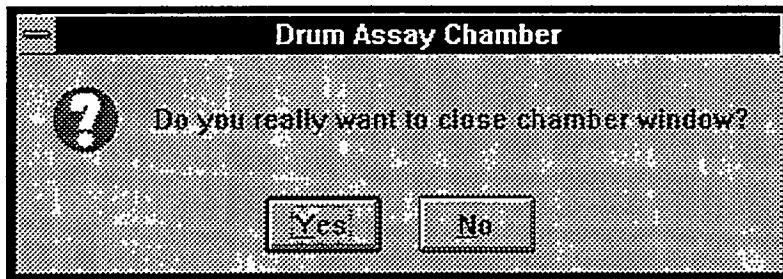
The initial SAS window is displayed. This window provides functions to log in as another user and to exit the SAS program.
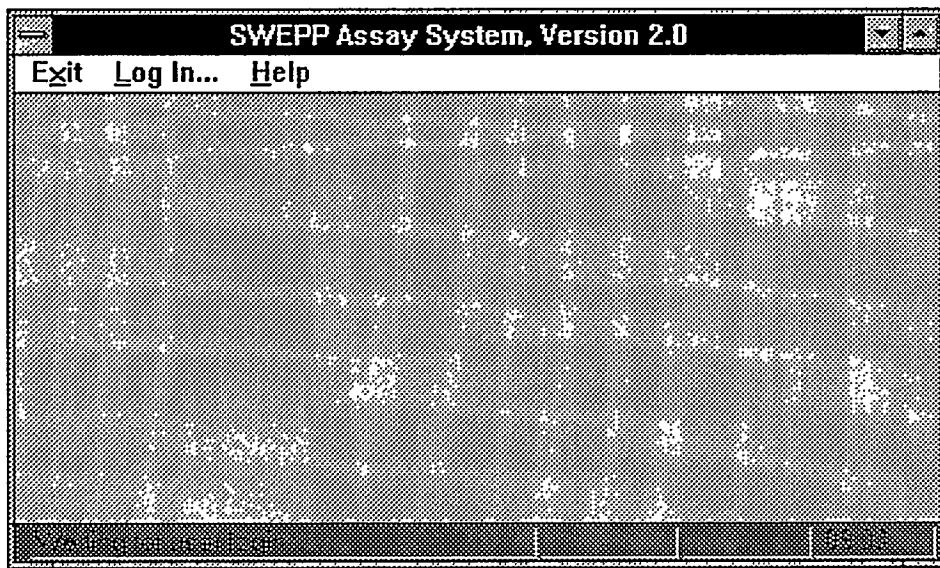
*Pass/Fail Criteria*

Test passes if the confirmation dialog and the initial SAS window are displayed.

10.1.5 Invalid Test Cases

UA.8

Purpose

This test addresses the requirement to permit only users with a valid user ID to access SAS, requirement 3.1.2.2 M.1. This test enters an invalid user ID.

Input Description

    1) In the login dialog, enter an invalid operator ID and valid operator password.

    2) Click on OK.

Expected Results

"Invalid ID or Password" dialog is displayed.
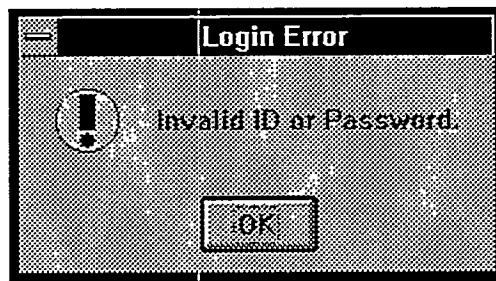
Pass/Fail Criteria

The test passes if the error dialog is displayed.

UA.9

Purpose

This test addresses the requirement to permit only authorized users to access the system, requirement 3.1.2.2 M.1. This test enters a valid user ID, but invalid user password.

Input Description

    1) In the login dialog, enter an valid operator ID and invalid operator password.

    2) Click on OK.

Expected Results

"Invalid ID or Password" dialog is displayed.
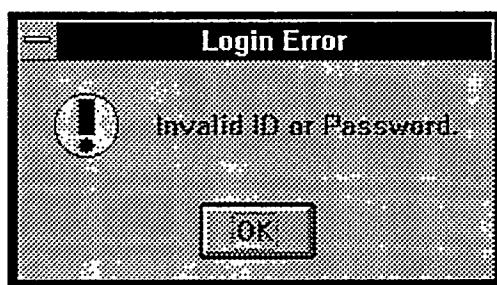
Pass/Fail Criteria

The test passes if the error dialog is displayed.

10.2 Administrator Functions

10.2.1 Introduction and Description

These tests address modifying the list of users who have access to the system, as well as manipulating the log file.

10.2.2 Special Requirements

The user list dialog will be visible for the test cases dealing with the user list. The dialog inputs are described for each test. Optionally, following each test, the file USER.LST in the assay system root directory may be printed to verify that the user list is stored with appropriate data.

10.2.3 Procedure Steps

      1) Log in as an administrator.
      2) Pull down the File menu.
For user list test cases:
      3) Select User List.
      4) The user list dialog is displayed.
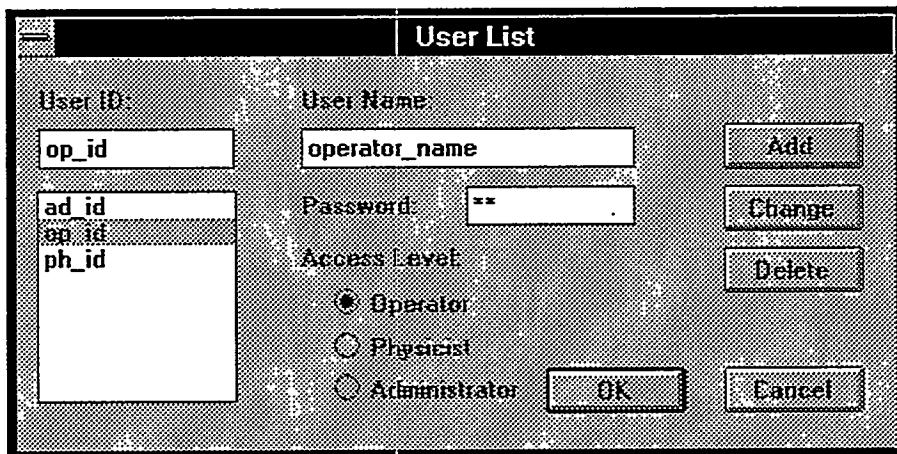
10.2.4 Valid Test Cases

AF.1

Purpose

This test addresses manipulation of the log file, requirement 3.1.2.2 M.2.

Input Description

1) Pull down the File menu.
2) Select Print Log Files.
3) After the file prints, pull down the File menu.
4) Select New Log Files.

Expected Results

The log file should print.

Pass/Fail Criteria

Test passes if the log file prints successfully.

AF.2

Purpose

This test addresses adding an operator, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,

   - Enter valid user ID {[A-Z | a-z | 0-9]}6
   - Enter user name {[A-Z | a-z | 0-9]}32
   - Enter password {[A-Z | a-z | 0-9]}6
   - Select Operator access level.

2) Click on Add.
3) Click on OK.

Expected Results

When the user list dialog is displayed again, the entered user ID appears in the list of users. When that user ID is selected, the user name is displayed, operator access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the operator is added to the list, and the attributes previously entered are displayed when the ID is selected.

AF.3

Purpose

This test addresses adding a physicist, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,

   - Enter valid user ID {[A-Z | a-z | 0-9]}6
   - Enter user name {[A-Z | a-z | 0-9]}32
   - Enter password {[A-Z | a-z | 0-9]}6
   - Select Physicist access level.

2) Click on Add.
3) Click on OK.

Expected Results

When the user list dialog is displayed again, the entered user ID appears in the list of users. When that user ID is selected, the user name is displayed, physicist access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the physicist is added to the list, and the attributes previously entered are displayed when the ID is selected.

AF.4

Purpose

This test addresses adding an administrator, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,
   - Enter valid user ID {[A-Z | a-z | 0-9]}6
   - Enter user name {[A-Z | a-z | 0-9]}32
   - Enter password {[A-Z | a-z | 0-9]}6
   - Select Administrator access level.
2) Click on Add.
3) Click on OK.

Expected Results

When the user list dialog is displayed again, the entered user ID appears in the list of users. When that user ID is selected, the user name is displayed, administrator access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the administrator is added to the list, and the attributes previously entered are displayed when the ID is selected.

AF.5

Purpose

This test addresses changing an operator's user ID, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,
   - Select an existing user ID from the pull down menu.
2) Change the user ID.
3) Click on Change.
4) Click on OK.

Expected Results

When the user list dialog is displayed again, the entered user ID appears in the list of users. When that user ID is selected, the user name is displayed, operator access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the operator's user ID is changed.

AF.6

Purpose

This test addresses changing an operator's user password, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,
   - Select an existing user ID from the pull down menu.
2) Change the password.
3) Click on Change.
4) Click on OK.

Expected Results

When the user list dialog is displayed again, and that user ID is selected, the user name is displayed, operator access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the operator's user password is changed; the operator must login with the new password.

AF.7

Purpose

This test addresses changing an operator's access level, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,

- Select an existing operator user ID from the pull down menu.
- Select Physicist access level radio button.

2) Click on Change.

3) Click on OK.

4) In the user list dialog,

- Select an existing operator user ID from the pull down menu.
- Select Administrator access level radio button.

5) Click on Change.

6) Click on OK.

7) Return the access level to its original status when the test is complete.

Expected Results

When the user list dialog is displayed again, and that user ID is selected, the user name is displayed, the appropriate access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the access level is changed.

AF.8

Purpose

This test addresses changing a physicist's user ID, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,

- Select an existing physicist's user ID from the pull down menu.

2) Change the user ID.

3) Click on Change.

4) Click on OK.

Expected Results

When the user list dialog is displayed again, the entered user ID appears in the list of users. When that user ID is selected, the user name is displayed, physicist access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the physicist's user ID is changed.

AF.9

Purpose

This test addresses changing a physicist's user password, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,

   • Select an existing physicist's user ID from the pull down menu.
2) Change the password.
3) Click on Change.
4) Click on OK.

Expected Results

When the user list dialog is displayed again, and that user ID is selected, the user name is displayed, physicist access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the physicist's user password is changed; the physicist must login with the new password.

AF.10

Purpose

This test addresses changing a physicist's access level, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,

   • Select an existing physicist user ID from the pull down menu.
   • Select Operator access level radio button.
2) Click on Change.
3) Click on OK.
4) In the user list dialog,

   • Select an existing physicist user ID from the pull down menu.
   • Select Administrator access level radio button.
5) Click on Change.
6) Click on OK.
7) Return the access level to its original status when the test is complete.

Expected Results

When the user list dialog is displayed again, and that user ID is selected, the user name is displayed, the appropriate access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the access level is changed.

AF.11

Purpose

This test addresses changing the current administrator's user ID, requirement 3.1.2.2 M.4.

Input Description
1) In the user list dialog,
   - Select the current administrator's user ID from the pull down menu.
2) Change the user ID.
3) Click on Change.
4) Click on OK.

Expected Results

When the user list dialog is displayed again, the entered user ID appears in the list of users. When that user ID is selected, the user name is displayed, administrator access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the administrator's user ID is changed.

AF.12

Purpose

This test addresses changing an administrator's user ID, requirement 3.1.2.2 M.4.

Input Description
1) In the user list dialog,
   - Select an existing administrator's user ID from the pull down menu (other than the current administrator's).
2) Change the user ID.
3) Click on Change.
4) Click on OK.

Expected Results

When the user list dialog is displayed again, the entered user ID appears in the list of users. When that user ID is selected, the user name is displayed, administrator access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the administrator's user ID is changed; the administrator must login with the new password.

AF.13

Purpose

This test addresses changing the current administrator's user password, requirement 3.1.2.2 M.4.

Input Description
1) In the user list dialog,
   - Select an existing administrator's user ID from the pull down menu.
2) Change the password.
3) Click on Change.
4) Click on OK.

5) Return the access level to its original status when the test is complete.

Expected Results

When the user list dialog is displayed again, and that user ID is selected, the user name is displayed, administrator access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the administrator's user password is changed.

AF.14

Purpose

This test addresses changing an administrator's user password, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,

- Select an existing administrator's user ID from the pull down menu (other than the current administrator's).

2) Change the password.
3) Click on Change.
4) Click on OK.
5) Return the access level to its original status when the test is complete.

Expected Results

When the user list dialog is displayed again, and that user ID is selected, the user name is displayed, administrator access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the administrator's user password is changed.

AF.15

Purpose

This test addresses changing an administrator's access level, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,

- Select an existing administrator user ID from the pull down menu.
- Select Operator access level radio button.

2) Click on Change.
3) In the user list dialog,

- Select an existing administrator user ID from the pull down menu.
- Select Physicist access level radio button.

4) Click on Change.
5) Click on OK.
6) Return the access level to its original status when the test is complete.

Expected Results

When the user list dialog is displayed again, and that user ID is selected, the user name is displayed, the appropriate access level is indicated, and the password is hidden.

Pass/Fail Criteria

Test passes if the administrator's access level is changed.

AF.16

Purpose
This test addresses deleting an operator user ID, requirement 3.1.2.2 M.4.

Input Description
1) In the user list dialog, select a user ID with operator access.
2) Click on Delete.
3) Click on OK.

Expected Results
When the user list dialog is displayed again, the deleted user ID does not appear in the list.

Pass/Fail Criteria
Test passes·if deleted user ID does not appear in the list.

AF.17

Purpose
This test addresses deleting a physicist user ID, requirement 3.1.2.2 M.4.

Input Description
1) In the user list dialog, select a user ID with physicist access.
2) Click on Delete.
3) Click on OK.

Expected Results
When the user list dialog is displayed again, the deleted user ID does not appear in the list.

Pass/Fail Criteria
Test passes if deleted user ID does not appear in the list.

AF.18

Purpose
This test addresses deleting a administrator user ID, requirement 3.1.2.2 M.4.

Input Description
1) In the user list dialog, select a user ID with administrator access. The administrator selected must be different from that of the administrator who is performing this test.
2) Click on Delete.
3) Click on OK.

Expected Results
When the user list dialog is displayed again, the deleted user ID does not appear in the list.

Pass/Fail Criteria
Test passes if deleted user ID does not appear in the list.

10.2.5 Invalid Test Cases

AF.19

Purpose

This test addresses adding a duplicate operator ID, requirement 3.1.2.2 M.4.

Input Description

    1) In the user list dialog, select an operator user ID already in the list.

    2) Click on Add.

Expected Results

"Duplicate ID not allowed!" dialog is displayed.
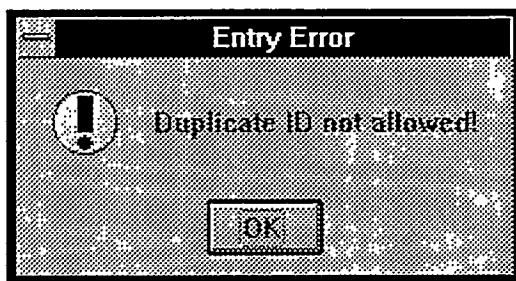
Pass/Fail Criteria

Test passes if dialog is displayed.

AF.20

Purpose

This test addresses adding a duplicate physicist ID, requirement 3.1.2.2 M.4.

Input Description

    1) In the user list dialog, select a physicist user ID already in the list.

    2) Click on Add.

Expected Results

"Duplicate ID not allowed!" dialog is displayed.
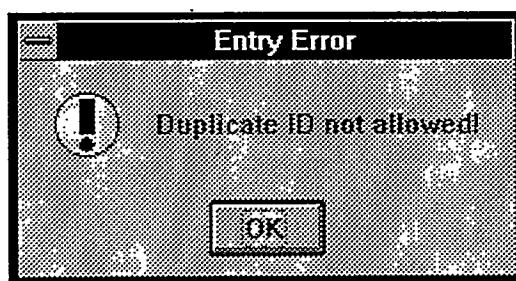
Pass/Fail Criteria

Test passes if dialog is displayed.

AF.21

Purpose

This test addresses adding a duplicate administrator ID, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog, select an administrator user ID already in the list.
2) Click on Add.

Expected Results

"Duplicate ID not allowed!" dialog is displayed.
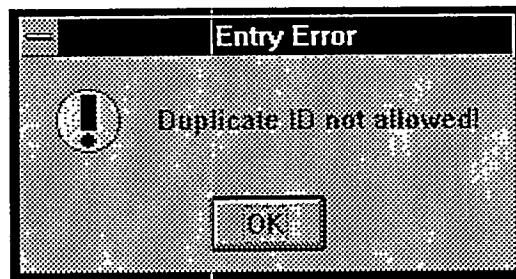
Pass/Fail Criteria

Test passes if dialog is displayed.

AF.22

Purpose

This test addresses changing the current administrator's access level, requirement 3.1.2.2 M.4.

Input Description

1) In the user list dialog,
   - Select the current administrator's user ID from the pull down menu.
   - Select Operator access level radio button.
2) Click on Change.
3) In the user list dialog,
   - Select the current administrator's user ID from the pull down menu.
   - Select Physicist access level radio button.
4) Click on Change.
5) Return the access level to its original status when the test is complete.

Expected Results

"You cannot change your own level" dialog is displayed.
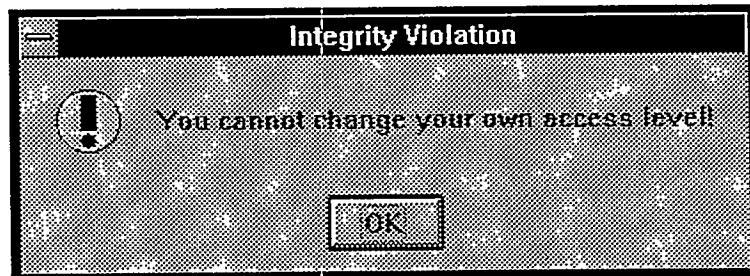
Pass/Fail Criteria
Test passes if dialog is displayed.

<center>*AF.23*</center>

Purpose
This test addresses deleting the current administrator's user ID, requirement 3.1.2.2 M.4.

Input Description
       1) In the user list dialog, select the user ID of the administrator performing this test.
       2) Click on Delete.

Expected Results
"You cannot delete yourself!" dialog is displayed.

Pass/Fail Criteria
Test passes if dialog is displayed.

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10.3 Container List

10.3.1 Introduction and Description

These tests address modifying the list of containers that the assay system can process by adding containers to and deleting containers from the container list.

10.3.2 Special Requirements

The container list dialog will be visible. The dialog inputs are described for each test. Optionally, following each test, the file CONTAIN.LST in the assay system root directory may be printed to verify that the container list is stored with appropriate data. The file CONTAIN.LST must be write-enabled in order to perform the following tests.

10.3.3 Procedure Steps

1) Log in as a physicist.
2) Pull down the Options menu.
3) Select Container List.
4) If the file CONTAIN.LST allows write access, the container list dialog is displayed as shown:
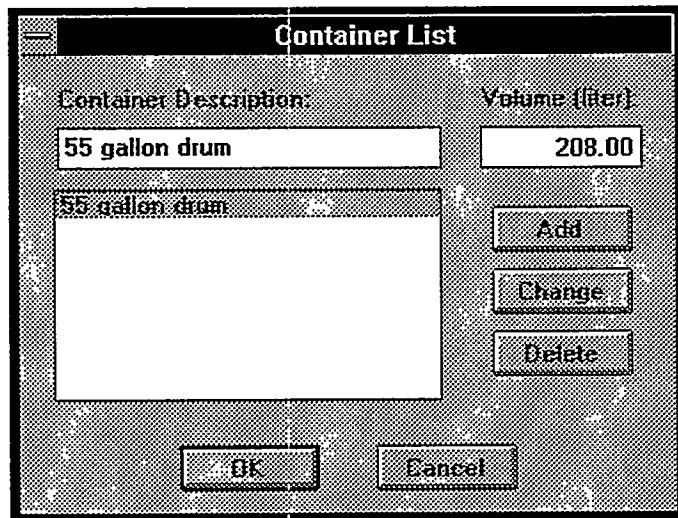
If the file CONTAIN.LST does not allow write access, the container list dialog is displayed as shown (addresses SCR User Interface Problems, Item 11):
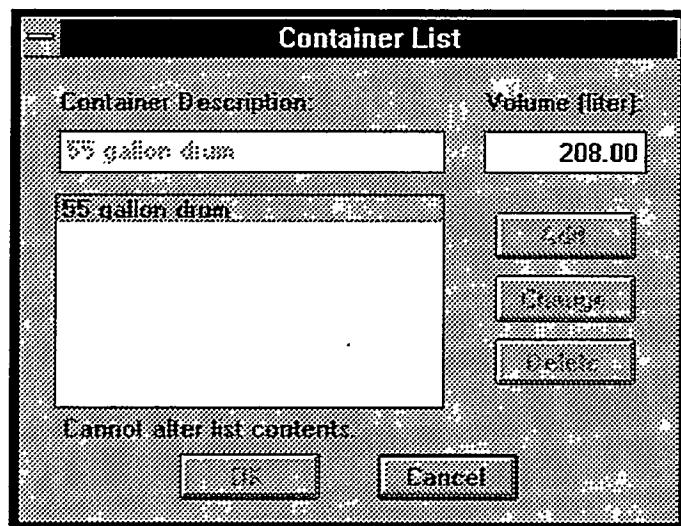
10.3.4 Valid Test Cases

CL.1

Purpose

This test addresses adding a container to the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description

1) In the container list dialog,
   - Enter a container description.
   - Enter a volume in the range > 0.00 and < 1000.00.
2) Click on Add.
3) Click on OK.

Expected Results

When the container list dialog is displayed again, the entered container description appears in the list of containers and the volume agrees with the volume entered to two digits after the decimal.

Pass/Fail Criteria

Test passes if the entered container appears in the list.

CL.2

Purpose

This test addresses changing a container in the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description

1) In the container dialog, select the container description entered in the previous test.
2) Modify the container volume to a different volume in the range > 0.00 and < 1000.00.
3) Click on Change.
4) Click on OK.

Expected Results

When the container list dialog is displayed again, the modified container description appears in the list.

Pass/Fail Criteria

Test passes if the modified container is in the list.

CL.3

Purpose

This test addresses deleting a container from the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description

1) In the container dialog, select the container description modified in the previous test.
2) Click on Delete.
3) Click on OK.

Expected Results

When the container list dialog is displayed again, the deleted container description does not appear in the list.

Pass/Fail Criteria

Test passes if the deleted container is not in the list.

10.3.5 Invalid Test Cases

CL.4

Purpose

This test addresses adding a container to the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description

1) In the container list dialog, select a container description from the container list.

2) Click on Add.

Expected Results

"Duplicate description" dialog is displayed. -
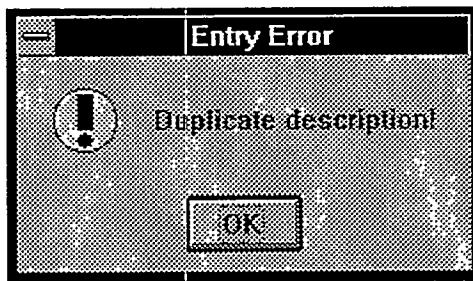
Pass/Fail Criteria

Test passes if dialog is displayed.

CL.5

Purpose

This test addresses adding a container to the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description

1) In the container list dialog,
   - Enter a container description
   - Enter a volume of 0.0.

2) Click on Add.

Expected Results

"Volume must be > 0" dialog is displayed.
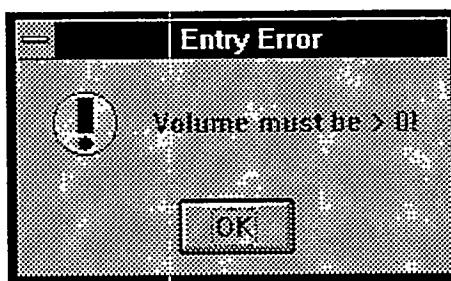
Pass/Fail Criteria
Test passes if dialog is displayed.

CL.6

Purpose
This test addresses adding a container to the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description
1) In the container list dialog,
   - Enter a container description
   - Enter a volume of -10.0.
2) Click on Add.

Expected Results
"Volume must be > 0" dialog is displayed.

Pass/Fail Criteria
Test passes if dialog is displayed.

CL.7

Purpose
This test addresses adding a container to the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description
1) In the container list dialog,
   - Enter a container description
   - Enter a volume of 999999.99.
2) Click on Add.
3) Click on Yes to add container.

Expected Results
"Volume seems excessive" dialog is displayed.
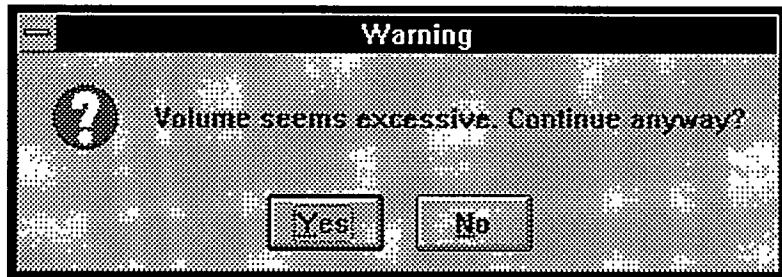
Pass/Fail Criteria
Test passes if dialog is displayed.

CL.8

Purpose

This test addresses adding a container to the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description

1) In the container list dialog,
   - Enter a container description
   - Enter a volume of 999999.99.
2) Click on Add.
3) Click on No to cancel container addition.

Expected Results

"Volume seems excessive" dialog is displayed.
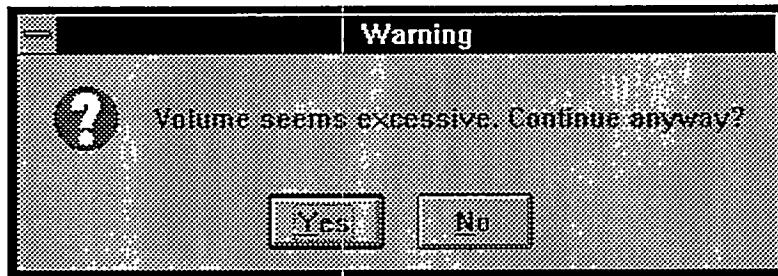
Pass/Fail Criteria

Test passes if dialog is displayed.

CL.9

Purpose

This test addresses changing a container in the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description

1) In the container list dialog,
   - Select any container
   - Enter a volume of 0.0.
2) Click on Change.

Expected Results

"Volume must be > 0" dialog is displayed.
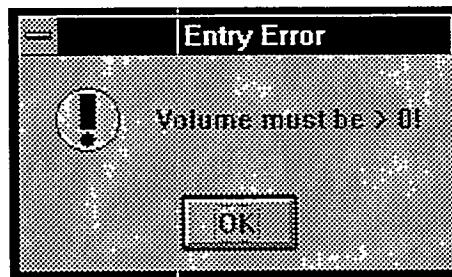
Pass/Fail Criteria
Test passes if dialog is displayed.

CL.10

Purpose
This test addresses changing a container in the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description
1) In the container list dialog,
   - Enter a volume of -10.0.
2) Click on Change.

Expected Results
"Volume must be > 0" dialog is displayed.

Pass/Fail Criteria
Test passes if dialog is displayed.

CL.11

Purpose
This test addresses changing a container in the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description
1) In the container list dialog,
   - Enter a volume of 999999.99.
2) Click on Change.
3) Click on Yes to change container.

Expected Results
"Volume seems excessive" dialog is displayed.
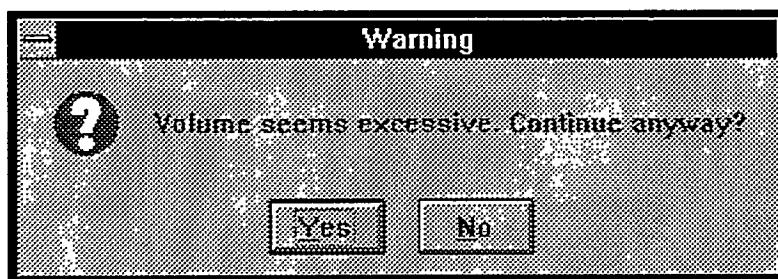
Pass/Fail Criteria
Test passes if dialog is displayed.

CL.12

Purpose

This test addresses changing a container in the list, requirements 3.1.4.2 M.1, 3.1.4.2 M.5, and SCR User Interface Problems, Item 11.

Input Description

    1) In the container list dialog,
- Enter a volume of 999999.99.

    2) Click on Change.

    3) Click on No to cancel container modification.

Expected Results

"Volume seems excessive" dialog is displayed.
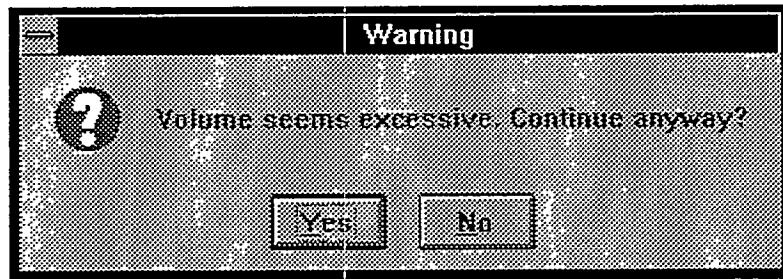
Pass/Fail Criteria

Test passes if dialog is displayed.

10.4 Matrix List

10.4.1 Introduction and Description

These tests address modifying the list of matrixes that the assay system can process by adding matrixes to and deleting matrixes from the matrix list.

10.4.2 Special Requirements

The matrix list dialog will be visible. The dialog inputs are described for each test. Optionally, following each test, the file MATRIX.LST in the assay system root directory may be printed to verify that the matrix list is stored with appropriate data. The file MATRIX.LST must be write-enabled in order to perform the following tests.

10.4.3 Procedure Steps

1) Login as a physicist.
2) Pull down the Options menu.
3) Select Matrix List.
4) If the file MATRIX.LST allows write access, the matrix list dialog is displayed as shown:
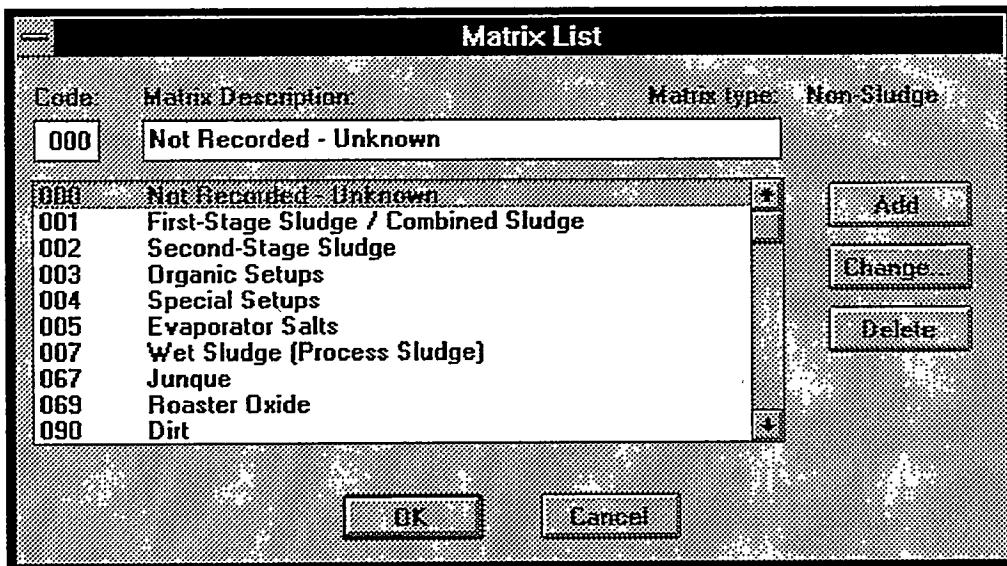
If the file MATRIX.LST does not allow write access, the matrix list dialog is displayed as shown:

Matrix List

Code	Matrix Description	Matrix type	Non-Sludge
000	Not Recorded - Unknown		

000	Not Recorded - Unknown	
001	First-Stage Sludge / Combined Sludge	
002	Second-Stage Sludge	
003	Organic Setups	
004	Special Setups	
005	Evaporator Salts	
007	Wet Sludge (Process Sludge)	
067	Junque	
069	Roaster Oxide	
090	Dirt	

Cannot alter list contents.

[OK] [Cancel]

(Buttons on right: Add, Params..., Delete)
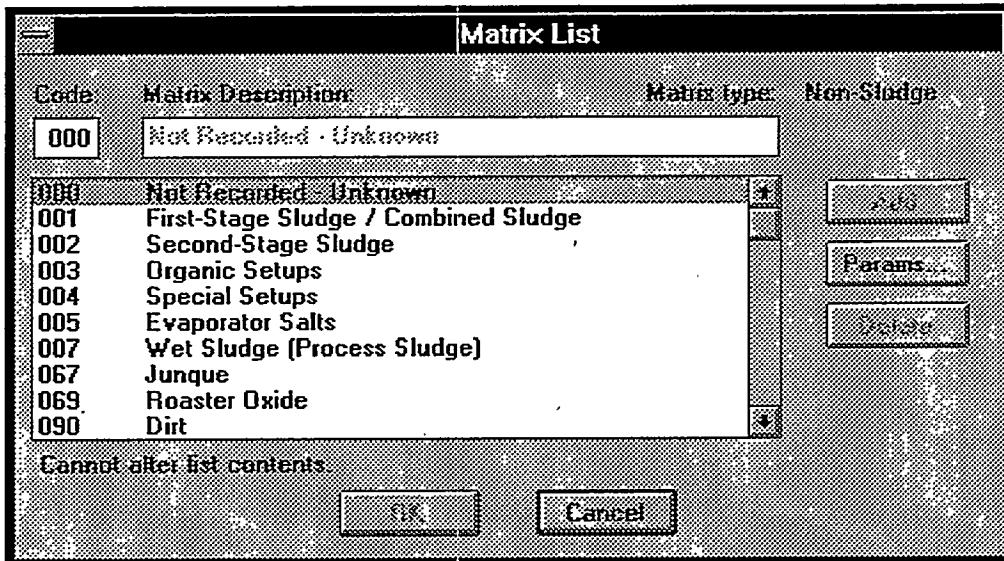
5) If the file MATRIX.LST allows write access, when required by specific tests, clicking on Add or Change, or double-clicking on an item in the list will display the matrix parameters dialog:

000 - Not Recorded - Unknown

Mass selection: ● Default   ○ Active   ○ Passive

Matrix type: ● Non-Sludge   ○ Sludge   ○ Am Sludge

Externally supplied Moderator Index 0.0000

Active self-absorption correction factor correlation coefficients:

C0	C1	C2	C3	DIV
1.0000	0.0150	0.0000	0.0000	1.0000

Externally supplied correction factors:

Active	0.0000	±	0.0000
Passive Shielded	0.0000	±	0.0000
Passive System	0.0000	±	0.0000

[OK] [Cancel]
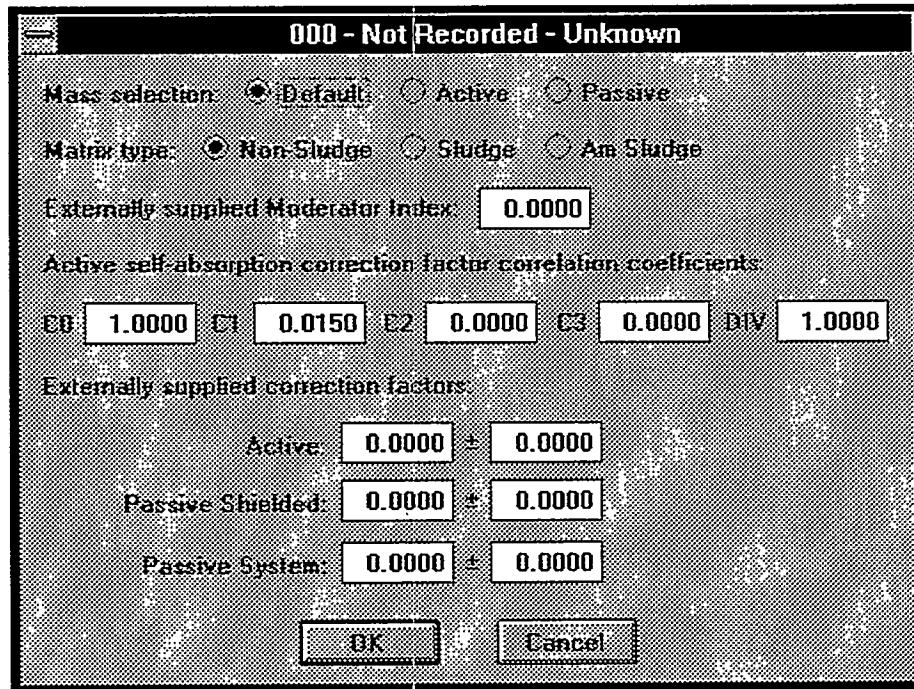
If the file MATRIX.LST does not allow write access, when required by specific tests, clicking on Params, or double-clicking on an item in the list will display the matrix parameters dialog but will not allow changes to be made (addresses SCR User Interface Problems, Items 10 and 11):

```
┌─────────────────────────────────────────────────────┐
│  ═    000 - Not Recorded - Unknown                    │
├─────────────────────────────────────────────────────┤
│  Mass selection:  ⊙ Default   ○ Active   ○ Passive    │
│                                                       │
│  Matrix type:  ⊙ Non-Sludge  ○ Sludge  ○ Am-Sludge   │
│                                                       │
│  Externally supplied Moderator Index:  [ 0.0000 ]     │
│                                                       │
│  Active self-absorption correction factor correlation │
│  coefficients:                                        │
│                                                       │
│  C0 [1.0000] C1 [0.0150] C2 [0.0000] C3 [0.0000] DIV [1.0000]│
│                                                       │
│  Externally supplied correction factors:              │
│                                                       │
│           Active:  [ 0.0000 ] ± [ 0.0000 ]            │
│                                                       │
│  Passive Shielded:  [ 0.0000 ] ± [ 0.0000 ]           │
│                                                       │
│    Passive System:  [ 0.0000 ] ± [ 0.0000 ]           │
│                                                       │
│            [ OK ]        [ Cancel ]                   │
└─────────────────────────────────────────────────────┘
```

10.4.4 Valid Test Cases

ML.1

Purpose

This test addresses adding a matrix to the matrix list, requirements 3.1.4.3 M.3 and M.4.

Input Description

    1) In the matrix list dialog,

- Enter a new code in [0, 999]
- Enter matrix description.

    2) Click on Add.

    3) In the matrix parameters dialog, click on OK to accept the default values.

    4) In the matrix list dialog, click on OK.

Expected Results

When the matrix list dialog is displayed again, the entered code and matrix description appear in the list of matrixes. When that item is selected, the code and description are displayed, and the word Non-Sludge appears as the matrix type.

Pass/Fail Criteria

Test passes if the entered matrix appears in the list.

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ML.2

Purpose

This test addresses adding a matrix to the matrix list, requirement 3.1.4.3 M.3 and M.4.

Input Description

1) In the matrix list dialog,
   - Enter a code in [0, 999]
   - Enter matrix description.
2) Click on Add.
3) In the matrix parameters dialog, select the Sludge radio button, then click on OK to accept the default values.
4) In the matrix list dialog, click on OK.

Expected Results

When the matrix list dialog is displayed again, the entered code and matrix description appear in the list of matrixes. When that item is selected, the code and description are displayed, and the word Sludge appears as the matrix type.

Pass/Fail Criteria

Test passes if the entered matrix appears in the list.

ML.3

Purpose

This test addresses adding a matrix to the matrix list, requirement 3.1.4.3 M.3 and M.4.

Input Description

1) In the matrix list dialog,
   - Enter a code in [0, 999]
   - Enter matrix description.
2) Click on Add.
3) In the matrix parameters dialog, select the Am Sludge radio button, then click on OK to accept the default values.
4) In the matrix list dialog, click on OK.

Expected Results

When the matrix list dialog is displayed again, the entered code and matrix description appear in the list of matrixes. When that item is selected, the code and description are displayed, and both Sludge and Am Sludge appear as the matrix types.

Pass/Fail Criteria

Test passes if the entered matrix appears in the list.

ML.4

Purpose

This test addresses deleting a matrix from the matrix list, requirement 3.1.4.3 M.3 and M.4.

Input Description

1) In the matrix list dialog, select one of the matrix codes added in the previous tests.
2) Click on Delete. The matrix code will be removed from the list.
3) Click on OK.

Expected Results

When the matrix list dialog is displayed again, the deleted code and matrix description do not appear in the list of matrixes

Pass/Fail Criteria

Test passes if the deleted matrix code no longer appears in the list.

ML.5

Purpose

This test addresses setting the matrix attributes for a matrix in the list, requirement 3.1.4.3 M.3 and M.4. Note that the coefficients for the active self-absorption correction factor correlation do not have range restriction, and thus are not tested.

Input Description

For each input field and data value listed in,

1) In the matrix list dialog, select one of the matrix codes added in the previous tests.
2) Click on Change.
3) In the matrix parameters dialog, enter the value specified in Table 2 for the field.
4) Click on OK.

Table 2. Valid Matrix Parameter Values.

Field	Value
Mass selection	Active
(select only one)	Passive
	Default
Moderator index	0.5
Active correction factor	1.0
Passive shielded correction factor	5.0
Passive system correction factor	10.0
Matrix Type	Non-Sludge
(select only one)	Sludge
	Am Sludge

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Expected Results

The system returns to the matrix list dialog in each case. The input value or selection is retained when the matrix parameter dialog is reentered by clicking on Change again.

Pass/Fail Criteria

Test passes if each changed value or selection is retained in the matrix parameter dialog on the next entry into the dialog.

10.4.5 Invalid Test Cases

ML.6

Purpose

This test addresses adding a matrix to the matrix list, requirement 3.1.4.3 M.3 and M.4.

Input Description
1) In the matrix list dialog,
   - Select a code and description from the list
   - Enter a different matrix description.
2) Click on Add.

Expected Results

"Duplicate Content Code" dialog is displayed.
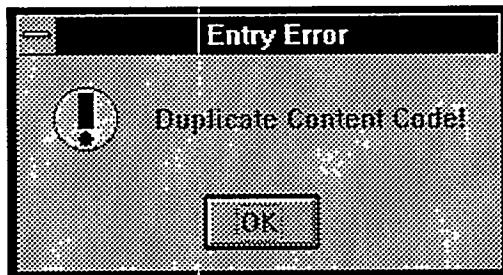
Pass/Fail Criteria

Test passes if dialog is displayed.

ML.7

Purpose

This test addresses adding a matrix to the matrix list, requirement 3.1.4.3 M.3 and M.4.

Input Description
1) In the matrix list dialog,
   - Enter a code of -10
   - Enter a matrix description.
2) Click on Add.

Expected Results

"Content Code must be in the range 0 to 999" dialog is displayed.

Entry Error

Content Code must be in the range 0 to 999

OK
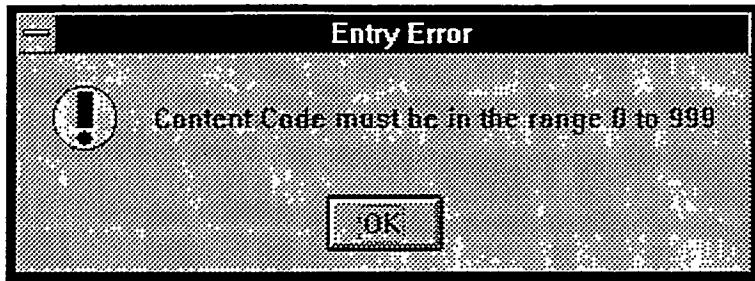
Pass/Fail Criteria
Test passes if dialog is displayed.

ML.8

Purpose
This test addresses adding a matrix to the matrix list, requirement 3.1.4.3 M.3 and M.4.

Input Description
In the matrix list dialog, attempt to enter more that three digits in the code field.

Expected Results
No more than three digits may be entered.

Pass/Fail Criteria
Test passes if no more than three digits can be entered.

ML.9

Purpose
This test addresses setting the matrix attributes for a matrix in the list, requirement 3.1.4.3 M.3 and M.4.

Input Description
For each input field and data value listed in Table 3,

1) In the matrix list dialog, select one of the matrix codes added in the previous tests.
2) Click on Change.
3) In the matrix parameters dialog, enter the value for the data field from Table 3.
4) Click on OK.

Table 3. Invalid Marix Parameter Values.

Field	Value	Expected Result
Moderator index	-0.5	moderator index must be in [0.0,1.0]
Moderator index	2.0	moderator index must be in [0.0,1.0]
Moderator index	0.0	(resets value, continue to next test)
Active correction factor	-1.0	correction factors must be ≥ 0.0
Active correction factor	1.0 ± -1.0	uncertainty must be positive
Active correction factor	0.0	(resets value, continue to next test)
Passive shielded correction factor	-1.0	correction factors must be ≥ 0.0
Passive shielded correction factor	1.0 ± -1.0	uncertainty must be positive
Passive shielded correction factor	0.0	(resets value, continue to next test)
Passive system correction factor	-1.0	correction factors must be ≥ 0.0
Passive system correction factor	1.0 ± -1.0	uncertainty must be positive
Passive system correction factor	0.0 ± 0.0	(resets value, continue to next test)

Expected Results
As indicated in Table 3, either the "Moderator index ..." dialog is displayed,

or the "Correction factors ..." dialog is displayed.
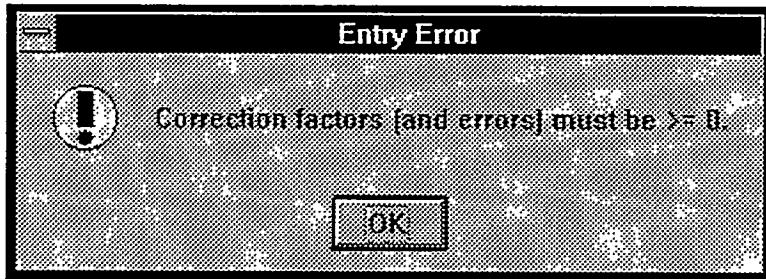
Pass/Fail Criteria
Test passes if each invalid value entered produced an error dialog.

10.5 Chamber Calibration

10.5.1 Introduction and Description

These tests address the modification of the chamber calibration parameters.

10.5.2 Special Requirements

The chamber calibration dialog will be visible. The dialog inputs are described for each test. Optionally, following each test, the file ..\DAC\CALIB.DAC from the assay system root directory may be printed to verify that the chamber calibration data are stored appropriately. The file CALIB.DAC must be write-enabled in order to perform the following tests.

10.5.3 Procedure Steps

1) Log in as a physicist.
2) Pull down Options menu.
3) Select Calibration.
4) If the file CALIB.DAC allows write access, the chamber calibration dialog will be displayed as shown.
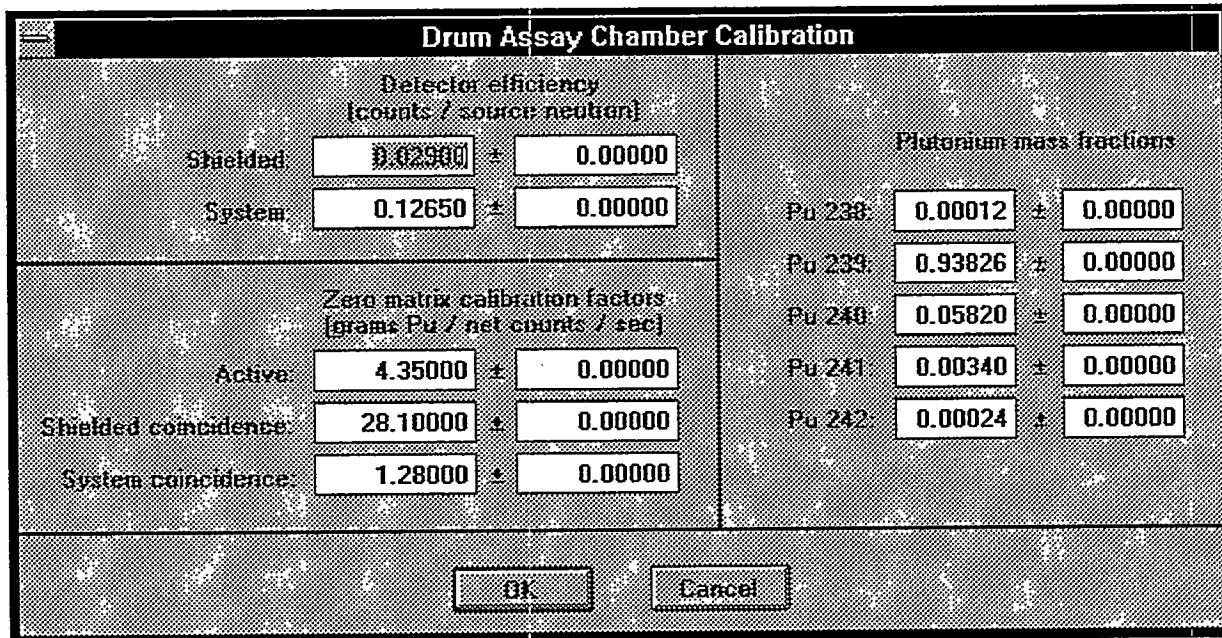
If the file CALIB.DAC does not allow write access, the chamber calibration dialog will be displayed as shown, but no changes can be made (addresses SCR User Interface Problems, Item 11):

Drum Assay Chamber Calibration

Detector efficiency
[counts / source neutron]

Shielded	0.10000	±	0.00000
System	0.17800	±	0.00000

Zero matrix calibration factors
[grams Pu / net counts / sec]

Active:	0.10000	±	0.00000
Shielded coincidence:	95.00000	±	0.00000
System coincidence:	3.67000	±	0.00000

Plutonium mass fractions

Pu 238:	1.00000	±	0.00000
Pu 239:	0.92000	±	0.00000
Pu 240:	0.05000	±	0.00000
Pu 241:	0.01500	±	0.00000
Pu 242:	0.00500	±	0.00000

Parameters cannot be changed.   [OK]   [Cancel]

10.5.4 Valid Test Cases

CC.1

Purpose

This test addresses setting the chamber calibration parameters, requirement 3.1.3.3 M.3.

Input Description

For each input field and data value listed in Table 4,

1) In the chamber calibration dialog, enter the data value in the field.
2) Click on OK.

Table 4. Valid chamber calibration parameter values.

Field	Value
Shielded detector efficiency	0.055
System detector efficiency	0.178
Active zero matrix calibration factor	15.4
Shielded coincidence zero matrix calibration factor	95.0
System coincidence zero matrix calibration factor	3.67

Expected Results

The system returns to the main window in each case. The value is retained when the calibration dialog is reentered.

Pass/Fail Criteria

Test passes if each value is retained in the calibration dialog.

CC.2

Purpose

This test addresses setting the chamber calibration parameters, requirement 3.1.3.3 M.3.

Input Description

1) In the chamber calibration dialog,
   - Enter Pu 238 mass fraction 0.01
   - Enter Pu 239 mass fraction 0.92
   - Enter Pu 240 mass fraction 0.05
   - Enter Pu 241 mass fraction 0.015
   - Enter Pu 242 mass fraction 0.005.
2) Click on OK.

Expected Results

The system returns to the main window. The values are retained when the calibration dialog is reentered.

Pass/Fail Criteria

Test passes if each value is retained in the calibration dialog on the next entry into the dialog.

10.5.5 Invalid Test Cases

CC.3

Purpose

This test addresses setting the chamber calibration parameters requirement 3.1.3.3 M.3.

Input Description

For each test case in Table 5,

    1) In the chamber calibration dialog, enter the value for the field from the table.

    2) Click on OK.

Table 5. Invalid chamber calibration parameter values.

Field	Value	Expected Result
Shielded detector efficiency	-0.5	detector efficiency must be in [0.0,1.0]
Shielded detector efficiency	2.0	detector efficiency must be in [0.0,1.0]
Shielded detector efficiency	0.5 ± -1.0	uncertainty must be positive
Shielded detector efficiency	0.029 ± 0	(resets value, continue to next test)
System detector efficiency	-0.5	detector efficiency must be in [0.0,1.0]
System detector efficiency	2.0	detector efficiency must be in [0.0,1.0]
System detector efficiency	0.5 ± -1.0	uncertainty must be positive
System detector efficiency	0.1265 ± 0	(resets value, continue to next test)
Active zero matrix calibration factor	-1.0	calibration factor must be ≥ 0.0
Active zero matrix calibration factor	0.5 ± -1.0	uncertainty must be positive
Active zero matrix calibration factor	4.35 ± 0	(resets value, continue to next test)
Shielded coincidence zero matrix calibration factor	-1.0	calibration factor must be ≥ 0.0
Shielded coincidence zero matrix calibration factor	0.5 ± -1.0	uncertainty must be positive
Shielded coincidence zero matrix calibration factor	28.1 ± 0	(resets value, continue to next test)
System coincidence zero matrix calibration factor	-1.0	calibration factor must be ≥ 0.0
System coincidence zero matrix calibration factor	0.5 ± -1.0	uncertainty must be positive
System coincidence zero matrix calibration factor	1.28 ± 0	(resets value, continue to next test)

Expected Results

As indicated in Table 5, either the "Detector efficiencies ..." dialog is displayed,

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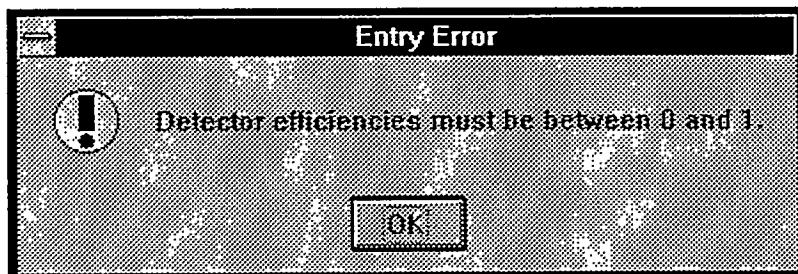
or the "Calibration factors ..." dialog is displayed.
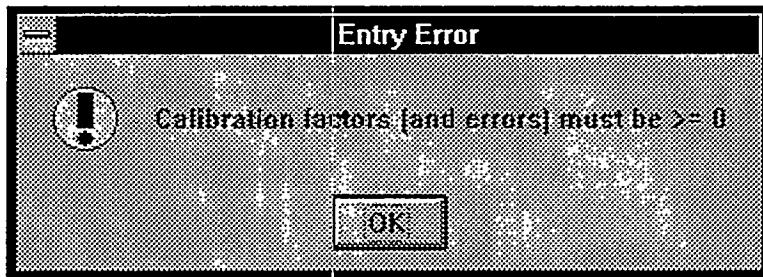
Pass/Fail Criteria

Test passes if each value entered produces the appropriate error dialog.

CC.4

Purpose

This test addresses setting the chamber calibration parameters, requirement 3.1.3.3 M.3.

Input Description

1) In the chamber calibration dialog,
   - Enter Pu 238 mass fraction 0.01
   - Enter Pu 239 mass fraction 0.92
   - Enter Pu 240 mass fraction -0.05
   - Enter Pu 241 mass fraction 0.015
   - Enter Pu 242 mass fraction 0.005.
2) Click on OK.

Expected Results

"Fraction must be in the range 0 to 1." dialog is displayed.
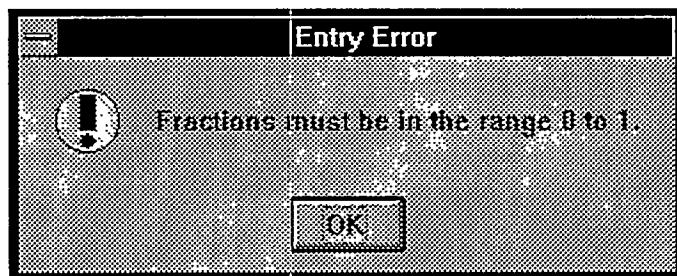
Pass/Fail Criteria

Test passes if error.dialog is displayed.

CC.5

Purpose

This test addresses setting the chamber calibration parameters, requirement 3.1.3.3 M.3.

Input Description

1) In the chamber calibration dialog,
   - Enter Pu 238 mass fraction 0.1
   - Enter Pu 239 mass fraction 0.92
   - Enter Pu 240 mass fraction 0.05
   - Enter Pu 241 mass fraction 0.015
   - Enter Pu 242 mass fraction 0.005.

2) Click on OK.

Expected Results

"Sum of fractions greater than..." dialog is displayed.
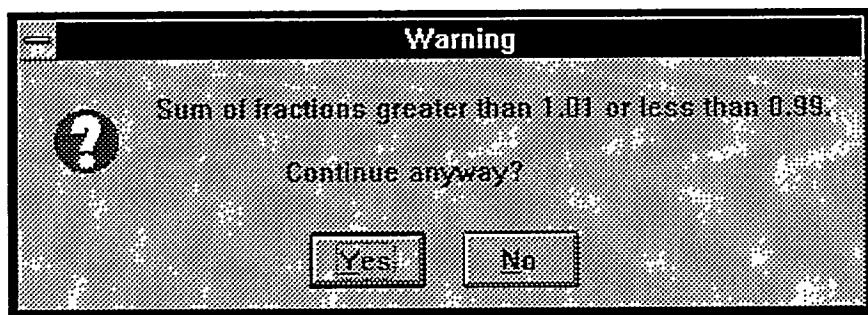
Pass/Fail Criteria

Test passes if error dialog is displayed.

10.6 Waste Attributes

10.6.1 Introduction and Description

These tests address choosing a file name, setting container identification, selecting the container type, selecting the matrix type, and entering the container's the net weight. These elements constitute the waste attributes.

10.6.2 Special Requirements

The new file dialog will be visible.

10.6.3 Procedure Steps

    1) Log in as an operator.
    2) Pull down File menu.
    3) Select New.
    4) The new file dialog is displayed.
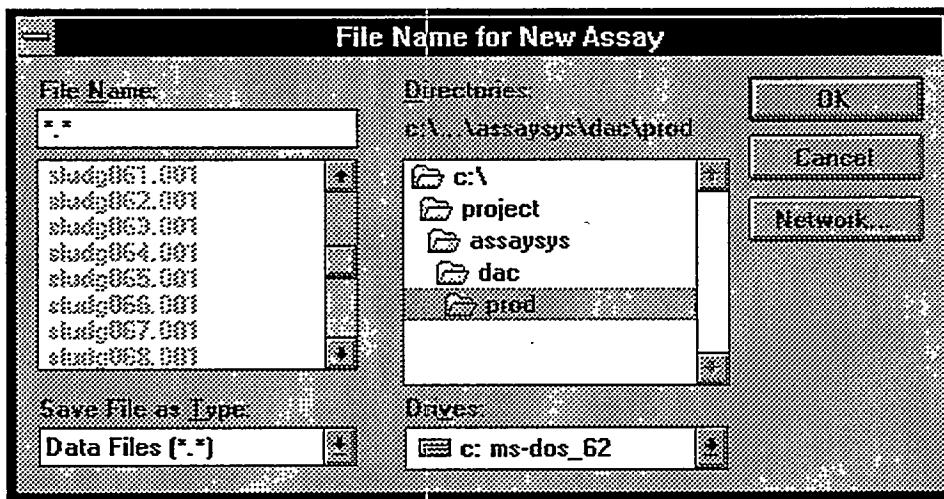
    5) When valid file names are entered for specific tests, clicking on OK will display the waste attributes dialog.

```
┌──────────────────────────────────────────────────────┐
│ ─    C:\PROJECT\ASSAYSYS\DAC\PROD\X.001             ▲ │
├──────────────────────────────────────────────────────┤
│ Identification:                                        │
│ ┌────────────────────────────────────────┐            │
│ │ test_case_id                            │            │
│ └────────────────────────────────────────┘            │
│ Container Type:                      Net Volume (L)    │
│ ┌──────────────────────────────┬─┐  ┌───────────────┐ │
│ │ 55 gallon drum               │▼│  │       208.0   │ │
│ └──────────────────────────────┴─┘  └───────────────┘ │
│ Matrix Type:                         Net Weight (kg):  │
│ ┌──────────────────────────────┬─┐  ┌───────────────┐ │
│ │ 000 Not Recorded - Unknown   │▼│  │         0.0   │ │
│ └──────────────────────────────┴─┘  └───────────────┘ │
│                                                        │
│        ┌──────────┐         ┌──────────┐               │
│        │  Assay   │         │  Close   │               │
│        └──────────┘         └──────────┘               │
└──────────────────────────────────────────────────────┘
```
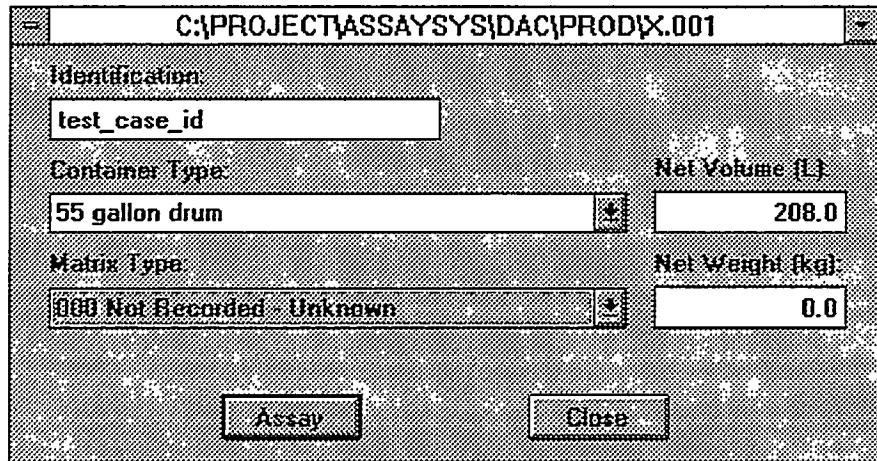
10.6.4 Valid Test Cases

WA.1

Purpose

This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and M.3 and 3.1.4.3 M.1 and M.3. This test is particularly aimed at testing valid file names.

Input Description

    1) In the new file dialog, enter file name WA_1.

    2) Click on OK.

    3) In the waste attributes dialog,

- Select 55 gallon drum for the container type
- Select matrix type 152
- Enter net weight 6.0.

    4) Click on Assay (do not select an Assay type).

    5) Click on Close.

Expected Results

File name is accepted and becomes the identification in the waste attributes dialog; waste attributes appear in the dialog box.

Pass/Fail Criteria

Test passes if the waste attributes dialog contains the attributes that were input.

WA.2

Purpose

This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and M.3 and 3.1.4.3 M.1 and M.3. This test is particularly aimed at testing valid file names.

Input Description

    1) In the new file dialog, enter file name 999999.

    2) Click on OK.

    3) In the waste attributes dialog,

- Select 55 gallon drum for the container type
- Select matrix type 152
- Enter net weight 6.0.

4) Click on Assay (do not select an Assay type).

5) Click on Close.

Expected Results

File name is accepted and becomes the identification in the waste attributes dialog; waste attributes appear in the dialog box.

Pass/Fail Criteria

Test passes if the waste attributes dialog contains the attributes that were input.

WA.3

Purpose

This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and M.3 and 3.1.4.3 M.1 and M.3. This test is particularly aimed at testing valid file names.

Input Description

1) In the new file dialog, enter file name $&$###.

2) Click on OK.

3) In the waste attributes dialog,

- Select 55 gallon drum for the container type
- Select matrix type 152
- Enter net weight 6.0.

4) Click on Assay (do not select an Assay type).

5) Click on Close.

Expected Results

File name is accepted and becomes the identification in the waste attributes dialog; waste attributes appear in the dialog box.

Pass/Fail Criteria

Test passes if the waste attributes dialog contains the attributes that were input.

WA.4-WA.7

Purpose

This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and M.3, 3.1.4.3 M.1 and M.3, and SCR User Interface Problems, Item 3. These tests are particularly aimed at testing valid matrix types.

Input Description

For each test case in Table 6,

1) In the new file dialog, enter the file name using the identification name from the table.

2) Click on OK.

3) In the waste attributes dialog, using the values from the table,

- Select container type
- Select matrix type
- Enter net weight.

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4) Click on Assay (do not select an Assay type).

5) Click on Close.

Expected Results

File name is accepted and becomes the identification in the waste attributes dialog; waste attributes appear in the dialog box. The matrix type displayed initially should be the same matrix type as was used in each previous test.

Pass/Fail Criteria

Test passes if the waste attributes dialog contains the attributes that were input, and if the matrix type displayed initially is the same matrix type as was used in each previous test.

Table 6. Waste attribute input, valid test cases.

| Identification	Container type	Matrix code	Net weight
WA_4	55 gallon drum	0	10
WA_5	55 gallon drum	152	70
WA_6	55 gallon drum	292	80
WA_7	55 gallon drum	320	110

WA.8

Purpose

This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and M.3, and 3.1.4.3 M.1 and M.3; it also addresses SCR User Interface Problems, Item 1. This test is particularly aimed at testing starting a new assay from the Run menu rather than the File menu.

Input Description

1) Log in as an operator.
2) Pull down Run menu.
3) Select New Assay.
4) The new file dialog is displayed.
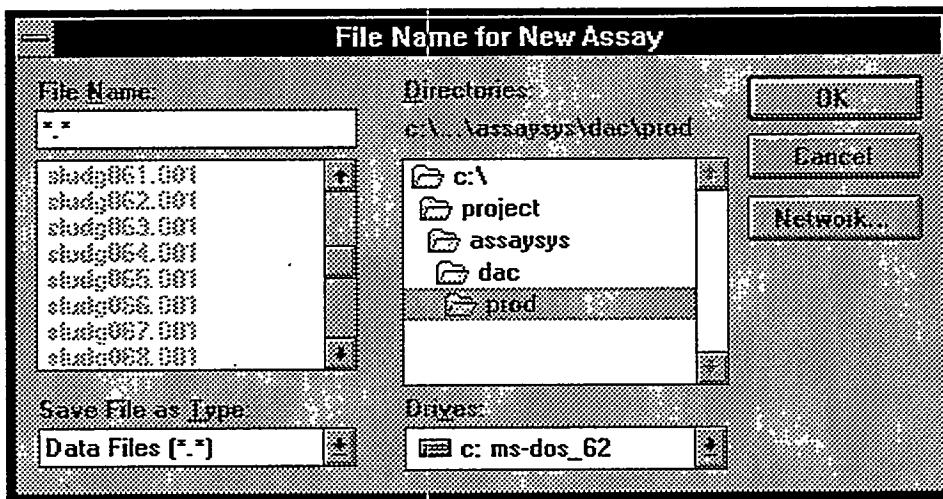
5) When valid file names are entered for specific tests, clicking on OK will display the waste attributes dialog.
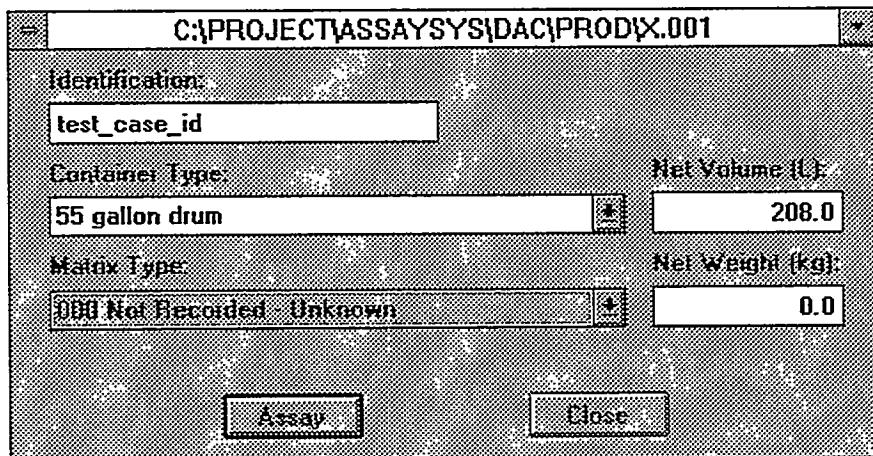
Expected Results

File name is accepted and becomes the identification in the waste attributes dialog; waste attributes appear in the dialog box.

Pass/Fail Criteria

This test passes if files can be opened successfully.

<div align="center">

WA.9

</div>

Purpose3

This test addresses switching between "Waste," "Active," "Passive" and "Results" windows, SCR User Interface Problems, Item 1. The PAN system must be functioning for this test.

Input Description

1) In the new file dialog, enter file name WA_9.
2) Click on OK.
3) In the waste attributes dialog,
   - Select 55 gallon drum for the container type
   - Select matrix type 152
   - Enter net weight 6.0.
4) Click on Assay.
5) Select Full.
6) If a warning about no current background appears, select Yes to continue.
7) Wait for the assay to complete (this may take several minutes).
8) Switch between the "Waste," "Active," "Passive" and "Results" windows by clicking the mouse within any visible part of the target window.
9) Click on Close (in the "Results" window).

Expected Results

Any window can be viewed by clicking the mouse within any visible part of the window.

Pass/Fail Criteria

Test passes if all windows can be viewed by clicking the mouse within any visible part of the window.

10.6.5 Invalid Test Cases

WA.10

Purpose

This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and 3.1.4.3 M.1. This test is particularly aimed at testing invalid file names.

Input Description

In the new file dialog, click on OK without selecting (or entering) a file name.

Expected Results

The new file dialog remains displayed.

Pass/Fail Criteria

Test passes if the new file dialog remains displayed.

WA.11

Purpose

This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and 3.1.4.3 M.1. This test is particularly aimed at testing invalid file names.

Input Description

In the new file dialog, enter file name *.001.

Expected Results

The new file dialog remains displayed; the file list is updated to show only files with the suffix ".001," if any exist. If no files match this criteria, then the list will be empty.

Pass/Fail Criteria

Test passes if the new file dialog remains displayed as described.

WA.12

Purpose

This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and 3.1.4.3 M.1. This test is particularly aimed at testing invalid file names.

Input Description

In the new file dialog, enter file name ?.001.

Expected Results

The new file dialog remains displayed; the file list is updated to show only files with a single character prefix and the suffix ".001," if any exist. If no files match this criteria, then the list will be empty.

Pass/Fail Criteria
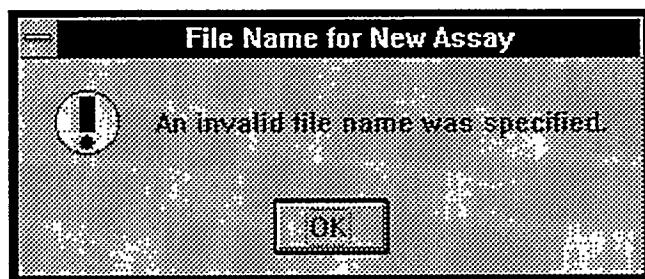
Test passes if the new file dialog remains displayed as described.

WA.15

Purpose

This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and 3.1.4.3 M.1. This test is particularly aimed at testing when there is no net weight value entered.

Input Description

    1) In the new file dialog, enter the file name WA_15.

    2) Click on OK.

    3) In the waste attributes dialog, click on Assay.

Expected Results

"Weight must be > 0" dialog is displayed.
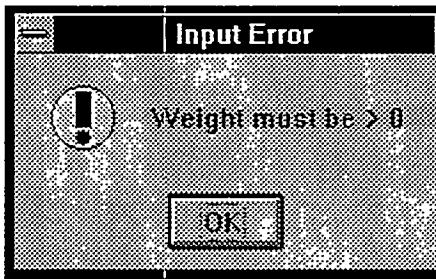
Pass/Fail Criteria

Test passes if error dialog is displayed.

WA.16

Purpose

This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and 3.1.4.3 M.1. This test is particularly aimed at testing net weights that are too small.

Input Description

    1) In the new file dialog, enter file name WA_16.

    2) Click on OK.

    3) In the waste attributes dialog,

        • Select 55 gallon drum for the container type

        • Select matrix type 152 for the matrix type

        • Enter net weight 0.

    4) Click on Assay.

Expected Results

"Weight must be > 0" dialog is displayed.
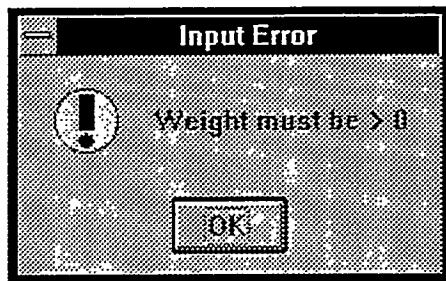
Pass/Fail Criteria
Test passes if error dialog is displayed.

WA.17

Purpose
This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and 3.1.4.3 M.1. This test is particularly aimed at testing negative net weights.

Input Description
1) In the new file dialog, enter file name WA_17.
2) Click on OK.
3) In the waste attributes dialog,
   - Select 55 gallon drum for the container type
   - Select matrix type 152 for the matrix type
   - Enter net weight -10.
4) Click on Assay.

Expected Results
"Weight must be > 0" dialog is displayed.
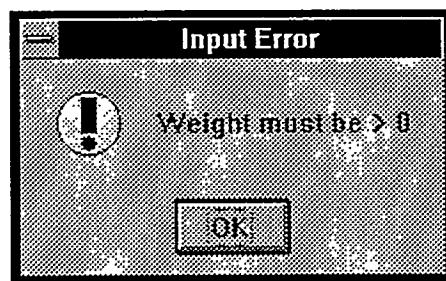
Pass/Fail Criteria
Test passes if error dialog is displayed.

WA.18

Purpose

This test addresses setting the waste attributes, which include file name, container identification, matrix type, and container net weight, requirements 3.1.4.2 M.1 and 3.1.4.3 M.1. This test is particularly aimed at testing non-numeric data in the net weight field.

Input Description

1) In the new file dialog, enter file name WA_18.
2) Click on OK.
3) In the waste attributes dialog,
   - Select 55 gallon drum for the container type
   - Select matrix type 152 for the matrix type
   - Enter net weight $$$.$$.
4) Click on Assay.

Expected Results

"Weight must be > 0" dialog is displayed
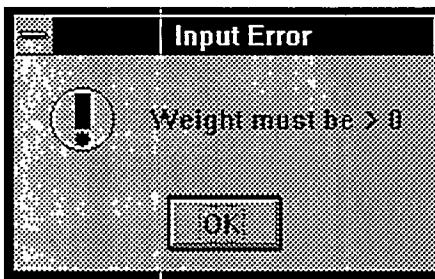
Pass/Fail Criteria

Test passes if error dialog is displayed.

WA.19

Purpose

This test addresses the requirement to input the container information, requirements 3.1.4.2 M.1 and 3.1.4.3 M.1. This test is particularly aimed at testing net weight values that are too large.

Input Description

    1) In the new file dialog, enter file name WA_19.

    2) Click on OK.

    3) In the waste attributes dialog,

        • Select 55 gallon drum for the container type

        • Select matrix type 152 for the matrix type

        • Enter net weight 999999.99.

    4) Click on Continue.

Expected Results

"Weight seems excessive" dialog is displayed.
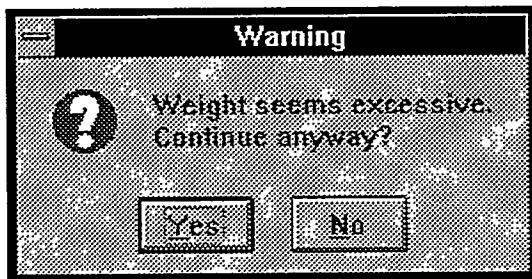
Pass/Fail Criteria

Test passes if warning dialog is displayed.

10.7 Toggle Switches

10.7.1 Introduction and Description

These tests address the options Auto Summary Report, Auto Data Save, and Background Correction.

10.7.2 Special Requirements

The open file dialog will be visible. The file for this test is located in the .\DAC subdirectory of the assay system root directory.

10.7.3 Procedure Steps

1) Log in as an operator or physicist, as specified in the test case.
2) Pull down File menu.
3) Select Open.
4) The open file dialog is displayed.

Open File for Recalculation

File Name:
.

000496
actcrate.dac
backgrnd
calib.dac
chisq.dac
correl.dac
options.dac
pascrate.dac

Directories:
c:\...\swepp\demo\sas\dac

c:\
projects
swepp
demo
sas
dac
backg

OK
Cancel
Network...

List Files of Type:
Data Files (*.*)

Drives:
c: ms-dos_62
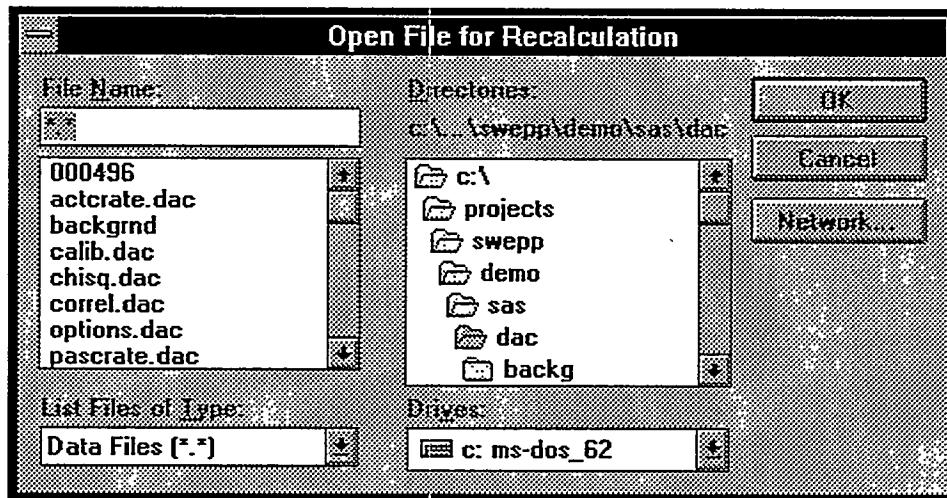
10.7.4 Valid Test Cases

TS.1

Purpose

This test addresses the Auto Summary Report and Auto Data Save options, requirements 3.1.3.3 M.1 and M.2.

Input Description

1) Log in as an operator.
2) In the open file dialog, change to the DAC subdirectory and select the file 000496.
3) Click on OK.
4) Pull down the Options menu and verify that Auto Summary Report and Auto Data Save are checked.
5) In the Waste Attributes dialog, click on Continue.
6) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
7) In the results dialog, click on Close.

Expected Results

A summary report should be printed automatically. The report identifies date and time of the background data acquisition.

Pass/Fail Criteria

The test passes if the above summary report is printed as described.

TS.2

Purpose

This test addresses Auto Summary Report toggling, requirements 3.1.3.3 M.1 and M.2.

Input Description

1) Log in as an operator.
2) Pull down the Options menu and ensure that Auto Summary Report is toggled off.
3) In the open file dialog, change to the DAC subdirectory and select the file 000496.
4) Click on OK.
5) In the Waste Attributes dialog, click on Continue.
6) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
7) In the results dialog, click on Close.

Expected Results

No hardcopy summary report should appear.

Pass/Fail Criteria

Test passes if the summary report is not printed.

TS.3

Purpose

This test addresses the Auto Summary Report and Background Correction options, requirements 3.1.3.3 M.1 and M.2.

Input Description

1) Log in as a physicist.
2) In the open file dialog, change to the DAC subdirectory and select the file 000496.
3) Click on OK.
4) Pull down the Options menu and verify that both Auto Summary Report and Background Correction are toggled on.
5) In the Waste Attributes dialog, click on Continue.
6) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
7) In the results dialog, click on Close.

Expected Results

A summary report should be printed automatically. The report identifies date and time of the background data acquisition.

Pass/Fail Criteria

The test passes if the above summary report is printed as described.

TS.4

Purpose

This test addresses Auto Summary Report toggling, requirements 3.1.3.3 M.1 and M.2.

Input Description

1) Log in as a physicist.
2) Pull down the Options menu and ensure that Auto Summary Report is toggled off.
3) In the open file dialog, change to the DAC subdirectory and select the file 000496.
4) Click on OK.
5) In the Waste Attributes dialog, click on Continue.
6) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
7) In the results dialog, click on Close.

Expected Results

No hardcopy summary report should appear.

Pass/Fail Criteria

Test passes if the summary report is not printed.

TS.5

Purpose

This test addresses Background Correction toggling, requirements 3.1.3.3 M.1 and M.2.

Input Description

1) Log in as a physicist.
2) Pull down the Options menu and ensure that Auto Summary Report is toggled on and Background Correction is toggled off.
3) In the open file dialog, change to the DAC subdirectory and select the file 000496.
4) Click on OK.
5) In the Waste Attributes dialog, click on Continue.
6) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
7) In the results dialog, click on Close.

Expected Results

A summary report should be automatically printed. The report indicates that the background correction was not applied.

Pass/Fail Criteria

The test passes if the summary report is printed as described.

10.7.5 Invalid Test Cases

None.

10.8 Chamber Operation Parameters

10.8.1 Introduction and Description

These tests address the capability to modify the active pulse count limits and passive count time limits.

10.8.2 Special Requirements

The CAMAC crate must be on-line.

10.8.3 Procedure Steps

1) Log in as an operator.
2) Pull down the Options menu.
3) If not checked, select Auto Summary Report to toggle on.
4) Pull down the Options menu and select Assay Times.
5) The chamber operation parameters dialog is displayed.
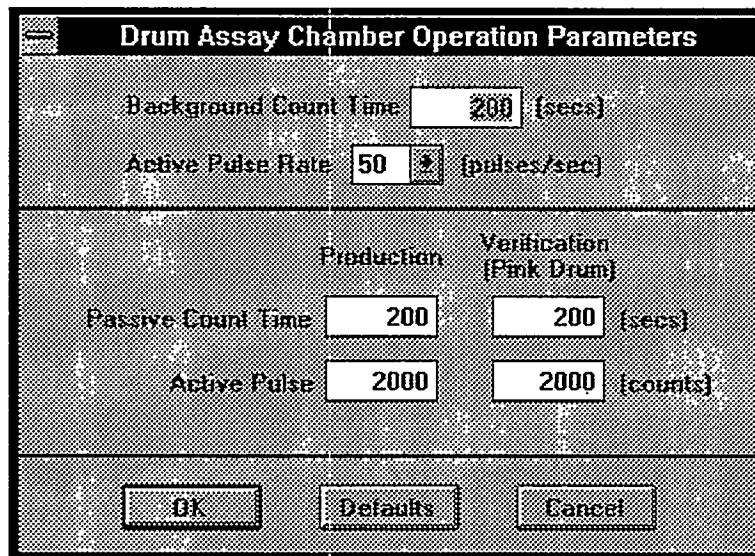
10.8.4 Valid Test Cases

CP.1

Purpose

This test addresses setting the background count time limit, requirements 3.1.3.3 M.1 and M.2, and acquiring and storing passive background data, requirements 3.1.3.4 M.6 and M.7.

Input Description

1) In the chamber operation parameters dialog, enter the background count time of 10 sec.
2) Click on OK.
3) Pull down the Run menu and select Background.
4) Wait until the acquisition is completed normally.
5) Press Accept button in the passive background data dialog.
6) Pull down the File menu and select Print.
7) Select the file name BACKGRND from the DAC directory.
8) Click on OK.

Expected Results

The background data file should be printed. The counts from the 10 kHz clock (port 4, station 11 for the drum assay chamber) should be between 100,000 and 102,000 units.

Pass/Fail Criteria

Test passes if the background data file is printed as described.

CP.2

Purpose

This test addresses setting the background count time limit, requirements 3.1.3.3 M.1 and M.2, and acquiring and storing passive background data, requirements 3.1.3.4 M.6 and M.7.

Input Description

1) In the chamber operation parameters dialog, enter the background count time of 300.
2) Click on OK.
3) Pull down the Run menu and select Background.
4) After the acquisition has started, in the acquisition dialog, click on Cancel.

Expected Results

The acquisition is canceled and the system returns to the operator menu bar.

Pass/Fail Criteria

Test passes if the Run menu item is enabled in the menu bar.

CP.3

Purpose

This test addresses setting the background count time limit, requirements 3.1.3.3 M.1 and M.2, and acquiring and storing passive background data, requirements 3.1.3.4 M.6 and M.7.

Input Description

1) In the chamber operation parameters dialog, enter the background count time of 200.
2) Click on OK.
3) Pull down the Run menu and select Background.

5) Press Accept button in passive background data dialog.
6) Pull down the File menu and select Print.
7) Select the file name BACKGRND from the DAC directory.
8) Click on OK.

Expected Results

The background data file should be printed. The counts from the 10 kHz clock (port 4, station 11 for the drum assay chamber) should be between 2,000,000 and 2,002,000.

Pass/Fail Criteria

Test passes if the background data file is printed as described.

CP.4

Purpose

This test addresses setting the active pulse count limit and passive count time limit for verification, requirements 3.1.3.3 M.1 and M.2. It also covers acquiring active and passive data, requirements 3.1.3.4 M.3 and M.6, and storing the data, requirements 3.1.3.4 M.4 and M.7.

Input Description

1) In the chamber operation parameters dialog,
   - Enter passive count time for verification of 10
   - Enter active pulse count for verification of 100 (this must also be manually entered in the neutron generator control panel).
2) Click on OK.
3) Select Yes.
4) Click on OK.
5) Pull down the Run menu and select Verification.
6) Wait until both the active and the passive acquisitions are completed normally.
7) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
8) If the Auto Data Save box is selected in the Options menu the results will be automatically saved; otherwise, in the results dialog, click on Save.
9) Click on Close.
10) Pull down the File menu and select Print.
11) Select the file name 000496 from the DAC directory.
12) Click on OK.

Expected Results

The verification data file should be printed. The counts from the 10 kHz clock (port 4, station 11 for the drum assay chamber) should be between 100,000 and 102,000. The counts for the active pulse (port 6, station 11 for the drum assay chamber) should be exactly 100.

Pass/Fail Criteria

Test passes if the verification data file is printed as described.

CP.5

Purpose

This test addresses setting the active pulse count limit and passive count time limit for verification, requirements 3.1.3.3 M.1 and M.2. It also covers acquiring active and passive data, requirements 3.1.3.4 M.3 and M.6, and storing the data, requirements 3.1.3.4 M.4 and M.7.

Input Description

1) In the chamber operation parameters dialog,
   - Enter passive count time for verification of 200
   - Enter active pulse count for verification of 2,000.
2) Click on OK.
3) Pull down the Run menu and select Verification.
4) Wait until both the active and the passive acquisitions are completed normally.
5) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
6) If the Auto Data Save box is selected in the Options menu the results will be automatically saved; otherwise, in the results dialog, click on Save.
7) Click on Close.
8) Pull down the File menu and select Print.
9) Select the file name 000496 from the DAC directory.
10) Click on OK.

Expected Results

The verification data file should be printed. The counts from the 10 kHz clock (port 4, station 11 for the drum assay chamber) should be between 2,000,000 and 2,002,000. The counts for the active pulse (port 6, station 11 for the drum assay chamber) should be exactly 2,000.

Pass/Fail Criteria

Test passes if the verification data file is printed as described.

CP.6

Purpose

This test addresses setting the active pulse count limit and passive count time limit for production, requirements 3.1.3.3 M.1 and M.2. It also covers acquiring active and passive data, requirements 3.1.3.4 M.3 and M.6, and storing the data, requirements 3.1.3.4 M.4 and M.7.

Input Description

1) In the chamber operation parameters dialog,
   - Enter passive count time for production of 10
   - Enter active pulse count for production of 100.
2) Click on OK.
3) Click on Yes.
4) Click on OK.
5) Pull down the File menu and select New.
6) In the new file dialog, enter file name CP_6.
7) Click on OK.
8) In the waste attributes dialog,
   - Select 55-gallon drum for the container type

- Select matrix type 152
- Enter net weight 6.0.

9) Click on Assay.

10) Select Full.

11) Wait until both the active and the passive acquisitions are completed normally.

12) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.

13) If the Auto Data Save box is selected in the Options menu the results will be automatically saved; otherwise, click on Save.

14) Click on Close.

15) Pull down the File menu and select Print.

16) Select file name CP_6.001.

17) Click on OK.

Expected Results

The summary report and the production data file should be printed. The counts from the 10 kHz clock (port 4, station 11 for the drum assay chamber) should be between 100,000 and 102,000. The counts for the active pulse (port 6, station 11 for the drum assay chamber) should be exactly 100.

Pass/Fail Criteria

Test passes if the production data file is printed as described.

CP.7

Purpose

This test addresses setting the active pulse count limit and passive count time limit for production, requirements 3.1.3.3 M.1 and M.2. It also covers acquiring active and passive data, requirements 3.1.3.4 M.3 and M.6, and storing the data, requirements 3.1.3.4 M.4 and M.7.

Input Description

1) In the chamber operation parameters dialog,
   - Enter passive count time for production of 300
   - Enter active pulse count for production of 5,000.
2) Click on OK.
3) Click on Yes.
4) Click on OK.
5) Pull down the File menu and select New.
6) In the new file dialog, enter file name CP_7.
7) Click on OK.
8) In the waste attributes dialog,
   - Select 55-gallon drum for the container type
   - Select matrix type 152
   - Enter net weight 6.0.
9) Click on Assay.
10) Select Full.
11) Wait until both the active and the passive acquisitions are completed normally.
12) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
13) If the Auto Data Save box is selected in the Options menu the results will be automatically saved; otherwise, click on Save.
14) Click on Close.
15) Pull down the File menu and select Print.
16) Select file name CP_7.001.
17) Click on OK.

Expected Results

The production data file should be printed. The counts from the 10 kHz clock (port 4, station 11 for the drum assay chamber) should be between 3,000,000 and 3,002,000. The counts for the active pulse (port 6, station 11 for the drum assay chamber) should be exactly 5,000.

Pass/Fail Criteria

Test passes if the production data file is printed as described.

10.8.5 Invalid Test Cases

CP.8

Purpose

This test addresses setting the chamber operation parameters . This test is against requirement 3.1.3.3 M.1.

Special Requirements

Exit from the assay system. Rename the OPTIONS.DAC file in the DAC subdirectory to OPTIONS.BAK. At the conclusion of the this test, rename the OPTIONS.BAK file to OPTIONS.DAC.

Input Description

Log in to the assay system as either an operator or physicist.

Expected Results

"File not found" dialog is displayed,
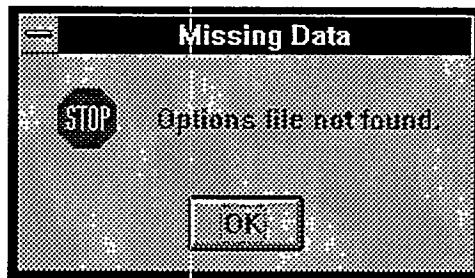
the "Chamber configuration file(s) not found" dialog is displayed,
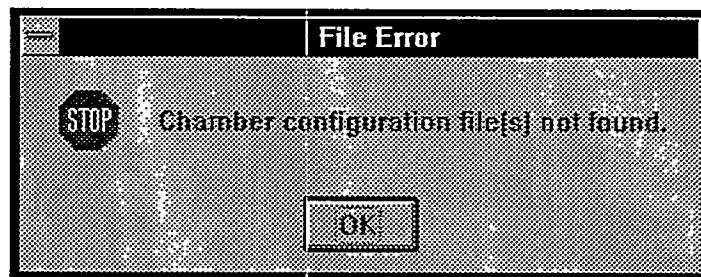
and the "No chamber(s) specified..." dialog is displayed.

Pass/Fail Criteria
The test passes if the error dialog is displayed.

<div align="center">

CP.9

</div>

Purpose
This test addresses setting the background count time to invalid values. This test is against requirement 3.1.3.3 M.2.

Input Description
   1) In the chamber operation parameters dialog, enter background count time 0.
   2) Click on OK.

Expected Results
"Values must be > 0" dialog is displayed.
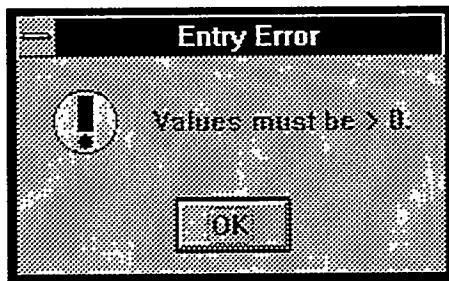
Pass/Fail Criteria
The test passes if the error dialog is displayed.

<div align="center">

CP.10

</div>

Purpose
This test addresses setting the background count time to invalid values. This test is against requirement 3.1.3.3 M.2.

Input Description
   1) In the chamber operation parameters dialog, enter background count time -10.
   2) Click on OK.

Expected Results
"Values must be > 0" dialog is displayed.

Pass/Fail Criteria
The test passes if the error dialog is displayed.

<div align="center">

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</div>
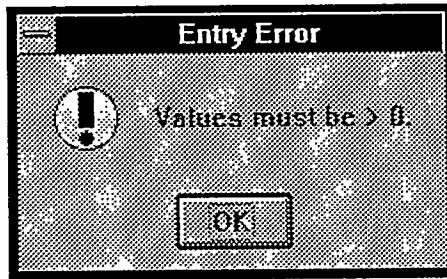
CP.11

Purpose

This test addresses setting the background count time to invalid values. This test is against requirement 3.1.3.3 M.2.

Input Description

1) In the chamber operation parameters dialog, enter background count time 6,000.
2) Click on OK.

Expected Results

"Count time(s) exceed one hour ..." warning dialog is displayed.
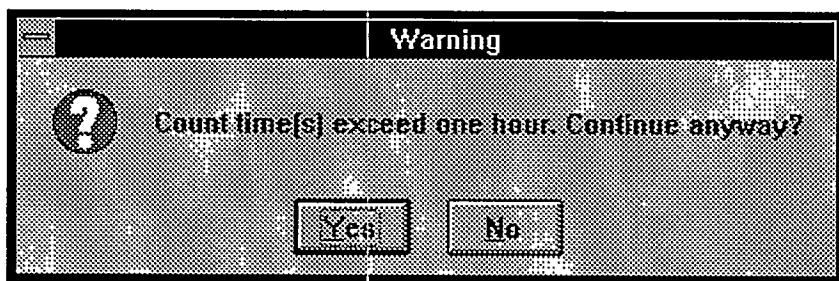
Pass/Fail Criteria

The test passes if the error dialog is displayed.

CP.12

Purpose

This test addresses setting the active pulse count for verification to invalid values. This test is against requirement 3.1.3.3 M.2.

Input Description

1) In the chamber operation parameters dialog, enter active pulse count for verification 0.
2) Click on OK.

Expected Results

"Values must be > 0" dialog is displayed.
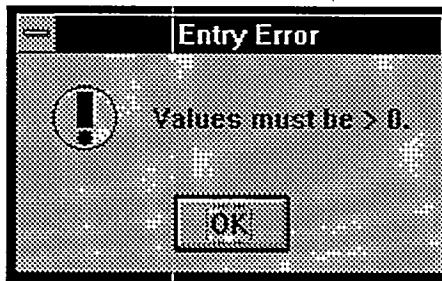
Pass/Fail Criteria

The test passes if the error dialog is displayed.

CP.13

Purpose

This test addresses setting the active pulse count for verification to invalid values. This test is against requirement 3.1.3.3 M.2.

Input Description

1) In the chamber operation parameters dialog, enter active pulse count for verification -10.

2) Click on OK.

Expected Results

"Values must be > 0" dialog is displayed.

Entry Error
(!) Values must be > 0.
OK
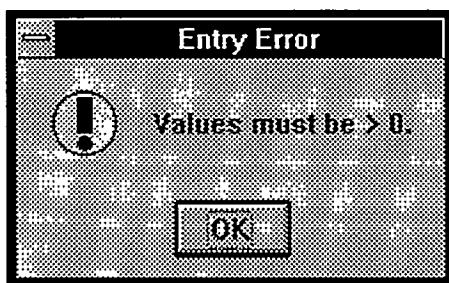
Pass/Fail Criteria

The test passes if the error dialog is displayed.

CP.14

Purpose

This test addresses setting the active pulse count for verification to invalid values. This test is against requirement 3.1.3.3 M.2.

Input Description

In the chamber operation parameters dialog, attempt to enter more that six digits in the active pulse count for verification field.

Expected Results

No more than six digits may be entered.

Pass/Fail Criteria

Test passes if no more than six digits can be entered.

CP.15

Purpose

This test addresses setting the active pulse count for production to invalid values. This test is
Input Description.

Input Description

1) In the chamber operation parameters dialog, enter active pulse count for production 0.
2) Click on OK.

Expected Results

"Values must be > 0" dialog is displayed.
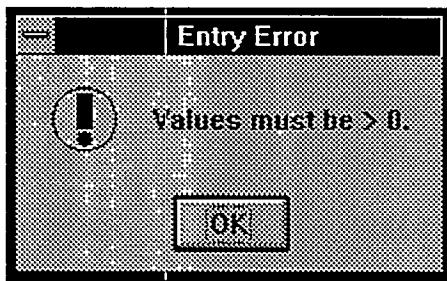
Pass/Fail Criteria

The test passes if the error dialog is displayed.

CP.16

Purpose

This test addresses setting the active pulse count for production to invalid values. This test is
against requirement 3.1.3.3 M.2.

Input Description

1) In the chamber operation parameters dialog, enter active pulse count for
production -10.
2) Click on OK.

Expected Results

"Values must be > 0" dialog is displayed.
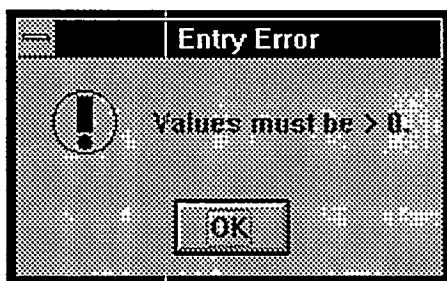
Pass/Fail Criteria

The test passes if the error dialog is displayed.

CP.17

Purpose

This test addresses setting the active pulse count for production to values that are too large. This test is against requirement 3.1.3.3 M.2.

Input Description

In the chamber operation parameters dialog, attempt to enter more that six digits in the active pulse count for production field.

Expected Results

No more than six digits may be entered.

Pass/Fail Criteria

Test passes if no more than six digits can be entered.

CP.18

Purpose

This test addresses setting the passive count time for verification to invalid values. This test is against requirement 3.1.3.3 M.2.

Input Description

1) In the chamber operation parameters dialog, enter passive count time for verification 0.
2) Click on OK.

Expected Results

"Values must be > 0" dialog is displayed.
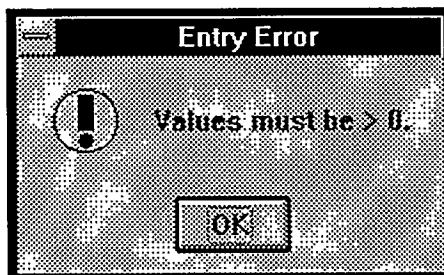
Pass/Fail Criteria

The test passes if the error dialog is displayed.

CP.19

Purpose

This test addresses setting the passive count time for verification to invalid values. This test is against requirement 3.1.3.3 M.2.

Input Description

1) In the chamber operation parameters dialog, enter passive count time for verification -10.
2) Click on OK.

Expected Results

"Values must be > 0" dialog is displayed.
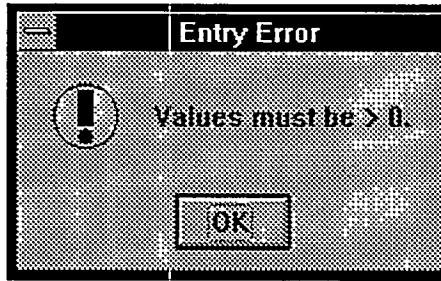
Pass/Fail Criteria

The test passes if the error dialog is displayed.

CP.20

Purpose

This test addresses setting the passive count time for verification to values that are too large. This test is against requirement 3.1.3.3 M.2.

Input Description

1) In the chamber operation parameters dialog, enter passive count time for verification 9999.
2) Click on OK.

Expected Results

"Count time(s) exceed one hour ..." dialog is displayed.
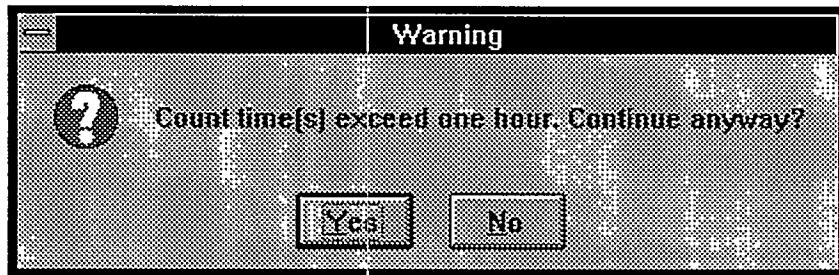
Pass/Fail Criteria

The test passes if the error dialog is displayed.

CP.21

Purpose

This test addresses setting the passive count time for production to invalid values. This test is against requirement 3.1.3.3 M.2.

Input Description

1) In the chamber operation parameters dialog, enter passive count time for production 0.
2) Click on OK.

Expected Results

"Values must be > 0" dialog is displayed.

Entry Error

Values must be > 0.

OK
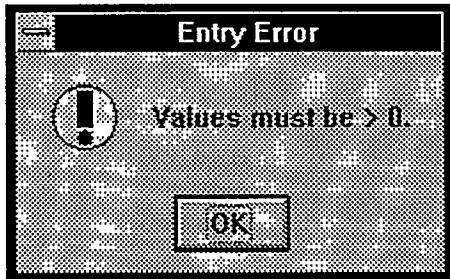
Pass/Fail Criteria
The test passes if the error dialog is displayed.

CP.22

Purpose
This test addresses setting the passive count time for production to invalid values. This test is against requirement 3.1.3.3 M.2.

Input Description
1) In the chamber operation parameters dialog, enter passive count time for production -10.
2) Click on OK.

Expected Results
"Values must be > 0" dialog is displayed.

Entry Error

Values must be > 0.

OK
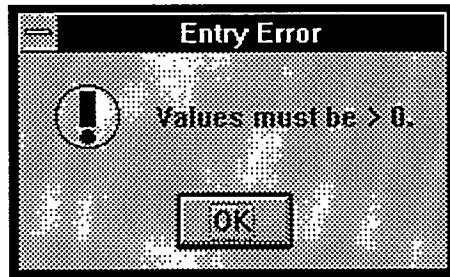
Pass/Fail Criteria
The test passes if the error dialog is displayed.
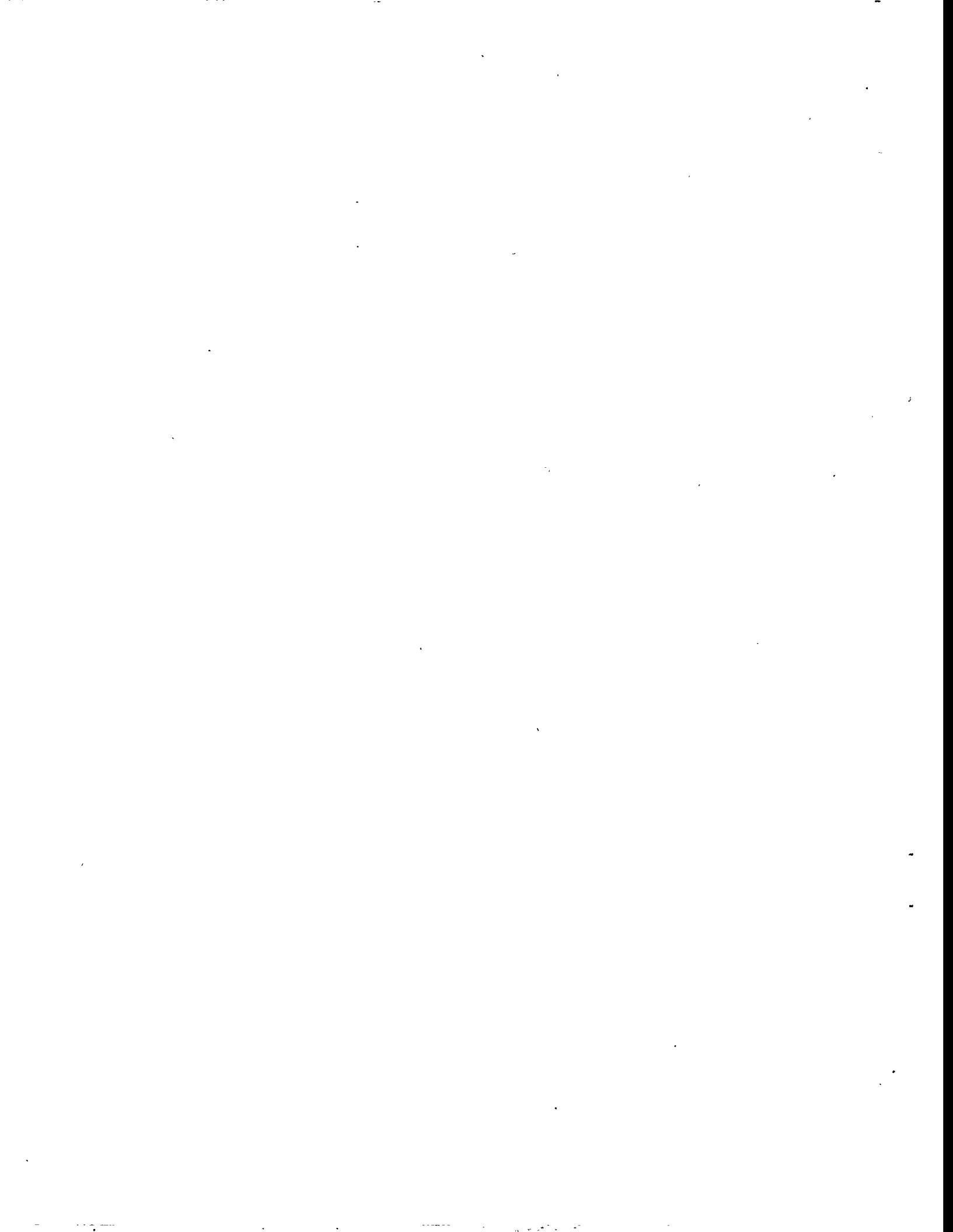
10.9 CAMAC Interface

10.9.1 Introduction and Description

These tests address whether the CAMAC configuration files are available to SAS and whether the CAMAC system is operational.

10.9.2 Special Requirements

Auto Summary Report must be enabled. The default processing options, active pulse counts and passive count time, must be enabled. The CAMAC crate must be on-line.

10.9.3 Procedure Steps

Log in as an operator.

10.9.4 Valid Test Cases

CI.1

Purpose

This test evaluates the SAS interface with the CAMAC system, requirement 3.1.3.4 M.1 and SCR Requested Enhancements, problem 4.

Input Description

1) Pull down the File menu and select New.
2) In the new file dialog, enter file name CI_1.
3) Click on OK.
4) In the waste attributes dialog,

- Select 55-gallon drum for the container type
- Select matrix type 152
- Enter net weight 6.0.

5) Click on Assay.
6) Select Full.
7) Wait until both the active and the passive acquisitions are completed normally.
8) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
9) If the Auto Data Save box is selected in the Options menu the results will be automatically saved; otherwise, click on Save.
10) Click on Close.
11) Pull down the File menu and select Print.
12) In the print file dialog, enter file name CI_1.001.
13) Click on OK.

Expected Results

A summary report will be automatically printed. The saved file will be printed when the print file option is completed.

Pass/Fail Criteria

The test passes if a summary report is printed, and if the save file is printed and all sections are present in the printout. The sections which should be present are:

1) A header section listing file creation date, program ID and file ID.
2) CHAMBER.
3) CONTAINER.
4) MATRIX.
5) PU_MASS_FRACTIONS.
6) An "Active" data.
7) A "Passive Gross".
8) A "Passive Background".
9) A "Chamber Configuration Parameters".
10) A "Net Active Count Rates".
11) A "Net Passive Count Rates".
12) A "Active/Passive Mass Values".
13) A "Reported Mass Values".
14) A "Derived Quantities".
15) A "Calculated Matrix Corrections".
16) A "Recalculated Mass Values".

10.9.5 Invalid Test Cases

CI.2

Purpose

This test evaluates the SAS interface with CAMAC, when power to the CAMAC is not available, requirement 3.1.3.4 M.1.

Special Requirements

Switch off the power to the CAMAC crate. At the conclusion of this test, switch on the power to the CAMAC crate.

Input Description

1) Pull down the File menu and select New.
2) In the new file dialog, enter file name CI_2.
3) Click on OK.
4) In the waste attributes dialog,
   - Select 55-gallon drum for the container type
   - Select matrix type 152
   - Enter net weight 6.0.
5) Click on Assay.
6) Select Full.

Expected Results

"Check CAMAC crate power ..." dialog is displayed.
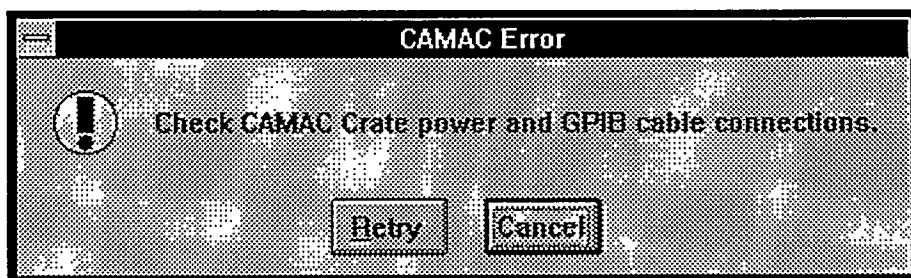
Pass/Fail Criteria

The test passes if the error dialog is displayed.

CI.3

Purpose

This test evaluates the SAS interface with the CAMAC system when the CAMAC crate configuration file is not available, requirement 3.1.3.4 M.1.

Special Requirements

Log out from the system. Rename ACTCRATE.DAC in the DAC subdirectory to ACTCRATE.BAK. Log in to the system as either an operator or a physicist. At the conclusion of this test, log out from the system and rename ACTCRATE.BAK to ACTCRATE.DAC.

Input Description

1) Pull down the File menu and select New.
2) In the new file dialog, enter file name CI_3.
3) Click on OK.
4) In the waste attributes dialog,

   • Select 55-gallon drum for the container type

   • Select matrix type 152

   • Enter net weight 6.0.

5) Click on Assay.
6) Select Active.

Expected Results

"Active CAMAC crate configuration file not found" dialog is displayed.
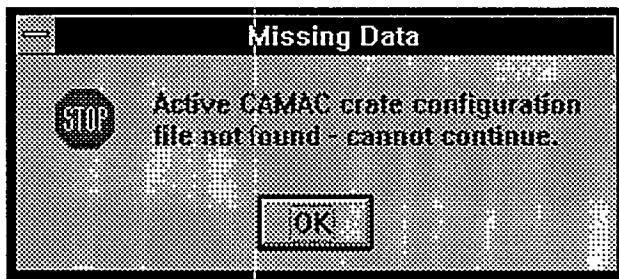
Pass/Fail Criteria

The test passes if the error dialog is displayed.

<center>*CI.4*</center>

Purpose

This test evaluates the SAS interface with the CAMAC system when the CAMAC crate configuration file is not available, requirement 3.1.3.4 M.1.

Special Requirements

Log out from the system. Rename PASCRATE.DAC in the DAC subdirectory to PASCRATE.BAK. Log in to the system as either an operator or a physicist. At the conclusion of this test, log out from the system and rename PASCRATE.BAK to PASCRATE.DAC.

Input Description

1) Pull down the File menu and select New.
2) In the new file dialog, enter file name CI_4.
3) Click on OK.
4) In the waste attributes dialog,

   • Select 55-gallon drum for the container type

   • Select matrix type 152

   • Enter net weight 6.0.

5) Click on Assay.
6) Select Passive.

Expected Results

"Passive CAMAC crate configuration file not found" dialog is displayed.
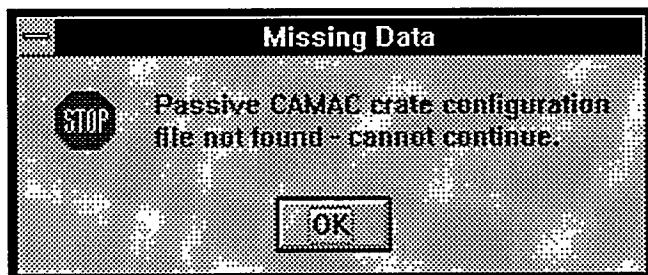
Pass/Fail Criteria

The test passes if the error dialog is displayed.

CI.5

Purpose

This test evaluates the SAS interface with the CAMAC system when the controller is not available, requirement 3.1.3.4 M.1.

Special Requirements

The CAMAC crate power must be on. The configuration files ACTCRATE.DAC and PASCRATE.DAC must be available. The GPIB controller cable connection from the PC to the CAMAC crate must be disconnected.

Input Description

      1) Pull down the File menu and select New.

      2) In the new file dialog, enter file name CI_5.

      3) Click on OK.

      4) In the waste attributes dialog,

              • Select 55-gallon drum for the container type

              • Select matrix type 152

              • Enter net weight 6.0.

      5) Click on Assay.

      6) Select Full.

Expected Results

"Check CAMAC crate power ..." dialog is displayed.
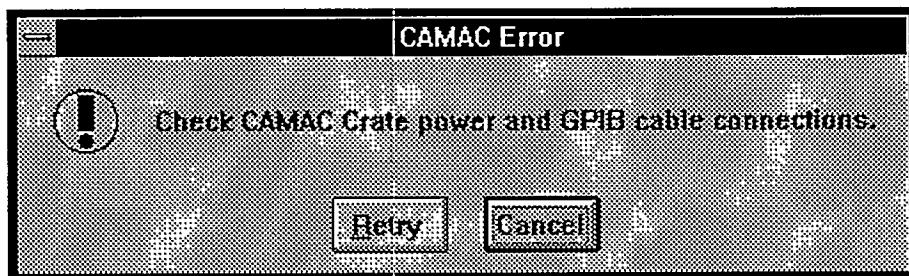
Pass/Fail Criteria

The test passes if the error dialog is displayed.

10.10 Time and Date of Data Acquisition

10.10.1 Introduction and Description

These tests address the time and date for the active and passive data acquisition.

10.10.2 Special Requirements

The CAMAC crate must be on-line. Auto Summary Report must be enabled.

10.10.3 Procedure Steps

Log in as an operator.

10.10.4 Valid Test Cases

TDDA.1

Purpose

This test addresses the acquisition of active data, time and date of the acquisition, and storing the active data on file, as specified by requirement 3.1.3.4 M.2, 3.1.4.2 M.4, and 3.1.4.3 M.27.

Input Description

1) Pull down the File menu and select New.
2) In the new file dialog, enter file name TDDA_1.
3) Click on OK.
4) In the waste attributes dialog,
    - Select 55-gallon drum for the container type
    - Select matrix type 152
    - Enter net weight 6.0.
5) Click on Assay.
6) Select Active.
7) Using the "clock" window in the lower right-hand corner of the screen, note time in hours, minutes, and seconds when Active was selected.
8) Wait until the acquisition is completed normally.
9) Select File menu, then click on Save.
10) Click on Close.
11) Pull down the File menu and select Print.
12) In the print file dialog, enter file name TDDA_1.001.
13) Click on OK.

Expected Results

The summary report for TDDA_1 will be printed. The time of active data acquisition on the report should be within 10 seconds of the noted computer clock time. The saved file will be printed when the print file option is completed.

Pass/Fail Criteria

The test passes if a summary report is printed, and if the save file is printed and all sections are present in the printout.

TDDA.2

Purpose

This test addresses the acquisition of passive data, time and date of the acquisition, and storing the passive data on file, as specified by requirement 3.1.3.4 M.2, 3.1.4.2 M.4, and 3.1.4.3 M.27.

Input Description

1) Pull down the File menu and select New.
2) In the new file dialog, enter file name TDDA_2.
3) Click on OK.
4) In the waste attributes dialog,
   - Select 55 gallon drum for the container type
   - Select matrix type 152
   - Enter net weight 6.0.
5) Click on Assay.
6) Select Passive.
7) Using the "clock" window in the lower right-hand corner of the screen, note time in hours, minutes, and seconds when Passive was selected.
8) Wait until the acquisition is completed normally.
9) Select File menu, then click on Save.
10) Click on Close.
11) Select File menu, select Print, then enter TDDA_2.001.

Expected Results

The summary report for TDDA_2 will be printed. The time of passive data acquisition on the report should be within 10 seconds of the noted computer clock time.

Pass/Fail Criteria

This test passes if the summary report appears as indicated.

10.10.5 Invalid Test Cases

None.

10.11 Passive Signals

10.11.1 Introduction and Description

These tests address the calculation of the passive shielded total, system total, system coincidence, and shielded coincidence rates and errors.

10.11.2 Special Requirements

Ensure that Auto Summary Report is enabled. The files needed for these tests should be located in the .\DAC\TEST subdirectory of the assay system root directory.

10.11.3 Procedure Steps

Log in as an operator or physicist, as specified.

10.11.4 Valid Test Cases

PS.1

Purpose
This test addresses passive data acquisition and reduction, requirements 3.1.3.4 M.8, and 3.1.3.6 M.1 through M.8, and SCR Technical Problems, Item 5.

Input Description
1) Login as an operator.
2) Pull down the File menu and select Open.
3) In the open file dialog, select the file name PS.001.
4) Click on OK.
5) In the waste attributes dialog, click on Continue.
6) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
7) In the results dialog, click on Close after evaluating if the responses are different from the values given below.
8) Pull down the File menu and select Print, then select the file name PS.001.

Expected Results
A warning about too large a variation in side detector counts will appear, and the offending data field in the "Passive Data" window will be highlighted. The values from hand calculations, using the formulas provided in the SRS [2], are shown below. These values must be independently verified.

Shielded total net rate = 9.14 ± 0.22 counts/sec
System total net rate = 37.81 ± 0.49 counts/sec
Shielded coincidence net rate = 0.10 ± 0.024 counts/sec
System coincidence net rate = 2.01 ± 0.11 counts/sec

	Bare counts	Shielded counts		Net Rate ± One Sigma (counts/sec)	
Passive Data					
Left:	5113	1406	Shielded Total:	9.14 ±	0.22
Back:	5476	1365	System Total:	37.81 ±	0.49
Right:	6835	2222	Shielded Coincidence:	0.101 ±	0.024
Door:	6262	1344	System Coincidence:	2.012 ±	0.110
Top:	4145	1106			
Bottom:	2489	964	Notes:		
Sum:	30320	8407	Maximum side variation from average is 40 %.		
Total:	30320	8407			

Pass/Fail Criteria

The test passes if the expected results are attained.

10.11.5 Invalid Test Cases

PS.2

Purpose

This test addresses the handling of invalid passive assay data values, requirements 3.1.3.4 M.8 and 3.1.3.6 M.1 through M.8

Input Description

1) Login as an operator.
2) Pull down the File menu and select Open.
3) In the open file dialog, select the file name PS.002.
4) Click on OK.
5) In the Waste Attributes dialog, click on Continue.
6) Pull down the File menu and select Close.

Expected Results

"Incomplete Data" dialog is displayed.
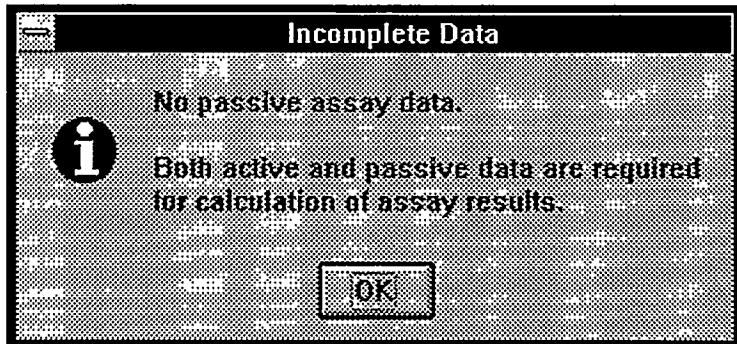
Pass/Fail Criteria
This test passes if the informational dialog is displayed.

PS.3

Purpose
This test addresses the handling of invalid passive data values, requirements 3.1.3.4 M.8 and 3.1.3.6 M.1 through M.8.

Input Description
1) Login as a physicist.
2) Pull down the File menu and select Open.
3) In the open file dialog, select the file name PS.003.
4) Click on OK.
5) In the Waste Attributes dialog, click on Edit.
6) Select "Use current Chamber & Matrix data."
7) Change the matrix type to 300.
8) In the Waste Attributes dialog, click on Continue.
9) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
10) In the results dialog, click on Close after evaluating the response. Do *not* save data.

Expected Results
"Assay results may be..." dialog is displayed.
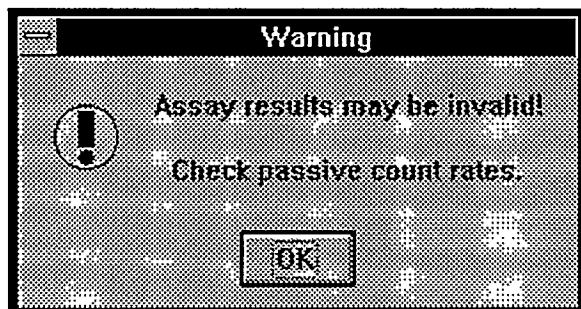
Pass/Fail Criteria
This test passes if the warning dialog is displayed.

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PS.4

Purpose

This test addresses the handling of invalid passive assay data values, requirements 3.1.3.4 M.8 and 3.1.3.6 M.1 through M.8.

Input Description

1) Login as an operator.
2) Pull down the File menu and select Open.
3) In the open file dialog, select the file name PS.004.
4) Click on OK.
5) In the Waste Attributes dialog, click on Continue.
6) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
7) In the results dialog, click on Close after evaluating the response.

Expected Results

"Rate < 0" dialog is displayed.
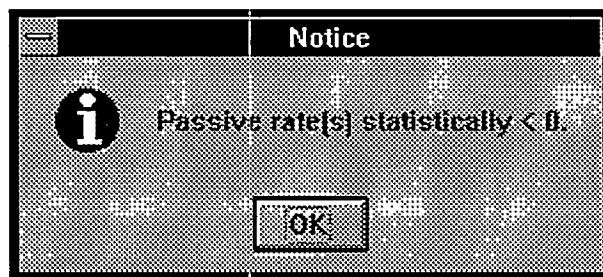
Pass/Fail Criteria

This test passes if the informational dialog is displayed.

10.12 Active Signals

10.12.1 Introduction and Description

These tests address the calculation of active flux monitor, barrel flux monitor, and shielded total rates and errors.

10.12.2 Special Requirements

Ensure that Auto Summary Report is enabled. The files needed for these tests should be located in the .\DAC\TEST subdirectory of the assay system root directory.

10.12.3 Procedure Steps

Login as an operator.

10.12.4 Valid Test Cases

AS.1

Purpose

This test addresses active assay data acquisition and reduction, requirements 3.1.3.4 M.5 and 3.1.3.5 M.1 through M.6, and SCR Technical Problems, Item 5.

Input Description

1) Pull down the File menu and select Open.
2) In the open file dialog, select the file name AS.001.
3) Click on OK.
4) In the Waste Attributes dialog, click on Continue.
5) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The results dialog will be displayed.
6) In the results dialog, click on Close after evaluating the response per active data box shown below.

Expected Results

The values from hand calculations, using the formulas provided in the SRS [2], are shown below. These values must be independently verified.

Shielded total net rate = 461.25 ± 11.00 counts/sec

Flux monitor net rate = 5795.05 ± 38.07 counts/sec

Barrel flux monitor net rate = 5794.45 ± 38.07counts/sec

The active data dialog displays the rates.

Active Data	Gross Counts	Background Counts	Net Rate ± One Sigma (counts/sec)	
Shielded Total	1922	385	461.3 ±	11.0
Flux Monitor	23186	29	5795.0 ±	38.1
Barrel Flux Monitor	23186	41	5794.5 ±	38.1

Pass/Fail Criteria

The test passes if the expected results are attained, and the proper number of significant figures are displayed.

## 10.12.5 Invalid Test Cases

AS.2

Purpose

This test addresses the handling of invalid active assay data values, requirements 3.1.3.4 M.5 and 3.1.3.5 M.1 through M.6

Input Description

    1) Pull down the File menu and select Open.

    2) In the open file dialog, select the file name AS.002.

    3) Click on OK.

    4) In the Waste Attributes dialog, click on Continue.

    5) Active and passive data dialogs will be displayed. Warning messages regarding the counts should also be displayed. Acknowledge any such messages. The results dialog will be displayed.

    6) In the results dialog, click on Close after evaluating the response.

Expected Results

"Very low counts..." dialog is displayed.
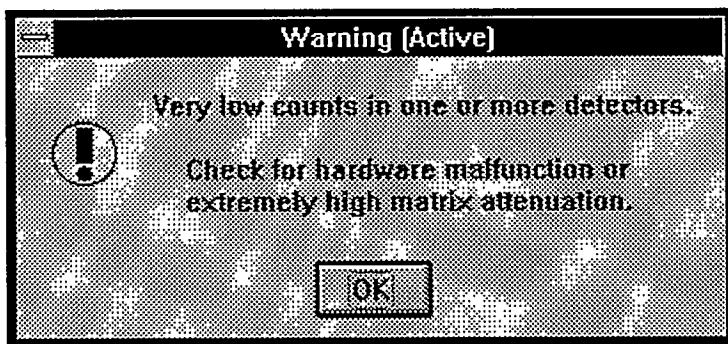
"Assay results may be invalid!" dialog is displayed.
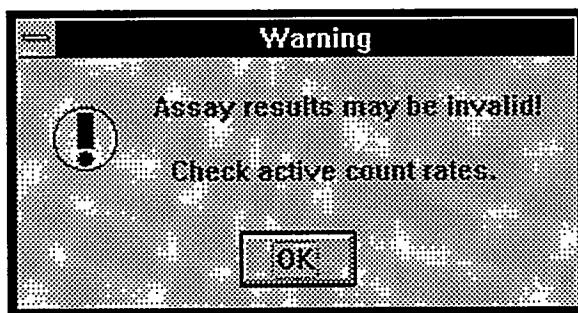
Pass/Fail Criteria

This test passes if the warning dialogs are displayed.

AS.3

Purpose

This test addresses the handling of invalid active assay data values, requirements 3.1.3.4 M.5 and 3.1.3.5 M.1 through M.6

Input Description

1) Pull down the File menu and select Open.
2) In the Open File dialog, select the file name AS.003.
3) Click on OK.
4) In the Waste Attributes dialog, click on Continue.
5) Active and passive data dialogs will be displayed. Warning messages regarding the counts should also be displayed. Acknowledge any such messages. The results dialog will be displayed.
6) In the results dialog, click on Close after evaluating the response.

Expected Results

"Very low counts..." dialog is displayed.
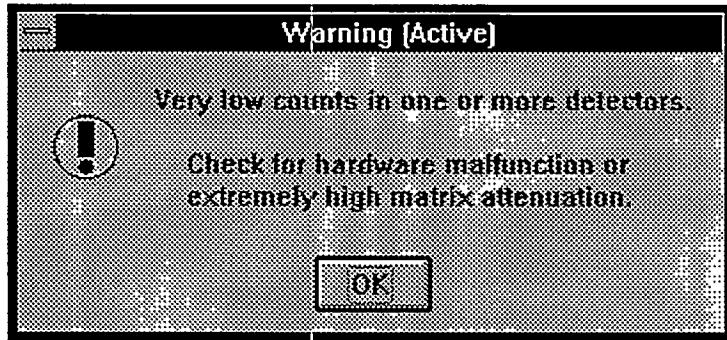
"Assay results may be invalid!" dialog is displayed.
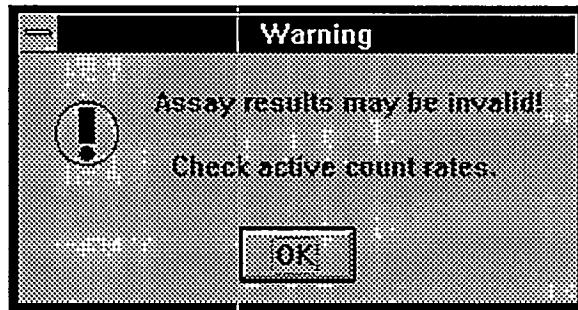
Pass/Fail Criteria

This test passes if the warning dialogs are displayed.

10.13 Data Reduction

10.13.1 Introduction and Description

These tests address the computation of active Plutonium mass, active Plutonium mass error, passive Plutonium mass, passive Plutonium mass error, Americium mass, Americium mass error, thermal power, thermal power error, thermal power density, thermal power density error, total alpha activity, total alpha activity error, activity concentration error, selection of the total Plutonium mass and error, individual plutonium isotopic masses (238, 239, 240 and 241), the mass of ^{235}U when its presence is indicated by gamma ray measurement results, TRU activity, TRU activity concentration, total activity, plutonium equivalent curies, and fissile gram equivalent. These tests will also test the assay recalculation from existing signal data and the production of the measurement summary.

10.13.2 Special Requirements

Ensure that Auto Summary Report is enabled. The files needed for these tests should be located in the .\DAC\TEST subdirectory of the assay system root directory. Open the file AS.INI located in the root directory of the assay system root directory and verify that "NEUT2_CONVERSION" is set to "OFF".

10.13.3 Procedure Steps

Login as an operator.

10.13.4 Valid Test Cases

DR.1

Purpose

This test addresses computation of Plutonium and Americium masses, thermal power, thermal power density, total alpha activity, activity concentration, and the associated errors. This test addresses the requirements 3.1.4.3 M.5 through M.12 and M.15 through M.26.

Input Description

1) Pull down the File menu and select Open.
2) In the Open File dialog, select the file name DR.001.
3) Click on OK.
4) In the Waste Attributes dialog, click on Continue.
5) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The Results dialog will be displayed.
6) In the Eesults dialog, click on Close after evaluating the response.

Expected Results

The values from hand calculations, using the formulas provided in the SRS [2], are shown below. These values must be independently verified.

Total Plutonium mass: (0.3411 ± 0.0086) g
Pu-238 mass: (4.093 ± 0.103)E-5 g
Pu-239 mass: (0.3201 ± 0.0081) g
Pu-240 mass: (0.01985 ± 0.00050) g
Pu-241 mass: (1.160 ± 0.029)E-3 g
Am-241 mass: (4.833 ± 0.138)E-3 g
Thermal power: (1.354 ± 0.026)E-3 Watts
Thermal power density: (1.842 ± 0.035)E-4 Watts/ft^3
Total activity: (0.1628 ± 0.0037) Ci
Alpha activity: (0.04218 ± 0.00080) Ci
TRU activity: (0.04218 ± 0.00080) Ci
TRU activity concentration: (4.218 ± 0.080)E+5 nCi/g
Plutonium Equivalent Curies: (0.04211 ± 0.00080) Ci
Fissile Gram Equivalent: (0.3232 ± 0.0082) g

The summary report is printed and the results dialog displays the values.

```
┌────────────────────────────────────────────────────────────────┐
│ ⯇                       Measurement Results                    ⯆ │
├────────────────────────────────────────────────────────────────┤
│                  Isotopic Mass Values  [ ± One Sigma ]           │
│  ┌──────────────────────────────────────────────────────────┐   │
│  │ Total Pu      [0.3411 ± 0.0086] g           [ Note 1 ]    │   │
│  │ Pu-238        [4.093 ± 0.103]E-5  g          [ Note 2 ]   │   │
│  │ Pu-239        [0.3201 ± 0.0081] g                         │   │
│  │ Pu-240        [0.01985 ± 0.00050]  g                      │   │
│  │ Pu-241        [1.160 ± 0.029]E-3  g                       │   │
│  │ Am-241        [4.833 ± 0.138]E-3  g          [ Note 3 ]   │   │
│  └──────────────────────────────────────────────────────────┘   │
│    Notes:   1 - Derived from Active Assay data.                  │
│             2 - Saved mass fractions used for Pu isotopic masses.│
│             3 - Determined using "Neutron Excess" method.        │
│                  Derived Values  [ ± One Sigma ]                 │
│  ┌──────────────────────────────────────────────────────────┐   │
│  │ Thermal Power            [1.354 ± 0.026]E-3  Watts      ▲ │   │
│  │ Thermal Power Density    [1.842 ± 0.035]E-4  Watts/ft**3 │   │
│  │ Total Activity           [0.1628 ± 0.0037]  Ci           │   │
│  │ Alpha Activity           [0.04218 ± 0.00080]  Ci         │   │
│  │ TRU Activity             [0.04218 ± 0.00080]  Ci         │   │
│  │ TRU Activity Concentration [4.218 ± 0.080]E+5  nCi/g    ▼ │   │
│  └──────────────────────────────────────────────────────────┘   │
│       [ Print Report ]       [ Save ]        [ Close ]           │
└────────────────────────────────────────────────────────────────┘
```

Pass/Fail Criteria

The test passes if the computed values agree with the hand calculations to two significant decimal digits.

DR.2

Purpose

This test addresses computation of Plutonium and Americium masses, thermal power, thermal power density, total alpha activity, activity concentration, and the associated errors. This test addresses the requirements 3.1.4.3 M.5 through M.12 and M.15 through M.26.

Input Description

1) Login as a physicist.
2) Pull down the File menu and select Open.
3) In the Open File dialog, select the file name DR.002.
4) Click on OK.
5) In the Waste Attributes dialog, click on Edit.
6) Select "Use Current Chamber & Matrix data."
7) Select matrix type 300.
8) Select Continue.
9) Active and passive data dialogs will be displayed. Warning messages regarding the counts may also be displayed. Acknowledge any such messages. The Results Dialog will be displayed.
10) In the Results Dialog, click on Close after evaluating the response. Do *not* save data.

Expected Results

The values from hand calculations, using the formulas provided in the SRS [2], are shown below. These values must be independently verified.

Total Plutonium mass: (3.207 ± 0.180) g
Pu-238 mass: (4.8 ± 2.6)E-4 g
Pu-239 mass: (3.013 ± 0.169) g
Pu-240 mass: (0.1883 ± 0.103) g
Pu-241 mass: (4.49 ± 1.94) E-3 g
Am-241 mass: (4.49 ± 1.94) E-3 g
Thermal power: (8.03 ± 0.50) E-3 Watts
Thermal power density: (1.093 ± 0.068)E-3 Watts/ft^3
Total activity: (0.72 ± 0.20) Ci
Alpha activity: (0.2567 ± 0.0157) Ci
TRU activity: (0.2567 ± 0.0157) Ci
TRU activity concentration: (2.567 ± 0.157)E+6 nCi/g
Pu Equivalent Curies: (0.2559 ± 0.0156) Ci
Fissile Gram Equivalent: (3.027 ± 0.170) g

The summary report is printed and the results dialog displays the values.

Pass/Fail Criteria

The test passes if the computed values agree with the hand calculations to two significant decimal digits.

Important Note

This test uses current matrix, calibration, and mass fraction data rather than the values stored in the data file DR.002. The assay results may therefore not agree with the values shown above, but must agree with the hand calculated values.

10.13.5 Invalid Test Cases

None.

10.14 Chi-Square

10.14.1 Introduction and Description

These tests address the function to compute chi-square statistics, requirement 3.1.3.3 M.4.

10.14.2 Special Requirements

The CAMAC crate must be on-line. The Pink Drum must be in the drum assay chamber.

10.14.3 Procedure Steps

Log in as an operator.

10.14.4 Valid Test Cases

CS.1

Purpose

This test addresses the function to compute chi-square statistics, requirement 3.1.3.3 M.4.

Input Description

1) Pull down the Run menu.
2) Select Chi-square.
3) The following notice is displayed.
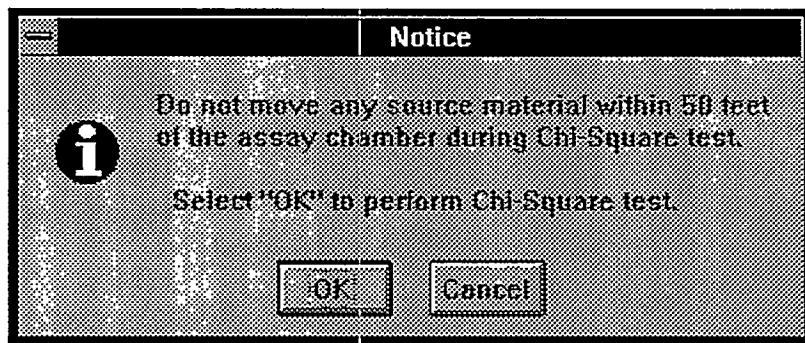
4) Click on OK.
5) Wait until the specified number of passive acquisitions are completed normally. The
   following dialog will be displayed. Click on OK. (The values shown in this dialog box
   are sample values only -- numbers in actual tests may be different.)
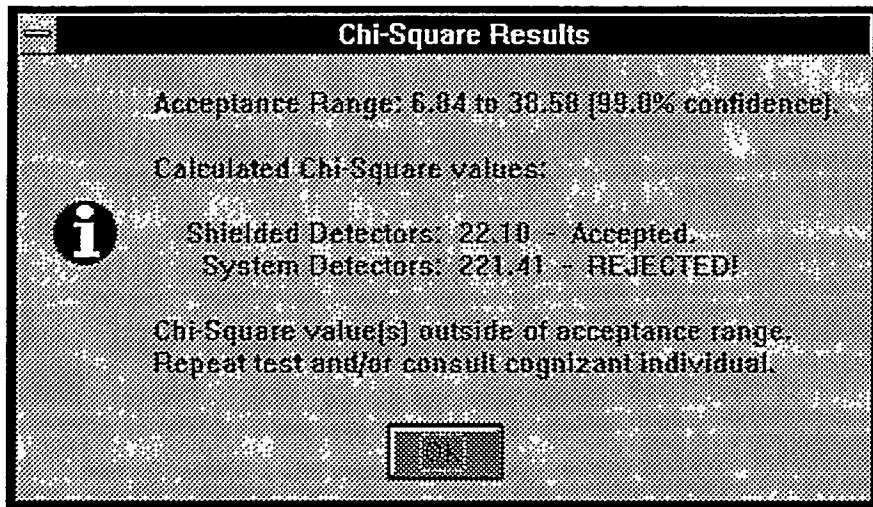
Expected Results
The "Chi-Square Results" window will appear and the chi-square report will be printed automatically.

Pass/Fail Criteria
The test passes if the "Chi-Square Results" window appears and the report is printed.

10.14.5 Invalid Test Cases

CS.2

Purpose
This test addresses the function to compute Chi-square statistics, requirement 3.1.3.3 M.4.

Special Requirements
Rename the file CHISQ.DAC in the DAC subdirectory to CHISQ.BAK. At the conclusion of the test, rename the file CHISQ.BAK to CHISQ.DAC.

Input Description
   1) Pull down the Run menu.
   2) Select Chi-square.

Expected Results
"File not found" dialog is displayed.
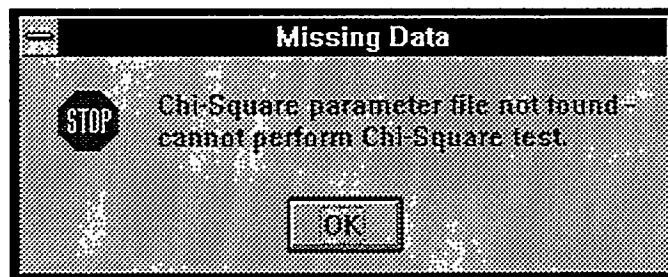
and then the "Chi-Square parameters not found!" dialog is displayed.

```
┌─────────────────────────────────────────┐
│ ▬          File Error                     │
├─────────────────────────────────────────┤
│                                           │
│  ┌────┐                                   │
│  │STOP│  Chi-Square parameters not found! │
│  └────┘                                   │
│                                           │
│            ┌─────────┐                    │
│            │   OK    │                    │
│            └─────────┘                    │
│                                           │
└─────────────────────────────────────────┘
```
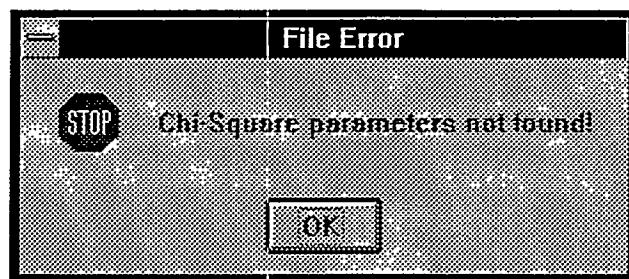
Pass/Fail Criteria

The test passes if the error dialog is displayed.

10.15 DMS Interface

10.15.1 Introduction and Description

These tests address the SAS interface with the DMS computer. Specifically, these tests address DMS requesting an assay or recalculation, SAS acknowledging receipt of DMS data, SAS performing the requested function and transmitting measurement results to the DMS computer, and SAS receiving an acknowledgment from the DMS computer.

10.15.2 Special Requirements

The CAMAC must be on-line. One of the SWEPP operations personnel must login to the DMS system.

10.15.3 Procedure Steps

1) Login as an operator.
2) Pull down the Run menu.
3) Select Remote.
4) The Remote Operation dialog is displayed.
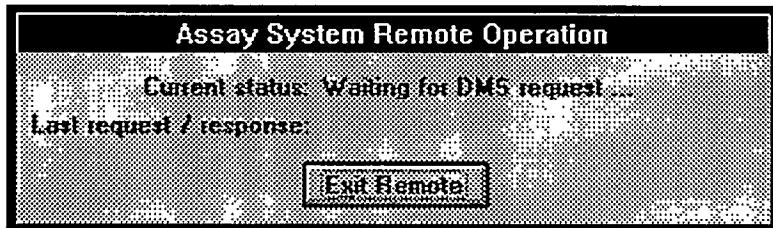
10.15.4 Valid Test Cases

DMS.1

Purpose

This test addresses the SAS receiving a request from the DMS to perform an assay, requirements 3.1.5.2 M.1, M.2, M.3, and M.4.

Special Requirements

If the network link between the SAS PC and SGRS Workstation is operating, check for the existence of a file named TEST01.GAM on the Workstation logical device PAN$RATIOS. If this file exists, rename or delete it (note that multiple versions of the same file can exist on the SGRS Workstation). Gamma ratios files are located on the SGRS logical device PAN$RATIOS.

Input Description

1) Have the SWEPP operator place a drum in the assay chamber. Any drum containing some fissile material including the "Pink Drum" can be used for this test.
2) Ensure that the Remote Dialog window is displayed on the SAS computer screen (see 10.15.3).
3) Have the SWEPP operator request a new assay via the DMS system using the following:

Container ID:	TEST01
Content Code:	000
Bar Code:	TEST01
Gross Weight:	100

Expected Results

SAS will display a status message in the Remote Dialog window indicating receipt of an assay request, acknowledgment of the request, and initiation of processing. The Waste Attributes window will be displayed showing the Container ID (TEST01), Content Code (matrix type 000) and Net Weight[2] received from the DMS, with the title bar showing TEST01 as the file name. Active and passive data acquisition and data analysis will be performed automatically. At the completion of data acquisition and analysis, the Results window will be displayed, a summary report printed and the assay results will be automatically transmitted to the DMS (the status line in the Remote Dialog window will indicate when data are being sent to the DMS). After all data have been received by the DMS (data transmission takes approximately 20 seconds), the DMS terminal will display selected assay quantities. The values displayed should agree with the corresponding quantities shown in the SAS Results window and on the SAS summary report.

Pass/Fail Criteria

The test passes if the derived quantity values displayed on the operator's DMS terminal agree with the derived values in the printed summary report to the minimum precision printed or displayed.

---

[2] The net weight should be approximately 25kg less than the gross weight; check DMS screen for actual value.

DMS.2

Purpose

This test addresses the SAS receiving a request from DMS to perform a recalculation, requirements 3.1.5.2 M.1, M.2, M.3, and M.5.

Special Requirements

If the network link between the SAS PC and SGRS Workstation is operating, check for the existence of a file named TEST01.GAM on the Workstation logical device PAN$RATIOS. If this file exists, rename or delete it (note that multiple versions of the same file can exist on the SGRS Workstation). Gamma ratios files are located on the SGRS logical device PAN$RATIOS.

Input Description

Have the operator request a recalculation for drum TEST01 through the DMS system.

Expected Results

SAS will display a status message in the Remote Dialog window indicating receipt of an assay request, acknowledgment of the request, and initiation of processing. The Waste Attributes window will be displayed showing the Container ID (TEST01), Content Code (matrix type 000) and Net Weight received from the DMS, with the title bar showing TEST01 as the file name. Active and passive data acquisition and data analysis will be performed automatically. At the completion of data acquisition and analysis, the Results window will be displayed, a summary report printed and the assay results will be automatically transmitted to the DMS (the status line in the Remote Dialog window will indicate when data are being sent to the DMS). After all data have been received by the DMS (data transmission takes approximately 20 seconds), the DMS terminal will display selected assay quantities. The values displayed should agree with the corresponding quantities shown in the SAS Results window and on the SAS summary report.

Pass/Fail Criteria

The test passes if the values shown in the SAS summary report and displayed on the DMS terminal agree with the values obtained during the initial assay of drum TEST01 (test DMS.1) within the precision printed or displayed.

DMS.3

Purpose

This test addresses the SAS receiving a request from the DMS to perform a recalculation, requirement 3.1.5.2 M.1, M.2, M.3 and M.5. Further, this test verifies that the SAS will use current matrix, calibration and SGRS data during a remote recalculation (Process 4 under 3.1.5.2 M.5), a new requirement added for SAS Version 2.0.

Special Requirements

The SGRS Workstation must be operating, the network link to the SAS PC must be functional and the PathWorks network software must be running on the SAS PC. This test can be delayed until after test VM.5 has been performed, if desired.

Input Description

1) Have someone familiar with the SGRS Workstation make a copy of a gamma ratios file. The file to be copied must contain a non-zero value for the Am241/Pu239 ratio and preferably a non-zero value for the U235/Pu239 mass ratio. (The file created during test VM.5 can be copied for this test.) Name the copy TEST01.GAM. Gamma ratios files are located on the SGRS logical device PAN$RATIOS.

2) Have the SWEPP operator (or someone with sufficient DMS privileges to change data values) make the following changes to drum TEST01 data values on the DMS system:
   Content Code: change from 000 to 007
   Gross Weight: change from 100 to 250

3) Have the SWEPP operator request a recalculation for drum TEST01 via the DMS system.

Expected Results

SAS will display a status message in the Remote Dialog window indicating receipt of an assay request, acknowledgment of the request, and initiation of processing. The Waste Attributes window will be displayed showing the Container ID (TEST01), Content Code (matrix type 007) and Net Weight received from the DMS, with the title bar showing TEST01 as the file name. Active and passive data acquisition and data analysis will be performed automatically. At the completion of data acquisition and analysis, the Results window will be displayed, a summary report printed and the assay results will be automatically transmitted to the DMS (the status line in the Remote Dialog window will indicate when data are being sent to the DMS). After all data have been received by the DMS (data transmission takes approximately 20 seconds), the DMS terminal will display selected assay quantities. The values displayed should agree with the corresponding quantities shown in the SAS Results window and on the SAS summary report.

Pass/Fail Criteria

1) The SAS summary report must list the Matrix Type as 007 and Net Weight as approximately 225 kg (actual value must agree with that shown on the DMS screen).
2) The summary report must have a note indicating that the Am-241 mass was determined using either "Pu-239 Mass Ratio" or "U-235 Mass Ratio" information.
3) If the file TEST01.GAM contains a non-zero value for the U235/Pu239 mass ratio, then the SAS summary report must show a U-235 mass value.
4) The values shown in the SAS summary report and displayed on the DMS terminal must agree within the precision displayed or printed.

Final Note

After tests DMS.1 through DMS.3 have been completed successfully, have someone with "delete" privilege (SWEPP Certification Specialist or DMS System Administrator) delete the data for drum TEST01 from the DMS system.

10.15.5 Invalid Test Cases

There are no invalid test cases. DMS performs its own time-out functions, e.g., if the RS-232 cable is disconnected between the DMS and SAS.

10.16 Version 2.0 Modifications

10.16.1 Introduction and Description

These tests address the operational performance of the modifications made in Version 2.0 of the SAS software.

10.16.2 Special Requirements

None.

10.16.3 Procedure Steps

Login as an operator or physicist, as indicated in the test case.

10.16.4 Valid Test Cases

VM.1

Purpose

This test addresses the performance of the SAS when a corrupted data file is read, addressing SCR Operational Problems, Item 3.

Input Description

1) Login as an operator.
2) Pull down the File menu.
3) Select Open.
4) In the Open File Dialog, enter file name VM.001.
5) Click on OK.
6) Click on Continue.
7) Click on OK.
8) Click on OK.

Expected Results

"Incomplete Data" dialog is displayed.
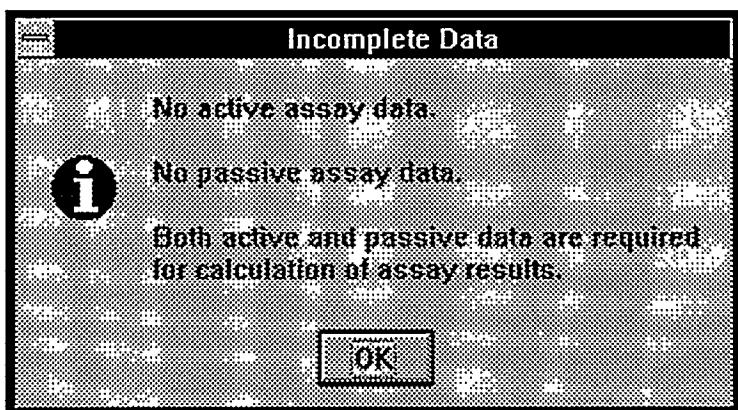
"Saved data file..." warning dialog is displayed.
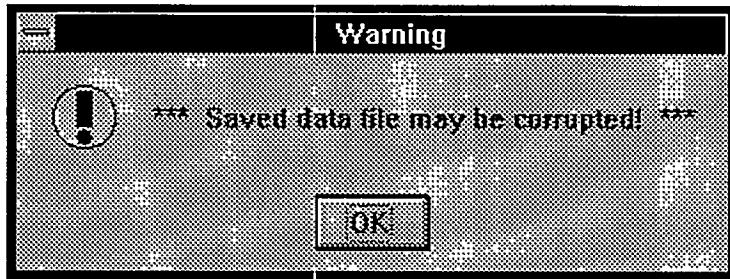
Pass/Fail Criteria

The test passes if the warning messages are displayed.

VM.2

Purpose

This test addresses the status of background data when a passive-only assay is performed, or if "Background Correction" is turned off, addressing SCR Operational Problems, Item 4.

Input Description

1) Login as an operator.
2) Pull down the File menu.
3) Select New.
4) In the New File Dialog, enter file name VM_2.
5) Click on OK.
6) In the Waste Attributes dialog,
   - Select 55-gallon drum for the container type
   - Select matrix type 001
   - Enter net weight 6.0.
7) Click on Assay.
8) Select Passive.
9) After the assay is completed, pull down the File menu.
10) Click on Save.
11) Pull down the File menu.
12) Select Print.
13) In the print file dialog, enter file name VM_2.001.
14) Click on OK.

Expected Results

The program should save the passive background data in the file, and this file will be printed.

Pass/Fail Criteria

The test passes if passive background data are present in the printed copy of the file in a section labeled "Passive Background."

VM.3

Purpose

This test addresses the notification of missing passive background data during a recalculation, addressing SCR Operational Problems, Item 5.

Input Description

1) Login as an operator.
2) Pull down the File menu.
3) Select Open.
4) In the Open File Dialog, enter file name VM.003.
5) Click on No in the message window.
6) Click on Continue.
7) Click on OK.
8) Click on Close.

Expected Results

"No background data..." dialog is displayed.
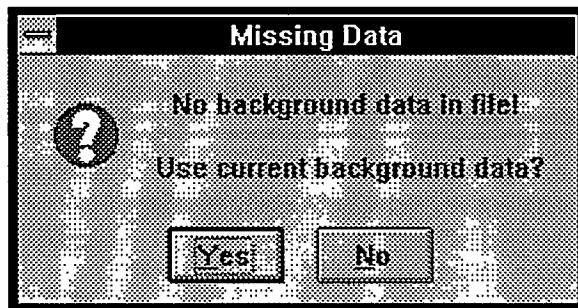
Pass/Fail Criteria

The test passes if a warning message is displayed.

VM.4

Purpose

This test addresses the window size, placement and color information, addressing SCR User Interface Problems, Item 9.

Input Description

1) Login as an operator.
2) Pull down the Options menu.
3) Select Color.
4) Select the desired color.
5) Click on OK.
6) Resize and reposition one or more windows.
7) Logout and exit the program completely.
8) Restart SAS, and log in as an operator.

Expected Results

The window sizes, positions, and background colors should be the same when the user logs back in.

Pass/Fail Criteria

The test passes if the window sizes, positions, and background colors are the same after logging in the second time as when they were set initially.

VM.5

Purpose

This test addresses the ability of a Physicist to reanalyze saved data with new parameters, requirements 3.1.2.2 M.2, 3.1.4.3 M.13 and M.14.

Input Description

Part I:

1) Place a drum containing plutonium, ^{241}Am, and ^{235}U in the assay chamber.
2) Login as an operator.
3) Pull down the File menu.
4) Select New.
5) The New File Dialog is displayed.
6) Enter file name VM_5.
7) Click on OK.
8) In the Waste Attributes dialog,
   - Select 55 gallon drum for the container type
   - Select matrix type 001
   - Enter net weight 1.0.
9) Click on Assay.
10) Select Full.
11) After the assay has completed, click on Save (unless file was saved automatically).
12) Click on Close.
13) Log out.

Part II:

1) Make an SGRS measurement on the same drum using the same file name (VM_5).
2) Log into SAS as a physicist.
3) Pull down the File menu.
4) Select Open.
5) Enter file name VM_5.
6) Click on OK.
7) In the Waste Attributes Dialog, click on Edit.
8) Select "Use current Chamber & Matrix data."
9) Click on Continue.

Part III:

1) Make an SGRS measurement on the same drum using the same file name (VM_5).
2) Login as a physicist.
3) Pull down the File menu.
4) Select Open.
5) Enter file name VM_5.
6) Click on OK.
7) Click on Continue.
8) Wait until the assay is complete, then click on Save.

Expected Results

Part I:

Expected results not included. Results/values were independently verified.

Part II:

The assay report should now show a ^{235}U mass and reflect the fact that mass ratio values were used for ^{241}Am determination. Results/values were independently verified.

Part III:

All values printed on the summary report must agree with the values on the summary report generated in Part II.

Pass/Fail Criteria

The test passes if the results from Part II are verified by "independent calculation," and if the summary reports from Parts II and III agree.

VM.6

Purpose

This test addresses the integrity of the background data, SCR Technical Problems, Item 3.

Input Description

1) Place the "Pink Drum" in the assay chamber.
2) Login as an operator.
3) Pull down the Options menu.
4) Select Assay Times.
5) Set Background Count Time to 100.
6) Pull down the Run menu.
7) Select Background.
8) At the conclusion of the run, a warning message will be displayed and the "Passive Background Data" window will be shown with bad data rates highlighted. Click on OK.
9) Select Reject in the "Passive Background Data" window.
10) Click on OK.

Expected Results

The Passive Background Data dialog should display a warning message, with bad data rates highlighted.
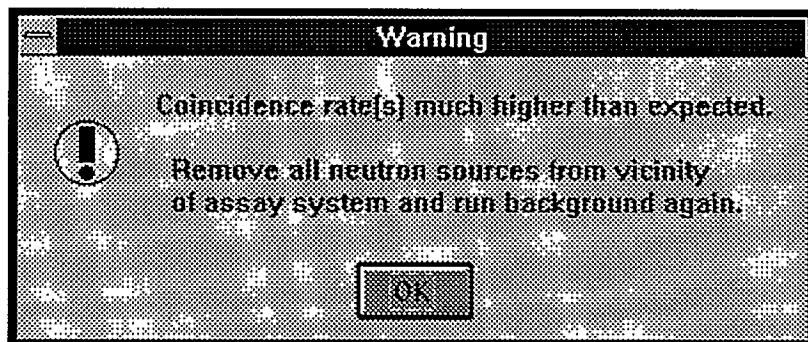
Passive Background Data

	Bare counts	Shielded counts		Net Rate ± One Sigma (counts/sec)	
Left:	288713	89542	Shielded Total:	4317.7 ±	6.6
Back:	288980	86642	System Total:	18482.0 ±	13.6
Right:	288413	87034	Shielded Coincidence:	108.2 ±	3.2
Door:	282469	84662	System Coincidence:	1161.5 ±	94.9
Top:	166853	46640			
Bottom:	102694	37610	Notes:		
Sum:	1418122	432130	Maximum side variation from average is 3 %. Sums not equal to Totals.		
Total:	1417520	432102	Accept	Reject	

Data Rejected

No background data stored.

OK
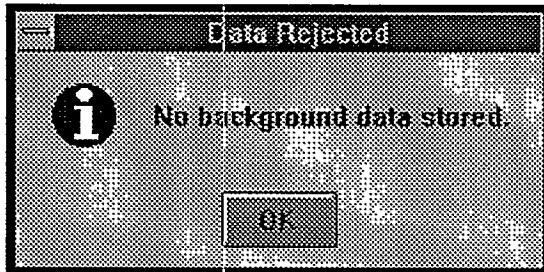
Pass/Fail Criteria

The test passes if the warning message is displayed and the "Passive Background Data" window will be shown with bad data rates highlighted.

VM.7

Purpose

This test addresses closing the "Waste Description" window after an assay is aborted, SCR User Interface Problems, Item 7.

Input Description

1) Login as a physicist.
2) Pull down the File menu.
3) Select New.
4) In the new file dialog, enter file name VM_7.
5) Click on OK.
6) In the Waste Attributes dialog,
   - Select 55-gallon drum for the container type
   - Select matrix type 152
   - Enter net weight 6.0.
7) Click on Assay.
8) When the assay starts, click on Cancel in the "Active Data Acquisition" status window.
9) Click on Yes in the "Confirmation Window."

10) Click on Close.

Expected Results

The Close buttons in the Waste Attributes window and the File pull-down menu are active after the assay is aborted.

Pass/Fail Criteria

The test passes if the Close buttons are active after the assay is aborted.

<div align="center">

VM.8

</div>

Purpose

This test addresses the addition of "keyboard accelerators" for the most commonly used menu options, SCR User Interface Problems, Item 5.

Input Description

1) Login as operator.
2) Pull down the File menu.
3) View the listed keyboard accelerator functions.
4) Exit the window and press Ctrl+N, for "New Assay."
5) Select Cancel.
6) Press Ctrl+O for "Open."
7) Select Cancel.
8) Press Ctrl+E for "Exit."
9) Select No.
10) Pull down the Run menu.
11) View the listed keyboard accelerator functions.
12) Exit the window and press Ctrl+N, for "New Assay."
13) Select Cancel.
14) Press Ctrl+R, for "Remote."
15) Select Exit Remote.
16) Pull down the Help menu.
17) View the listed keyboard accelerator function.
18) Exit the window and press the F1 key, for "Abort."
19) Select Acknowledge.

Expected Results

Accelerator keys are shown on the described menus and produce the expected results when entered from the keyboard.

Pass/Fail Criteria

Accelerator keys can be used to activate the described menu functions.

10.16.5 Invalid Test Cases

There are no invalid test cases.

11. REQUIREMENTS TRACEABILITY

The requirements traceability matrix in Table 7 identifies the requirement name and paragraph number from the Software Requirements Specification (SRS), Reference [2], the object where the requirement is designed and coded, and the test case that tests the requirement. The last column shows that each test passed the criteria specified in the test procedure, section 10.

Table 7. Requirements traceability matrix.

SRS or RWMC SCR 13623	Requirement	SDD / code	Test case	Pass Fail
3.1.2.2 M.1	Login users	login_dlg, user, user_list, main_wnd	UA.1,3,5,8,9	Pass
3.1.2.2 M.2	Present user menu functions	main_wnd	UA.1,3,5, AF.1, VM.5	Pass
3.1.2.2 M.3	Logout users	main_wnd	UA.2,4,6	Pass
3.1.2.2 M.4	Allow administrator to modify user list	users_dlg, user, user_list, main_wnd	AF.2 - 22	Pass
3.1.3.2 M.1	Read default processing options for assay system	main_wnd, chamber_wnd	all	Pass
3.1.3.3 M.1	Read default chamber processing options	chamber_wnd, options_dlg	TS.1 - 5, CP.1 - 8	Pass
3.1.3.3 M.2	Allow an operator or physicist to modify the processing options	chamber_wnd, options_dlg	TS.1 - 5, CP.1 - 7,9 - 23	Pass
3.1.3.3 M.3	Allow physicist to modify the chamber calibration	calibration_dlg, chamber_wnd	CC.1 - 5	Pass
3.1.3.3 M.4	Perform Chi-square test	chamber_wnd	CS.1 - 2	Pass
3.1.3.4 M.1	Read CAMAC crate configuration from file	camac_crate	CI.1 - 5	Pass
3.1.3.4 M.2	Get time and date of data acquisition	chamber_wnd, system_time, camac_crate	TDDA.1,2	Pass
3.1.3.4 M.3	Acquire active data from assay chamber	chamber, camac_crate, acquire_dlg	CP.4 - 7	Pass
3.1.3.4 M.4	Store active data on file	chamber_wnd, camac_crate	CP.4 - 7	Pass
3.1.3.4 M.5	Read active data from file	chamber_wnd, camac_crate	AS.1 - 3	Pass
3.1.3.4 M.6	Acquire passive data from assay chamber	chamber, camac_crate, acquire_dlg	CP.1 - 7	Pass
3.1.3.4 M.7	Store passive data on file	chamber_wnd, camac_crate	CP.1 - 7	Pass
3.1.3.4 M.8	Read passive data from file	chamber_wnd, camac_crate	PS.1 - 4	Pass

Table 7. Requirements traceability matrix (cont'd).

SRS	Requirement	SDD / code	Test case	Pass Fail
3.1.3.5 M.1	Compute flux monitor gross, background, and net rates	active_signals, detector	AS.1 - 3	Pass
3.1.3.5 M.2	Compute flux monitor gross, background, and net rate errors	active_signals, detector	AS.1 - 3	Pass
3.1.3.5 M.3	Compute barrel flux monitor gross, background, and net rates	active_signals, detector	AS.1 - 3	Pass
3.1.3.5 M.4	Compute barrel flux monitor gross, background, and net rate errors	active_signals, detector	AS.1 - 3	Pass
3.1.3.5 M.5	Compute shielded total gross, background, and net rates	active_signals, detector	AS.1 - 3	Pass
3.1.3.5 M.6	Compute shielded total gross, background, and net rate errors	active_signals, detector	AS.1 - 3	Pass
3.1.3.6 M.1	Compute shielded total rate	passive_signals, detector	PS.1 - 4	Pass
3.1.3.6 M.2	Compute shielded total rate error	passive_signals, detector	PS.1 - 4	Pass
3.1.3.6 M.3	Compute system total rate	passive_signals, detector	PS.1 - 4	Pass
3.1.3.6 M.4	Compute gross, background, and net system total rate error	passive_signals, detector	PS.1 - 4	Pass
3.1.3.6 M.5	Compute shielded coincidence rate	passive_signals, detector	PS.1 - 4	Pass
3.1.3.6 M.6	Compute shielded coincidence rate error	passive_signals, detector	PS.1 - 4	Pass
3.1.3.6 M.7	Compute system coincidence rate	passive_signals, detector	PS.1 - 4	Pass
3.1.3.6 M.8	Compute system coincidence rate error	passive_signals, detector	PS.1 - 4	Pass
3.1.4.2 M.1	Input container attributes	waste_dlg, container, chamber_wnd	CL.1 - 12, WA.1 - 8, 10 - 18	Pass
3.1.4.2 M.2	Store container data on file	chamber_wnd, container	CI.1	Pass
3.1.4.2 M.3	Read container data from file	chamber_wnd, container	WA.1 - 8	Pass
3.1.4.2 M.4	Provide container summary report	container	TDDA.1 - 2, others	Pass
3.1.4.2 M.5	Allow physicist to modify the container list	container_dlg, container, container_list, main_wnd	CL.1 - 12	Pass
3.1.4.3 M.1	Input matrix attributes	waste_dlg, matrix, chamber_wnd	WA.1 - 8, 10 - 18	Pass
3.1.4.3 M.2	Store matrix data on file	chamber_wnd, matrix	CI.1	Pass
3.1.4.3 M.3	Read matrix data from file	chamber_wnd, matrix	WA.1 - 8, ML.1 - 9	Pass
3.1.4.3 M.4	Allow physicist to modify the matrix list	matrix_dlg, matrix, matrix_list, main_wnd, matrix_parameter_dlg	ML.1 - 9	Pass

Table 7. Requirements traceability matrix (cont'd).

SRS	Requirement	SDD / code	Test case	Pass Fail
3.1.4.3 M.5	Compute active Pu mass	matrix	DR.1 - 2	Pass
3.1.4.3 M.6	Calculate active Pu mass error	matrix	DR.1 - 2	Pass
3.1.4.3 M.7	Calculate passive Pu mass	matrix	DR.1 - 2	Pass
3.1.4.3 M.8	Calculate passive Pu mass error	matrix	DR.1 - 2	Pass
3.1.4.3 M.9	Select either the active or passive Pu mass	matrix	DR.1 - 2	Pass
3.1.4.3 M.10	Select either the active or passive Pu mass error	matrix	DR.1 - 2	Pass
3.1.4.3 M.11	Calculate plutonium isotopic masses	matrix	DR.1 - 2	Pass
3.1.4.3 M.12	Calculate plutonium isotopic mass errors	matrix	DR.1 - 2	Pass
3.1.4.3 M.13	Calculate U-235 mass	matrix	VM.5	Pass
3.1.4.3 M.14	Calculate U-235 mass error	matrix	VM.5	Pass
3.1.4.3 M.15	Calculate the Am-241 mass	matrix	DR.1 - 2	Pass
3.1.4.3 M.16	Calculate the Am mass error	matrix	DR.1 - 2	Pass
3.1.4.3 M.17	Calculate thermal power	matrix	DR.1 - 2	Pass
3.1.4.3 M.18	Calculate the thermal power error	matrix	DR.1 - 2	Pass
3.1.4.3 M.19	Calculate the thermal power density	matrix	DR.1 - 2	Pass
3.1.4.3 M.20	Calculate the thermal power density error	matrix	DR.1 - 2	Pass
3.1.4.3 M.21	Calculate activity values	matrix	DR.1 - 2	Pass
3.1.4.3 M.22	Calculate the activity errors	matrix	DR.1 - 2	Pass
3.1.4.3 M.23	Calculate the TRU activity concentration	matrix	DR.1 - 2	Pass
3.1.4.3 M.24	Calculate the TRU activity concentration error	matrix	DR.1 - 2	Pass
3.1.4.3 M.25	Calculate fissile gram equivalent	matrix	DR.1 - 2	Pass
3.1.4.3 M.26	Calculate fissile gram equivalent error	matrix	DR.1 - 2	Pass
3.1.4.3 M.27	Provide a measurement summary report for the container	chamber_wnd, container	TDDA.1 - 2, others	Pass
3.1.5.2 M.1	Send "handshake" message to DMS	dms_dlg	DMS.1,2,3	Pass
3.1.5.2 M.2	Send measurement results to DMS	dms_dlg	DMS.1,2,3	Pass
3.1.5.2 M.3	Receive "handshake" message from DMS	dms_dlg	DMS.1,2,3	Pass
3.1.5.2 M.4	Receive new assay request from DMS	dms_dlg	DMS.1	Pass
3.1.5.2 M.5	Receive recalculation request from DMS	dms_dlg	DMS.2,2	Pass
UI.1	Switch between windows	chamber_wnd, waste_dlg, active_dlg, passive_dlg, results_dlg	WA.8,9	Pass
UI.3	Default "Matrix Type"	waste_dlg	WA.4-7	Pass
UI.5	"Keyboard accelerators"	assaysys.rc, main_wnd	VM.8	Pass
UI.6	Close "Chamber Window"	chamber_wnd	UA.7	Pass
UI.7	Close "Waste Description" window	waste_dlg	VM.7	Pass

Table 7. Requirements traceability matrix (cont'd).

SRS	Requirement	SDD / code	Test case	Pass Fail
UI.9	Window size, placement and color information	assay_system, main_wnd, chamber_wnd	VM.4	Pass
UI.10	View matrix parameters	matrix_parameter_dlg	ML.1 - 9	Pass
UI.11	Attempts to update write-protected lists	matrix_ldlg, matrix_parameter_dlg, container_dlg	CL.1 - 12, ML.1 - 9, CC.1 - 5	Pass
RE.4	Store additional information	chamber_wnd, matrix	CI.1	Pass
OP.3	Attempt to read corrupted data file	chamber_wnd, itstream	VM.1	Pass
OP.4	Append background data to save file	chamber_wnd	VM.2	Pass
OP.5	Notification of missing passive background data during a recalculation	chamber_wnd	VM.3	Pass
TP.3	Background data integrity	chamber_wnd, itstream	VM.6	Pass
TP.5	Significant figures displayed	chamber_wnd, matrix, active_dlg, passive_dlg, places	PS.1, AS.1	Pass

12. RESULTS

The first set of tests were conducted on April 2, 1996. The DMS interface tests were conducted on April 15, 1996, when the DMS programmer's part of that system was ready. These tests were DMS.1 and DMS.2. Because the software programming for DMS was not complete the interface between this system and DMS was all that was checked. These tests were also conducted twice because they initially failed due to programming problems which were fixed later that same day. Additional tests to validate the DMS interface were conducted on April 29, 1996; these tests, which were modified from the original test plan, tested the SAS receiving a request from the DMS to perform an assay, testing requirements 3.1.5.2 M.1, M.2, M.3, and M.4. These tests were completed successfully.

Some of the tests that had failed on April 2, 1996 were later re-conducted on April 3, 1996 after some programming modifications were made to the software. The problems occurred using the mass fractions from the Gamma assay on the recalculation. The test had to be re-done when the SGRS was available. The test VM.5 (parts I and II) was re-tested again on April 15, after additional programming fixes were made, and was successful. The addition of a Part III was also necessary to complete the entire test.

The tests that needed to be re-run on April 3, 1996 included WA.1, where modifications to the plan had to be made to reflect programming changes. Although WA.1 was completed successfully on the first test on April 2, 1996, some anomalies in the test were eliminated by re-testing and validating so that the test, per the modifications made to the plan, could be run successfully. Test CP.4 was conducted twice on April 2, because the printer being out of paper caused a general error in the application. This error was a known software problem related to the fact that the print routines that were originally developed for the program were not configured to be Windows print routines. This problem will need to be fixed in the next software update. The clock also failed the first time, but was subsequently correct in the second test. The problem was that the count criteria were arbitrarily met the second time and not the first, but the count data was correct. This problem existed because the test plan was too stringent, stating that the counts would be within 100 milliseconds, when in fact the computer interrogates the CAMAC crate every 100 to 150 milliseconds which can cause times of successive runs to vary by as much as 150 ms. This is not a problem since the actual CAMAC clock time is used in the assay calculations. The test plan has been changed to specify the time to be within 200 ms rather than 100 ms. Based on this information, the results of the CP.7 test were acceptable.

In tests TDDA.1 and TDDA.2 the clock time was 15.04.05 when started and the start time was recorded as 15.08.58. There was a disparity in the set time and test time because of the clock time and assay time being read as unequal. It was probable that the wrong time was written down during the first test. This test is an arbitrary test in that the

computer clock is read by the program so there should be no disparity. These tests were re-run with successful results.

Tests DR.1 and DR.2 did not pass on April 2, 1996 because there was a possible problem with the Am-241 mass. A program fix was required, and when re-tested on April 15, 1996, the problem was solved. The calculations from these tests, which were verified by an independent physicist, were validated as correct on April 29, 1996, when the independent physicist and the quality review met and evaluated the results.

13. ANOMALOUS EVENTS

Several corrections were made to the test plan during the testing conducted over the three day period. These changes included correcting editorial errors, indicating places where the proper screen capture in the example was not used, and adding additional steps or deleting steps that did not fit the test. Additional cases where changes had to be made were either the addition of new tests which further evaluated what was tested, or that were needed to test enhancements to this version of the software that were not part of the original tests conducted on a previous version of this software. Hand calculations were completed to validate the tests. Where disparities existed that could not be verified, tests were either re-run or the software programming was adjusted to be correct. In some cases, additional steps to complete a test were added that were not part of the plan for an individual test. In cases where examples existed and did not appear to be obvious, a note was added to prevent any confusion.

An additional correction that had to be made to the plan consisted of changing the user ID in cases where the wrong one was used. The tester and the programmer also added steps to test if a test was successful, such as changing a password, which validated that the computer had actually accepted the change. These instances were added to validate the test, even though they were not initially part of the test plan.

The problem with the clocks and the arbitrariness of the time between the clock and the assay system was not seen as a problem in test CP.4. This test, as noted above, was conducted twice on April 2, because the printer being out of paper caused a general error in the application. This error did not surprise the programmer, and was a known software problem which relates to the Windows print routines. This problem will need to be fixed in the next software update. It was suggested that operators be trained, or a note provided in the procedures, to indicate that operators need to check the paper level prior to system operation. The clock also failed the first time, but was subsequently correct in the second test. The problem was that the count criteria were arbitrarily met the second time and not the first, but the count data was correct. This problem existed because the test plan was too stringent, stating that the counts would be within 100 milliseconds, when in fact the computer interrogates the CAMAC crate every 100 to 150 milliseconds which can cause times of successive runs to vary by as much as 150 ms. This is not a problem since the actual CAMAC clock time is used in the assay calculations. The test plan has been changed to specify the time to be within 200 ms rather than 100 ms. The software

uses actual time, therefore a slight overrun on the pre-set time is not a problem. The calculations use actual time so this is not a problem. Based on this information, the results of the CP.7 test were acceptable.

During test CP.7, it was noted that the clock was 80 counts high. We determined that this condition was not a problem because the count is arbitrary and does not necessarily have to be exact. There would have been a concern if the counts were off two tenths of a second, this would have indicated that there was a problem. The degree of difference was an acceptable margin of error.

During test UA.1, it was noted that in one of the pull-down menus the available options to the user ID level were incorrect. The software was correct, it was the screen capture in the test plan that was not accurate. This problem was noted and the test plan updated to correct it. This problem occurred in the "Options" section of the pull down menu under the Physicist ID.

A problem was noted during test AF.3. Since testing had to conclude for a lunch break, and the system was shut down, the added password, which was to be deleted in test AF.16 - AF.18, was not saved. An additional problem was discovered in AF.5 - AF.15, where the plan stated that the user should enter the valid user ID, and not select it from the pull down menu. This problem has been corrected as part of the plan updates. In tests AF.19 - AF.21, the test said to select a user ID but did not define which one. These elements, it was determined during testing, had to be defined in order for the test to run correctly. These changes were also made.

During the CP.7 test, it was noted that a potential problem could exist. The plan states that an operator needs to save the data, but if the auto save feature is selected, this is not required to be done, but just validated. A note was added to tell users that they either need to save or make sure that the auto save feature is on and that it works properly.

Table 2 under test ML.5 was confusing to the tester in that certain sections of the table had numerous options, but it was not obvious that the user was to select only one for each group. A more logical grouping was suggested to improve readability and user clarity. Table 5 under test CC.3 also suffered from a similar problem. The order of the text was not presented in such a way that the verification would be performed correctly by a confused user. Improvement was necessary to change textual order so that it reflected the way a user would read the table and validate the data.

During the WA.1, WA.2, and WA.3 tests the test plan required that the operator select full assay. It was determined during testing, and validated by the programmer, that it was not necessary to select full. This correction to the test plan was subsequently made. In test WA.9, the test plan did not indicate that the window, after completing test step 5, would ask about running a background. It was noted that this needed to be added, and that the user needed to select yes in order to continue the test. In tests TS.1 and TS.3, in

step 2 of each test, an additional step needed to be added to instruct the user to change to the DAC subdirectory so that the files could be found. This was also added to the plan.

In the test series of CP.1 through CP.3 an additional step "press accept button in passive background data" was required to be added because this step needed to be completed. This anomaly was determined during testing. This has been added to the plan. Test CP.4 also required an additional step which required an operator to select "yes" after step two, and then confirm. Step 6 required rewording to address the possibility that the automatic save option may be selected and so the saving step may just be a verification. The test plan was reworded to provide for this possibility.

Tests DR.1 and DR.2 could not be successfully evaluated on the April 2, 1996, the original testing date, because the hand calculations to validate the data were not yet complete. The calculations were completed and validated on April 29, 1996, and the tests were subsequently determined to be successful.

Additional testing problems consisted of minor word changes which were corrected as needed. No additional corrections were required, or any subsequent testing on sequences that were previously tested and found to be successful.

An additional test was added to the test plan because it was necessary to verify that the latest gamma results were the ones being used by the software and not results that were previously filed. This test was necessary because in previous tests it was determined that the latest gamma results were not being captured. Additional tests to validate the DMS interface were conducted on April 29, 1996. These tests were not part of the original test plan, and tested the SAS receiving a request from the DMS to perform an assay, testing requirements 3.1.5.2 M.1, M.2, M.3, and M.4. These tests were completed successfully.

14. SUMMARY

At the completion of the fourth set of tests, all tests were conducted successfully. Hand calculations, which were unavailable during the testing phase, were also completed and subsequently validated and signed off as successful completions of test results generated during the four testing days. The CAO QAPD [15] has been satisfied by this test plan. This satisfies the Quality Level B testing requirements. The tests described in Section 10, Test Procedure, have verified that all requirements specified in the SRS are correctly implemented.

15. EVALUATION

The additional test case that was tested on April 29, 1996 was a good addition to the testing plan. This test validated that the gamma results being captured were the correct data and not data just stored in memory. This test also proved the interface would work between this software and DMS. An addition to operating procedures or training to

require operators to verify that the printer has enough paper before beginning to run tests would be a good addition. Since this was a problem during a test, a procedure step to validate that paper is in the printer should be put in place. Although some problems existed at the start of testing, they were minor and subsequently corrected by the programmer to the satisfaction of the quality control person and the tester.

Appendix A -- Software Test Execution Log

SOFTWARE TEST EXECUTION LOG
INEL-96/0058

Software: SWEPP ASSAY SYSTEM (SAS) VERSION 2.0

Test Category Identification	Tester Name	Test Observer	Test Date

Test Case #	Observations/Anomalies	Comments/Resolution	Test Results		
			Pass	Fail	Initials

COMMENTS:

REVIEW: DATE: