



United States
Department of
Agriculture

Food and
Nutrition
Service

Office of
Analysis and
Evaluation

Guidelines for Preparation and Review of EBT System Acceptance Test Plans

Guidelines for Preparation and Review of EBT System Acceptance Test Plans

April 1993

**Author:
Eugene J. Costa
Phoenix Planning & Evaluation, Ltd.**

**Submitted by:
Abt Associates Inc.
55 Wheeler Street
Cambridge, MA 02138**

**Submitted to:
U.S. Department of Agriculture
Food and Nutrition Service
Office of Analysis and Evaluation
Alexandria, VA 22302**

Project Director: John Kirlin

Project Officer: Kilolo (Sharon) Bingham

These guidelines were prepared under Contract Number 53-3198-8-38 with the Food and Nutrition Service, U.S. Department of Agriculture, under the authority of the Food Stamp Act of 1977, as amended. Points of view or opinions stated in this report do not necessarily represent official position of the Food and Nutrition Service.

TABLE OF CONTENTS

| | | <u>Page</u> |
|-----------|--|-------------|
| Chapter 1 | INTRODUCTION | 1 |
| | 1.1 Overview | 1 |
| | 1.2 A Definition of Acceptance Testing | 3 |
| | 1.3 Relationship of Acceptance Testing and the Functional Demonstration | 5 |
| | 1.4 Structure of the <u>Guidelines</u> Document | 5 |
| Chapter 2 | ACCEPTANCE TEST MANAGEMENT PLAN | 9 |
| | 2.1 Overview | 9 |
| | 2.2 Acceptance Test Overview | 11 |
| | 2.3 Organization | 12 |
| | 2.4 Coordination with Other Organizations, Systems, and Persons | 14 |
| | 2.5 Test Environment Description | 16 |
| | 2.6 Test Techniques, Methods and Tools | 17 |
| Chapter 3 | DEVELOPMENT AND DOCUMENTATION OF ACCEPTANCE TESTING PROCEDURES | 19 |
| | 3.1 Overview | 19 |
| | 3.2 Functional Matrix | 21 |
| | 3.3 Test Scripts | 22 |
| | 3.4 Requirements Verification Matrix | 24 |
| | 3.5 Narratives | 24 |
| Chapter 4 | DOCUMENTING AND EVALUATING TEST RESULTS | 27 |
| | 4.1 Overview | 27 |
| | 4.2 Defect Reporting Procedures | 27 |
| | 4.3 Defect-Severity Rating System | 29 |
| | 4.4 Acceptance Criteria and Defect Evaluation | 30 |
| | 4.5 Defect Classification | 32 |
| | 4.6 Examples of Defect-Severity Classifications | 32 |
| Chapter 5 | ESTABLISHING INITIAL VALUES | 35 |
| | 5.1 Overview | 35 |
| | 5.2 Types of System Files | 36 |
| | 5.3 Development of Acceptance Tests | 40 |
| | 5.4 Interfaces with Other Systems | 41 |
| | 5.5 Summary | 42 |

TABLE OF CONTENTS
(continued)

| | <u>Page</u> |
|------------|---|
| Chapter 6 | TESTING MAJOR PROCESSING COMPONENTS MAINTENANCE FUNCTIONS 43 |
| | 6.1 Overview 44 |
| | 6.2 Client Eligibility Systems 46 |
| | 6.3 Merchant Processing 50 |
| | 6.4 Client Processing 56 |
| | 6.5 Reporting 59 |
| | 6.6 Administrative Processing 62 |
| | 6.7 EBT System Security 64 |
| Chapter 7 | ERROR CONDITION HANDLING AND DESTRUCTIVE AND RECOVERY TESTING 71 |
| | 7.1 Overview 71 |
| | 7.2 Error Condition Handling Testing 72 |
| | 7.3 Destructive and Recovery Testing 74 |
| Chapter 8 | TRANSACTION PROCESSING TESTING 77 |
| | 8.1 Overview 77 |
| | 8.2 On-line Processing 78 |
| | 8.3 Backup Transaction Processing 81 |
| | 8.4 ARU Processing 83 |
| | 8.5 System-Generated Transactions 84 |
| Chapter 9 | SETTLEMENT PROCESSING TESTING 85 |
| | 9.1 Overview 85 |
| | 9.2 Holdover Processing 86 |
| | 9.3 Backup Transaction Processing Credits 87 |
| Chapter 10 | CONCURRENT PROCESSING TESTING 89 |
| | 10.1 Overview 89 |
| | 10.2 Test Examples 90 |
| Chapter 11 | STRESS AND THROUGHPUT TESTING 91 |
| | 11.1 Overview 92 |
| | 11.2 Timing Considerations 95 |
| | 11.3 Hardware Considerations 96 |
| | 11.4 Network Considerations 96 |
| | 11.5 Software Considerations 97 |
| | 11.6 Initial Values 98 |
| | 11.7 People 99 |

TABLE OF CONTENTS
(continued)

| | <u>Page</u> |
|------------|--|
| Chapter 12 | PRODUCTION (LIVE) DEMONSTRATION 101 |
| | 12.1 Overview 101 |
| | 12.2 Structure 101 |
| Chapter 13 | REGRESSION TESTING 105 |
| | 13.1 Overview 105 |
| | 13.2 Methods to Control Changes Made and Tested 106 |
| | 13.3 Regression Testing Decision Criteria 107 |
| | 13.4 Timing of Regression Testing 107 |
| Chapter 14 | "WHAT IF" TESTING 109 |
| | 14.1 Overview 109 |
| | 14.2 Timing 109 |
| | 14.3 Documentation 110 |
| | 14.4 Initial Values 110 |
| Chapter 15 | NETWORK CERTIFICATION 111 |
| | 15.1 Overview 111 |
| | 15.2 Terminal Device 112 |
| | 15.3 Transaction Processing 113 |
| | 15.4 Settlement Processing 114 |
| Chapter 16 | ACCEPTANCE TEST REPORT 117 |
| Appendix A | TEST SCRIPT EXAMPLE 121 |
| Appendix B | DEFECT REPORTING FORM EXAMPLES 125 |
| Appendix C | SUMMARY DEFECT REPORTING EXAMPLES 129 |
| Appendix D | STRESS TEST EXAMPLE 133 |
| Appendix E | SUMMARY OF INFORMATION TO BE INCLUDED IN EBT SYSTEM ACCEPTANCE TEST PLANS 139 |

Chapter 1

INTRODUCTION

With the passage of the Mickey Leland Memorial Domestic Hunger Relief Act of 1990,¹ Congress authorized the use of electronic benefit transfer (EBT) systems to issue and redeem benefits in the Food Stamp Program. Federal regulations implementing the EBT provisions of the Act were issued on April 1, 1992.

State agencies wishing to implement an EBT system must first submit a Planning APD (Advanced Planning Document). Following the planning process, the State agency must submit an Implementation APD followed by other documents, including a Functional Demonstration Plan and an Acceptance Test Plan. The Acceptance Test Plan needs to describe the methodology to be utilized to verify that the EBT system complies with Food Stamp Program requirements and system design specifications. The Acceptance Test Plan should be submitted shortly after the Detailed System Design Plan has been submitted to, and has been reviewed and approved by, Federal authorities. Once the Acceptance Test Plan has been reviewed and approved by Federal authorities, the acceptance test can be conducted. Following the completion of the acceptance test, the State agency must submit a report summarizing the activities and results of testing. Among other subject matters, the report shall contain the State agency's recommendation regarding implementation of the EBT system. Chapter 16 provides an overview of the type of information that FNS expects to be included in this report. Also, should the State determine, sometime in the future, that it is necessary to select a new vendor, then another acceptance test will need to be performed.

1.1 OVERVIEW

An Acceptance Test Plan is a document which describes the methodology to accomplish acceptance testing. Generally, it should address all aspects of conducting the test: the who?, what?, when?, why?, how?, and where? Specifically, it should address how the acceptance testing will cover each of the EBT system components. These components are:

¹ Title XVII, Pub. L. No. 101-624.

- Client Eligibility Systems;
- Merchant Processing;
- Client Processing;
- On-line Transaction Processing;
- Backup Transaction Processing;
- ARU Processing;
- Settlement Processing;
- Reporting; and
- Administrative Processing.

Due to the nature of testing and the diversity in system design alternatives, this Guidelines document is not intended to prescribe the specific contents of an Acceptance Test Plan, including test procedures. Rather, it provides a structure for preparing an Acceptance Test Plan and identifies the type of information that should be included in an Acceptance Test Plan. For example, reviewers of Acceptance Test Plan documents should expect hundreds of test cases to be included in the document. Attempting to create, and the inclusion of, all the possible test cases would not be a practical use of this Guidelines document. Also, all examples of test procedures in this document are described in a generic manner to avoid association with any particular EBT system, and its hardware, software, or network configurations. Actual Acceptance Test Plan documents should have procedures which test specific EBT system designs, and its associated hardware, software, and network configurations.

This Guidelines document has three major goals:

- 1) to help ensure that those preparing the Acceptance Test Plan develop procedures to test all relevant hardware, software, and telecommunications components as described in the system design document (SDD);
- 2) to provide examples of test procedures that have been used in prior EBT acceptance testing; and,

- 3) to assist program personnel in their understanding of the acceptance testing process and, subsequently, facilitate their review of submitted Acceptance Test Plans and procedures.

It should be understood that the final content and form of each State's Acceptance Test Plan will ultimately be determined by the system design of the State-initiated EBT system. This Guidelines document is based in part on the document entitled Guidelines for Preparation and Review of Online EBT System Design Plans.¹

A basic assumption of the Guidelines document is that the system being tested is based on on-line EFT (electronic funds transfer) principles. That is, all EBT transactions will be authorized through an immediate check of a centralized file containing clients' balance information. The Guidelines document is not intended for use in preparing acceptance test plans for systems using off-line authorization principles. These include systems using integrated chip access cards (or "smartcards") that contain clients' benefit information within the cards' internal memory. This Guidelines document has been purposely limited in scope to application of EBT in the Food Stamp Program environment. The guidance provided herein, however, may have some relevance to other programs.

Also, future EBT systems may introduce expanded functionality or new technology (within the context of an on-line EBT system) as vendors or State agencies incorporate improvements driven by marketplace innovations. As this occurs, preparers of the Acceptance Test Plan should ensure that these enhancements are subject to the same testing thoroughness as this Guidelines document outlines for existing technology and functionality. In addition, the performance of acceptance testing of EBT systems will mature. Preparers of Acceptance Test Plans should include new testing techniques and tools as appropriate under the circumstances.

1.2 A DEFINITION OF ACCEPTANCE TESTING

Acceptance testing is the second (the first being the Functional Demonstration) of two testing periods that are required by federal regulations. The goal is to verify that each

¹ Charles R. King and John A. Kirlin, Guidelines for Preparation and Review of Online EBT System Design Plans, Cambridge, Massachusetts: Abt Associates Inc., March 1993.

component of the EBT system complies with the Food Stamp Program (FSP) requirements and system design specifications. According to federal regulations, acceptance testing will include:

- functional requirements testing;
- error condition handling and destructive testing;
- security testing;
- recovery testing;
- controls testing;
- stress and throughput testing;
- regression testing; and
- "what-if" testing.

Each of the above tests are discussed in subsequent chapters of this document.

The acceptance test is a fast-paced period of time in which many activities must be accomplished. It requires the utilization and coordination of a tremendous amount of resources in the form of time and effort by many parties. Acceptance testing is accomplished primarily through the performance of very specific "test cases" or scenarios which are documented, and sometimes referred to as, test scripts. Every facet of a system in production should be "exercised" by these test cases. These test cases would include exercising individual functions and "groups" of functions.

In other words, acceptance testing involves putting the system through its paces to determine if it functions according to design. It should be the very last test of the system scheduled to be performed by system developers. It is therefore probably the most important pre-implementation milestone prior to going "live." Acceptance testing determines whether the system is ready for implementation, i.e., the system complies with EBT regulations and system design specifications. Acceptance testing must be successfully completed and reported on (see Chapter 16) prior to receiving FNS approval.

A cautionary note on acceptance testing. Acceptance testing is more of an art than a science. Many informed decisions will be required of the test group during the acceptance test.

methods for ensuring that the acceptance tests are thorough in their examination of the EBT system. Chapter 4 (Documenting and Evaluating Test Results) describes how the test results should be documented and how identified defects and deficiencies should be evaluated and then reviewed in the context of pre-determined acceptance criteria.

The second section of this document emphasizes each test component required as part of the acceptance test. Chapter 5 (Establishing Initial Values) describes the different approaches to populating the EBT system database with data elements necessary to conduct the test procedures.

Chapter 6 (Testing Major Processing Component Maintenance and Control Functions) describes how, for each major processing component, the system is validated as conforming to requirements stated in the system design document. This includes all system editing and control functions to ensure the integrity of the information stored in the system's databases.

Chapter 7 (Error Condition Handling and, Destructive and Recovery Testing) describes the system's ability to detect errors, and process and report them. Also, the system must be able to withstand disruptions to system components, and if unable to do so, restart or continue processing without affecting the integrity of the databases.

Chapter 8 (Transaction Processing Testing) focuses on the testing of the system's ability to process valid transactions within on-line processing, backup processing, and ARU processing.

Chapter 9 (Settlement Processing Testing) addresses the testing of the system's ability to ensure that the settlement process correctly accommodates all transaction activity, including merchant holdovers and crediting of backup transactions.

Chapter 10 (Concurrent Processing Testing) describes procedures designed to observe the results when unrelated functions are exercised simultaneously.

Chapter 11 (Stress and Throughput Testing) describes the elements to be considered in developing procedures that will ensure that the EBT system will meet the system processing speed criteria as promulgated by federal regulations.

Chapter 12 (Production (Live) Demonstration) presents the elements that need to be considered when planning the in-store demonstration of the operations of the EBT system using volunteer clients and merchants.

Chapter 13 (Regression Testing) describes the process of re-testing any changes made to the system that resulted from the discovery of defects.

Chapter 14 ("What-If" Testing) presents the planning issues to be considered prior to the entering of previously "non-scripted" scenarios in a free-form manner by observers and participants to the acceptance test.

Chapter 15 (Network Certification) addresses the testing that should be considered when third-party networks and processors provide an alternative entry point into the EBT system.

Chapter 16 (Acceptance Test Report) provides an overview of the type of information that FNS expects to be included in the Acceptance Test Report.

Finally, there are four appendices (A through D) that provide examples of material to be included in the Acceptance Test Plan.

Appendix E provides a summary of the material presented in this Guidelines document. It can be used as a quick reference guide by both preparers and reviewers of the Acceptance Test Plan.

Chapter 2

ACCEPTANCE TEST MANAGEMENT PLAN

As described in the prior chapter, an acceptance test occurs in a fast-paced period of time in which many activities must be accomplished. It requires the utilization and coordination of a tremendous amount of time and effort by many parties. It is therefore critical to avoid, whenever possible, having to perform an acceptance test a second time.

The success of an acceptance test can be measured in many ways. First and foremost is that the testing activities are completed with no major defects noted. Acceptance criteria as established in the Acceptance Test Plan must be met (see Chapter 4 for a discussion on acceptance criteria). Another, and more subtle measure of a test's success is the level of comfort that participants have at its conclusion that the EBT system and all of its components were thoroughly exercised and the results of testing were properly presented and analyzed. The planning and management of an acceptance test, or lack thereof, will have a direct correlation with the success of the test. The planning function is often an overlooked aspect of the acceptance test process, as is its importance to a test's success. The objective is to avoid a disorganized, unstructured test that leaves the participants in a state of wondering whether "all the bases were covered."

The Acceptance Test Plan should include a management plan that documents the planning and management of the acceptance test. This chapter provides preparers with guidelines on the type of information that should be included as a part of a management plan. It also provides reviewers with a basis by which they can determine the completeness of the management plan.

2.1 OVERVIEW

The management plan is an essential component of the Acceptance Test Plan document and it should prove to be an important ingredient to the success of the test. Several specific reasons for including a management plan in the Acceptance Test Plan document are that it:

- establishes the roles and responsibilities for all participants. This is very important considering the amount of coordination and effort that will be expended by numerous organizations and that the test must be accomplished in a very short period of time;

- establishes a hierarchy for the line of authority. It therefore determines who will make the ultimate decisions regarding the pass/fail status on testing procedures;
- provides an overall structure to the performance of the acceptance test to ensure its completion in a timely and efficient manner; and
- provides a method to control the test environment to help ensure that tests are developed and organized in a structured manner. This is important as a great amount of time can be lost, and deficiencies caused, by mistakes in the set-up of the test system, e.g., incorrect parameter settings.

A management plan will include information on how the acceptance test is to be organized, staffed, and managed. It will describe the level of coordination with other organizations participating in the test (State, County, FNS, Merchants, third-party processors, etc.), as well as when and where tests will be conducted, along with supporting information. Generally, the components of a management plan include:

- An overview of the acceptance test to include:
 - a description of the general "flow" of the test; and
 - concise description of the overall EBT system architecture/components and the major processes performed.
- Acceptance test organization to include:
 - the participants to the test;
 - their roles and responsibilities, including line of authority; and
 - test schedule, including the location of different test elements.
- A description of the coordination with other organizations and systems that is necessary in order to effectuate and complete transactions.
- A description of the test environment to include:
 - the host configuration;
 - POS devices;

- administrative terminals; and
 - telecommunications network(s).
- A description of the test techniques, methods and tools to be utilized during the test, as well as some explanation of why these are appropriate.

The remainder of this chapter will focus on each of these areas providing both preparers and reviewers with examples of the type of information that should be included.

2.2 ACCEPTANCE TEST OVERVIEW

Preparers should begin the Acceptance Test Plan by presenting an overview of the "flow" of the acceptance test. Included would be the types of tests (as described in later sections of this document) to be performed, the sequence of their performance, and the interactions with other organizations. The objective is to provide the reader with a general understanding of the activities comprising the acceptance test.

Preparers should also include a concise description of the overall EBT system architecture and the major processes performed. It is not necessary to provide the level of detail that was included in the system design document. Preparers may want to consider including the processing diagram(s), together with the explanation of the diagram(s), used in the system design document as a method to provide this general overview information. This summary of the EBT system will provide a general understanding of its operations. The Acceptance Test Plan should contain this information because there may be some individuals participating in the test who are unfamiliar with the system design. However, FNS recommends that participants in the acceptance testing be familiar with the contents of the system design document.

Reviewers should consider the adequacy of the materials included in the Acceptance Test Plan document from the viewpoint of someone who is new to the system. If processing diagrams are not utilized, the reviewer should determine whether all major components and processes are included by cross referencing the description provided in the Acceptance Test Plan to the system design document.

The reviewer should determine the completeness of this section of the overview after the entire Acceptance Test Plan document has been read.

2.3 ORGANIZATION

This section of the management plan chapter is concerned with providing information on the composition of the participants to the test, their roles and responsibilities, and the test schedule.

Participants to the Test

Preparers need to determine the number of individuals necessary to adequately perform the test procedures developed and described in the Acceptance Test Plan document. The Acceptance Test Plan document should include a description of all persons who will be involved in the test. The test team should include personnel from the system developer, including relevant subcontractors (e.g., POS device(s) programmers), if appropriate, State, County and FNS. The preparer should acquire, in advance, from the State, County and FNS, a listing of the individuals who will be involved in the acceptance test, especially the functional requirements portion of the test.

Participant Roles and Responsibilities

Each participant to the test should have a specific predetermined role in the test. Depending on the nature of the test, the roles and responsibilities may change. The preparer should describe each participant's role for each component of the test. For example, on day 1 of functional requirements testing, multiple teams of two individuals may be assigned to perform test procedures at a specific POS device. One of the individuals would be designated as the tester, and would enter the transactions as defined on test scripts. The other individual would be designated as the reviewer and would verify that the transaction was entered as defined and would record the result. On the second day of the test these roles would be reversed. It may also be appropriate that several individuals are designated as observers to the test.

The lines of authority must also be established and communicated to the test participants. This hierarchy will prescribe who will be making decisions regarding the EBT's system

performance and results of testing. Many decisions may be vigorously debated and there is a need to have advance agreement on whose decision is final.

Test Schedule

In order to ensure that participants in the acceptance test are in the right place at the right time, a schedule of the testing period should be developed. It should include when and where each test activity will be conducted. This is important as there most likely will be concurrent testing being performed at multiple sites, and the host computer may be located in a different city or State. Based upon experience at other EBT demonstration sites, functional requirements testing has occurred over two periods of time each consisting of three or four consecutive days. The first period is when the basic testing activities occur. The second period is usually mainly concerned with testing corrections made to the system, i.e., regression testing. Both test periods have required the participation of system developer, State, County, and FNS personnel. Other testing components such as stress testing will usually occur at a later time and has required fewer participants to be present.

Preparers of the Acceptance Test Plan should schedule the performance of the acceptance test, and all associated testing, well in advance of the scheduled system start-up date to allow adequate time for resolution of system discrepancies uncovered during the test and regression testing.

In general, the test schedule should include information on the following areas:

- Delivery, set-up and testing of the computer equipment and POS devices at all test locations.
- A daily schedule of testing events including, as examples:
 - generation of test databases,
 - issuance of test cards,
 - performance of transactions,
 - review and analysis of reports,
 - review and analysis of results, and
 - debriefing.
- The location of the tests.

The daily schedule must include multiple system cycles (days) as a means to accelerate the testing of all components and functions of the system. For example, accelerating the system's days to test stale dating of issuances or the expiration date of the EBT card.

Preparers and reviewers should be cognizant that decisions made in each of the above areas will affect the approach to the other. For example, a limited number of test participants may require a longer test schedule to accomplish the test objectives. Similarly, the approach taken to a specific test area may also affect other aspects of the test. The utilization of an automated testing tool to simulate test transactions during functional requirements testing may require fewer participants than would be expected are required to be involved with the test. Reviewers need to comprehend the entire acceptance test scenario to make a determination as to the adequacy of the Acceptance Test Plan in these areas.

2.4 COORDINATION WITH OTHER ORGANIZATIONS, SYSTEMS, AND PERSONS

There are a number of organizations and persons whom the processor will need to interact with as part of the acceptance test. A listing of these organizations and persons, along with a brief description of each, should be presented as a part of the management plan of the Acceptance Test Plan document. This will provide the reviewer with an understanding of the other organizations who are involved with the EBT system and to what extent each is involved. The preparer should provide sufficient information (eg., the type of relationship, the type of data provided or received) to enable the reviewer to discern the extent to which each organization affects the EBT system. A generic listing of these organizations, along with a summary description of their involvement with the acceptance test, is presented on the next page.

| ORGANIZATIONS, SYSTEMS AND PERSONS | TYPE OF INVOLVEMENT |
|---|---|
| Local Welfare Office | <ul style="list-style-type: none"> - Eligibility determination - Administering benefits - Interfacing with clients |
| State | <ul style="list-style-type: none"> - Maintenance of databases - Interfacing with EBT system - Projection of funds required for production (live) demonstration |
| Concentrator Bank | <ul style="list-style-type: none"> - ACH transactions |
| FNS Headquarters/Regional Office | <ul style="list-style-type: none"> - Establishment of letter of credit to fund acceptance test activities |
| FNS Regional Office | <ul style="list-style-type: none"> - Provide funding for letter of credit |
| Health and Human Services (HHS) Payment Management System | <ul style="list-style-type: none"> - Smartlink access |
| FNS Minneapolis Computer Support Center | <ul style="list-style-type: none"> - Submission of redemption data resulting from production (live) demonstration through interface |
| Retailers | <ul style="list-style-type: none"> - Participating in production (live) demonstration |
| Retailers with POS Systems | <ul style="list-style-type: none"> - Passing transaction data |
| Other Third-Party Processors | <ul style="list-style-type: none"> - Passing transaction data |
| Food Stamp Clients | <ul style="list-style-type: none"> - Participating in production (live) demonstration |

It will be necessary for preparers to add or subtract from this listing based on the specifics of the EBT system design. Reviewers should compare the list supplied to the system design document for completeness. The reviewer can then ascertain whether the Acceptance Test Plan document in later sections provides for any testing of interfaces with these organizations.

2.5 TEST ENVIRONMENT DESCRIPTION

The preparer should provide in this part of the Acceptance Test Plan document a full description of the test environment. This should include the exact configurations for the State (or local) and processor computers to be used in the testing, as well as that for the POS devices, administrative terminals, and the telecommunications network. This information should be provided for each component of the acceptance test, i.e., functional requirements testing including "live" testing, stress and throughput performance testing, etc. The test environment should be configured in a "production" mode of operations. This would apply to the processor's computer system(s), the telecommunications network, administrative terminals, and terminal devices set up in every type of configuration that will exist in the stores, e.g., single lane configurations and multi-lane, in-store controller configurations. Any differences between the test environment and a production environment should be detailed along with an explanation as to why a production environment could not be provided, and what implications these deviations might have on the test results, if any.

Testing of the EBT system in a production environment is absolutely essential to the evaluation of the results of the acceptance test. As examples:

- differing performance statistics (transaction throughput) may result from a host computer system that will be shared with other applications in a production environment but was tested with only the EBT applications processing on it.
- testing of only single lane in-store configurations will not adequately represent expected results of testing multiple-lane configurations which utilize an in-store controller.

The system design document should include the detail of the hardware components and the telecommunications network of the EBT system and the environment in which they were designed to be operating. The reviewer should use this information as a basis for determining whether the test environment presented is satisfactory for conduct of the acceptance test. The reviewer should investigate the ramifications of noted differences.

2.6 TEST TECHNIQUES, METHODS AND TOOLS

Acceptance testing of an EBT system involves passing data elements and transactions, as appropriate, through each component of the system to determine if the system responds as specified in the system design document. Some testing involves passing data that intentionally contains errors. Other testing involves passing high volumes of data. Acceptance testing techniques, methods and tools will vary based on the type of test being performed. For example, the majority of functional requirements testing to date has consisted of manually entered transactions at POS devices. Stress and throughput testing has been performed with a combination of manually and automated entry of test transactions.

Acceptance testing cannot be performed in an adequate manner by using only manual testing techniques. Transaction volumes cannot be generated which would provide any assurance that the system will operate as designed in a real world environment. Manually entered transaction sets do, however, provide information to base decisions on the EBT system's ability to meet the minimum functional requirements. Testing requires automated tools capable of allowing users to specify the type of transactions that they desire to have tested. Automated testing tools provide the users with the ability to more thoroughly exercise various transactions sets. This is particularly important as transactions sets manually entered may not trigger a hardware or software condition that would cause a different result than expected. For example, the capacity of a "buffer" area, and the expected result when capacity is reached, would probably not be tested through manually entered transaction sets due to the significant number of transactions that would need to be entered at an incredibly high rate of speed. The use of automated tools is a must when performing stress and throughput testing.

Preparers should include a description of the types of testing techniques and tools that will be used in the testing. Examples would include:

- transactions entered at POS devices to test functional requirements;
- pre-programmed POS devices to simulate or stress in-store controllers or the telecommunications network;
- files of test data to test batch edit programs on interfaces;
- use of data dictionaries to generate data for edit checking; and

- **proprietary software to simulate POS devices generating numerous transactions per second to test system throughput and ability to properly process high volumes of transactions.**

Chapter 3

DEVELOPMENT AND DOCUMENTATION OF ACCEPTANCE TESTING PROCEDURES

An EBT system comprises many different processing components. The Guidelines for Preparation and Review of Online EBT System Design Plans suggests that there are at least nine processing components which are inherent to today's EBT systems. Each of these processing components provides the capability to carry out numerous program functions. While the actual number of processing components will ultimately be determined by a particular EBT system's design, the acceptance test must be designed to test all functions provided by all processing components.

The purpose of this chapter is to provide preparers with a framework for the overall approach to developing and documenting acceptance test procedures to help ensure that all processing components, and the functions they provide, are thoroughly tested. Thorough testing is the basis for the "go/no go" decision to start-up the EBT system. Specific testing guidelines are presented in subsequent chapters of this document.

3.1 OVERVIEW

This chapter is concerned with the process of developing and documenting the tests that will be performed. The tests must be designed to thoroughly exercise individual functions and groups of functions comprising the EBT system. Therefore, acceptance tests are typically

example of a complementary string would be balance inquiry, purchase, refund, balance inquiry. The results of the transactions are evaluated after the entire string has been completed assuring that the system properly records and updates transactions in a realistic scenario.

The third stage of testing should attempt to perform strings of transactions in a more random order to test the integrity of the system and the system controls. An example of a random string would be balance inquiry, food stamp return (refund), purchase, balance inquiry. Again, the results are evaluated after the entire string has been completed.

The fourth stage of testing would interject attempts to disrupt the normal system functions and encompass error condition handling and destructive testing as well as security testing. An example would be to "pull the plug" (electrical or telecommunications) on the POS terminal prior to completion of a purchase transaction. These tests ensure that the system has adequate controls to prevent potential financial or performance losses.

The fifth stage of testing is providing a limited amount of benefits to a set of recipients for actual use in retail environments. This "live" test ensures that the user interface is acceptable and that performance in a live environment is as expected. If possible, the test should be performed in at least one of each type of retailer environment (i.e., single lane and multi-lane stores) and each type of POS equipment configuration (i.e., single POS terminal, in-store controller connected to multiple POS devices).

Other stages would include system recovery testing, stress and throughput testing, "what-if" testing, and regression testing. These tests are presented in subsequent chapters.

Further discussion on the elements comprising each of these stages is provided in subsequent chapters of this Guidelines document. However, the intricacy of the testing to be developed should be apparent. The preparer must be certain that tests for every potential permutation of transactions or sets of transactions have been developed, and must present them in a fashion that allows reviewers to easily form an assessment as to the completeness of the test procedures. This must be done for each processing component and for each special area test (e.g., stress testing).

This chapter provides guidance to preparers on the generic issues to be considered when developing the testing procedures and the manner of documenting such testing procedures. Four

methods are presented to assist preparers in accomplishing this endeavor. They include the use of:

- a functional matrix;
- test scripts;
- a requirements verification matrix; and
- narratives.

For many tests, it would be appropriate to use each of these methods. The methods "build" on each other in that the functional matrix provides the information for use in test scripts, and the test scripts provide some of the information for the requirements verification matrix. Preparers need to determine the proper use of each based on the specifics of the tests that they have designed. Each method is discussed in the remainder of this chapter.

3.2 FUNCTIONAL MATRIX

The purpose of a functional matrix is to provide a method to identify all potential permutations of functional and transaction sequences that can occur in a particular processing component. For example, the following simplified matrix illustrates three separate transaction combinations that can occur as a part of the on-line processing component of an EBT system.

| | | THEN PERFORM: | | | | | |
|----------------|-------------------------|------------------|-------------------------|---------------------|-------------------|-----------------------|-----------|
| | | Transaction Type | Perform Balance Inquiry | Food Stamp Purchase | Food Stamp Return | Food Stamp Conversion | Void Last |
| FIRST PERFORM: | Perform Balance Inquiry | | | 1 | | | |
| | Food Stamp Purchase | | | | 2 | | 3 |
| | Food Stamp Return | | | | | | |
| | Food Stamp Conversion | | | | | | |
| | Void Last | | | | | | |

The resulting transaction combinations would be:

1. Perform balance inquiry, food stamp purchase
2. Food stamp purchase, food stamp return
3. Food stamp purchase, void last

As previously indicated, these three transactions sets are very simple and relatively straight forward. Preparers should fully develop a matrix(ces) for each processing component identified in the system design document. Each matrix should include all transaction types specified for the processing component. Preparers need to identify and examine all the possible transaction sequence permutations represented in the matrix.

Reviewers of the matrices should:

- verify that the Acceptance Test Plan document provides a functional matrix for each processing component identified in the system design document;
- verify that each transaction type that is associated with a processing component in the system design document is represented on the matrix; and
- determine the comprehensiveness of the permutations identified by considering the combinations presented and identifying those that are missing.

3.3 TEST SCRIPTS

Once the permutations are identified through the use of functional matrices, the preparer should then convert the sequences developed into test script format. This will assist in the performance and tracking of the testing to be performed. Transactions or transaction sets (multiple transactions) are usually referred to as "test cases" and should be identified as such on the test scripts. For example, the three transaction sequences identified in the above functional matrix would be identified on the test scripts as test case 1, test case 2, and test case 3. Test scripts will minimally include the following information.

- card or PAN being used
- the cardholder name
- the cardholder status
- the card generation number

- the PIN
- retailer and clerk ID
- POS device or other device being used to enter the transaction
- test case number
- the type of transaction
- the amount of the transaction
- the expected response
- the expected balance
- spaces to record observation of the actual system response and the balance returned

When developing the test scripts, preparers should economically present the scripts by avoiding repetition of common information for multiple test cases. For example, it would be sufficient to provide the information for the first seven items identified above one time and then provide the information requested in the next six items for each test case.

An example of a test script is presented in Appendix A.

Preparers need to take the development of test cases a step further than simply transposing the permutations identified in the functional matrices. An EBT system is much more complex and preparers should develop test scripts which take into consideration the myriad of conditions and circumstances under which each transaction set can occur in the "real" world and, therefore, need to be tested. As examples, this would include:

- conditions which generate approvals and denials, e.g., sufficient and insufficient balances in a recipient's account or the use of the correct and then incorrect generation card.
- the processing of each transaction set, at each type of retailer environment and on each type of POS device.
- processing over multiple benefit periods or months and calendar years.
- processing sequences of transactions at multiple merchants (e.g., perform a purchase at one merchant and attempt a refund at another).

These conditions and circumstances should be specifically identified in the EBT system's design document and the preparer must provide test scripts for each. Preparers should bear in mind that testers will need to trace the results generated from the test scripts to on-line history files and daily reports and should incorporate this into their test procedures. Preparers may develop variations on the test script in order to accommodate all the functions and requirements which need to be tested.

Reviewers should trace each permutation identified in the functional matrix to the test case in the test scripts and ascertain, through reference to the system design document, whether all conditions and circumstances were considered in the scripts.

3.4 REQUIREMENTS VERIFICATION MATRIX

Another method to ensure that all specifications have been tested is through the use of a requirements verification matrix. This matrix serves multiple purposes in that it requires the preparer to cross-reference the specifications and the system design to test procedures and their results. A requirements verification matrix could include:

- all specifications as promulgated by the State and FNS;
- system design document references that addresses each specification;
- the acceptance test procedure(s) that will test the EBT system design; and
- the results of the acceptance test procedures.

The matrix could be further segregated by major functional requirement areas as described in the Federal regulations for State EBT systems.

An example of a requirements verification matrix is provided in Exhibit 3-1.

3.5 NARRATIVES

In most situations, it will be necessary for preparers to describe a test scenario in more detail than can be provided by the previously presented methods. In these situations it would be appropriate to provide narratives as a lead-in to the test scripts. For example, many test scripts will require some "set up" so that the tester understands the purpose of a script or series of scripts. There are also some test procedures that do not lend themselves to being documented by way of test scripts and would therefore be documented predominately by the use of narratives. The stress and throughput tests are examples of this type of test procedure. They usually require that multiple transactions be run at very high transaction rates using multiple devices. The narrative would be used to describe the test and the expected test results. The script may then be limited to identify a representative transaction being processed.

Exhibit 3-1

Requirements Verification Matrix

| Functional Area | FNS and State Specifications | Design Document Reference | Acceptance Test Procedures | Summary of Results¹ |
|------------------------------|--------------------------------------|----------------------------------|-----------------------------------|---------------------------------------|
| Authorize Household Benefits | Transfer of Eligibility Information | Section 5, page 2 | Test Case 2 | Pass |
| | Post Issuance Data | Section 5, page 10 | Test Case 3 | Fail - Priority 3 ² |
| | | | | |
| Providing Household Benefits | FS Purchase | Section 6, Page 7 | Test Cases 20, 21, 27, 29 | Pass |
| | FS Purchase using Back-up Procedures | Section 6, Page 9 | Test Cases 22, 23, 28, 30 | Pass |

Notes: ¹ To be completed after the test.

² Refers to defect reporting explained in Chapter 4.

Chapter 4

DOCUMENTING AND EVALUATING TEST RESULTS

As test cases and other test procedures are performed, the results should be recorded immediately. Those tests that produce the expected results are, naturally, the easier to document. Simply indicating that the test "passed" in some fashion should be sufficient. The difficulty begins when discrepancies are identified through the testing procedures. These discrepancies need to be documented and brought to the immediate attention of the test coordinator for review, investigation and resolution.

4.1 OVERVIEW

As indicated earlier, one of the measures of the success of an acceptance test is that it is completed with no major defects noted. At this stage of the EBT system's development cycle, it should be anticipated that the majority of all testing would provide the expected result. Unfortunately, a completely defect-free test would not be realistic. There will be some discrepancies between actual and expected results. The evaluation of severity of the defects is somewhat subjective. To limit this subjectiveness to the maximum extent possible, the Acceptance Test Plan document should contain information regarding the manner in which defects will be evaluated. It is imperative that there be agreement on the treatment and evaluation of discrepancies prior to the start of testing.

This chapter focuses on providing a format for documenting discrepancies, evaluating the significance of each discrepancy, and the control and follow-up required that should be included in the Acceptance Test Plan.

4.2 DEFECT REPORTING PROCEDURES

Preparers should provide as a part of the Acceptance Test Plan document the procedures that the testers and the system developer will follow when a defect is discovered. Typically, the procedures would include:

- how to document the defect;
- to whom to report the defect; and
- when to report the defect.

Preparers of the Acceptance Test Plan document should provide a multi-sectioned form for testers to report defects noted and for the system developer to document the cause of the defect and its resolution. The form developed should include at least the following information.

- date of the test;
- tester's name;
- test case generating the defect;
- problem description;
- client card number; and
- defect resolution.

Each form submitted should be assigned a sequential control number. Two sample forms from previous EBT system acceptance tests are presented in Appendix B.

In all situations, the Acceptance Test Plan should require the immediate reporting of defects to the system developer's test director. This is significant as the system developer may need to review the sequence of steps performed by the testers in order to properly diagnose the cause of the defect. In some cases the system developer may need to view the terminal screen or message displayed by the POS device.

Preparers should also provide a description in the Acceptance Test Plan of the procedures that the system developer will take to investigate and correct the defects noted.

Reviewers are concerned with the level of effort that the system developer intends to make available during the acceptance testing to resolve and correct the defects. The extent and magnitude of effort devoted will directly affect the time that it would take to complete the acceptance test.

4.3 DEFECT-SEVERITY RATING SYSTEM

Preparers need to present as a part of the Acceptance Test Plan the defect-severity rating system that will be used at the acceptance test. The rating system would also include the action that will occur as the result of encountering that severity of defect. The rating system should include logical "categories" or "priority levels" that defects can be assigned.

Reviewers should be concerned with the reasonableness of the rating system and the follow-up actions.

To assist both the preparer and reviewer, the following is an example of a defect-severity ranking scheme that has been used at other acceptance tests.

| PRIORITY | DESCRIPTION | ACTION |
|----------|--|---|
| 1 | Major system defect/malfunction | Testing is halted until problem is resolved. Once resolved, testing starts over. |
| 2 | Defect/major malfunction of processing component | Testing is halted in particular processing component but continues in other components. Scripts will be adjusted if necessary and problem resolution will be performed. Testing will restart in this component once defect is corrected. Defect will be included as a part of regression testing. |
| 3 | Minor function problem | Testing will continue on all aspects of the system. Defect will be included as a part of regression testing. |
| 4 | Edit/cosmetic error | No effect on testing. To be corrected prior to system being placed in production environment. |
| 5 | All others including design clarifications | No effect on testing. To be addressed as a future system enhancement or design update. |

Examples of defects by level of severity are presented under Section 4.6. Preparers should also establish procedures (e.g., logs) to ensure that each defect is included in regression testing.

4.4 ACCEPTANCE CRITERIA AND DEFECT EVALUATION

Once the defect-severity rating system has been developed, and subsequently agreed upon, the acceptance criteria for the testing should be established. Based upon the categories of priority levels established in the rating system, preparers should include in the Acceptance Test Plan the acceptable number of defects (by defect-severity level) that can be detected by the test procedures and still result in a "go" decision. This number should be represented by a range rather than a finite amount. It should also be understood that there will be some leeway from the established ranges to allow for special circumstances that develop during the testing. For example, a high number of defects noted which might have been caused by operations personnel inadvertently suspending access to the host computer for a few minutes may be segregated from the total count of defects in order to make a proper assessment of the EBT system performance. This error may have artificially skewed the test results and an adjustment in the acceptable number of defects would be appropriate for this group of defects.

The ramifications of the types of defects identified should be evaluated from two perspectives. The first is by the total number of defects noted by priority (severity) classification. Some guidelines follow:

- Any priority 1 defect would require that all testing be restarted after the defect has been corrected.
- Two to three priority 2 defects would be acceptable if they could be corrected within the acceptance test period, regression testing resulted in no additional defects being uncovered, and testing of the component(s) was able to be completed.
- Approximately 20 priority 3 defects would be acceptable if they could be corrected with regression testing performed either during the acceptance test period or a later date and prior to the EBT system being placed in production operations.
- All priority 4 defects need only be corrected prior to the EBT system being placed in production operations.
- Priority 5 defects need to be addressed as a future system enhancement.

The second perspective to view reported defects is by processing component. An accumulation of defects within a single processing component would warrant that additional

acceptance testing be performed on that particular component. The rationale for this logic is that there may be an underlying problem with the entire processing component and that there may in fact be more defects yet to be uncovered. The acceptable number of defects within a processing component would be dependent upon the significance of the component and the severity level assigned to each of the defects. A high number of defects in a processing component will also affect the approach taken with regression testing of the component. Further discussion on determining the appropriate level of regression testing is presented under Section 13.3.

To ease the overall evaluation process, preparers should provide layouts of summaries of the test results that will be used during the test. Test procedures should require that the summaries be updated on a daily basis. The summaries should report on:

- total defects;
- defects by processing component;
- defects by priority level by day; and
- status of defects by priority level and processing component.

Appendix C provides examples of formats for summarizing defects for the total defects and defects by processing component. Formats for summarizing defects by priority level by day and status of defects by priority level and processing component should essentially follow a similar style.

In addition to the summaries, a typed, detailed description of each defect should be provided to test participants at the conclusion of the test, along with the resolution and other appropriate information. These descriptions will make use of the information provided on the defect reporting forms presented in Appendix B. These descriptions will also be included as an attachment to the report to FNS conveying the results of the acceptance test prepared by the State agency. Additional information to be included in this report is presented in Chapter 16.

4.5 DEFECT CLASSIFICATION

The results of testing should be reviewed at the end of each day by the entire test team. It is at this time that the defect-severity level is assigned to the defect(s). The entire team should participate in reaching a consensus as to each defect's severity level ranking. Should there be some disagreement, then the individual identified in the Acceptance Test Plan document as the ultimate decision maker should assign the proper classification.

Preparers should document the defect evaluation procedures that will be used for the acceptance test ensuring that the test schedule provides adequate time at the end of each day to review each defect and its resolution.

The system developer should not wait until the end of the day to begin the process of determining the cause of the defect and the corrective measure needed. The impact of the defect should be determined as soon as practical in order to make any adjustments needed in the testing that is taking place subsequent to the discovery of the defect. For example, when it is evident to the test coordinator that a Priority 1 defect may have occurred, all testing should be halted so that the test team can meet to assess the defect. Likewise, the immediate correction of a defect can negatively affect other prior tested components, and all corrections need to be considered in regression testing. To ensure that the integrity of the testing process is maintained, the processor should obtain the approval of the test coordinator prior to making corrections.

4.6 EXAMPLES OF DEFECT-SEVERITY CLASSIFICATIONS

To assist the preparer and reviewer with developing the procedures surrounding the documentation and evaluating of test results, the following are examples of defects by level of severity.

Priority 1

- Transactions processed against incorrect client or merchant accounts.

Priority 2

- Host does not return an "access denied" message when a non-authorized third party cards is used at the POS device.
- ARU not providing correct client account balances.
- First Card setup dropped by the system when two cards were sent within 1/100 of a second

Priority 3

- Recurring "transmitting error" message displayed by similar POS devices when attempting a purchase transaction - potential code problem.
- Totals on daily administrative reports do not agree with store totals generated on retailer POS printer tapes.
- Cents remaining from a coupon conversion not recorded by the system in reports or data sent to the State eligibility system.
- System allows access to a recipient's account balance with the use of a hot card (assumes that all access is denied via a hot card).
- Mathematical algorithm used to calculate the amount of a food stamp conversion reduces the client benefit balance for an incorrect amount.
- Administrative terminal locks up during sign-off when wrong key is pressed.

Priority 4

- Terminal at retailer printing incorrect retailer name on the receipt.
- Certain screens have spelling errors in the field descriptions.

Priority 5

- State agency request to provide a cumulative-to-date column on certain reports.
- State request to make a displayed message more descriptive.

Chapter 5

ESTABLISHING INITIAL VALUES

EBT system files, in their simplest form, are comprised of many data elements (e.g., names, addresses, program codes, dollar amounts, etc.). These data elements will contain the specific information necessary to allow the EBT system to process the types of transactions that are specified in the system design document. Once a system has been fully developed and is

simulate the composition of each file at various stages in its production life cycle (e.g., a client's transaction history).

This method of populating the system files facilitates the testing process by "short cutting" the creation of the values needed to conduct particular test procedures that otherwise would have had to be created through laboriously detailed transaction sets and scripts. For example, a test of a system design specification that limits the transaction history for a client to his or her last 100 transactions can be tested in two ways. One way would be to develop detailed test scripts which would require the entering of 100 plus transaction sets through a POS device, each updating the history for the client. The other way would be to populate the appropriate file with 90 plus transactions for a particular client and then processing 10 or more transactions through a POS device during the test itself.

The initial values needed for acceptance testing are determined, and documented, as the acceptance test procedures are being designed. They are entered into the EBT system either manually or through an interface to other systems. Also, the introduction of the initial values into the EBT system may occur at different times for different files and different segments of each file. The Acceptance Test Plan document should identify how and when each file will be initialized.

The key factors which will determine the initial value requirements for the acceptance test activities include:

- the types of system files, including their structure and organization, defined in the system design document, and
- the extent and magnitude of the test procedures developed as a part of the acceptance test.

These factors are discussed in this chapter.

5.2 TYPES OF SYSTEM FILES

EBT systems consist of many data files which can be classified as either static or dynamic files. Dynamic files contain data elements whose values frequently change as they are acted upon during day-to-day processing activities. Examples of dynamic files include the client file and the merchant file. Static files are files that contain processing parameters that are not

Exhibit 3-4

MERCHANT HISTORY INFORMATION SCREEN

MHF

CURRENT DATE mm/dd/yy
TIME hh:mm

M T E C H E B T S Y S T E M

MERCHANT HISTORY RECORDS

ENTER MERCHANT CASE NUM : _____ NAME-
ENTER START DATE (M/D/Y): ___ / ___ / ___ ADDR-
ENTER START TIME (HH:MM): ___ : ___

| CLIENT | | | | | CL | FC | RS | TRAN | TRAN | BUS | REFERENCE |
|--------|--------|------|------|------|----|----|----|------|------|------|-----------|
| CASE # | AMOUNT | STAT | SEQ# | AUTH | ID | CD | CD | DATE | TIME | DATE | NUMBER |

F1 = DISPLAY F3 = CONTINUE SF1 = MAIN MENU
SF12 = EBT FILE MENU SF16 = EXIT

Used with permission

Initialization and Setup

Under Initialization and Setup, preparers will be describing the process of setting up clients' EBT accounts using data from the eligibility system. Descriptions of the client database's structure and data elements should be key items of the presentation. Mapping of eligibility system to EBT system databases should describe the flow of data elements between the two systems. Edit criteria, defined for each data element, should be provided to ensure integrity of data applied to EBT system files.

Establishing clients on an EBT system often requires reformatting of records maintained on county or State eligibility systems to allow data transfer to EBT system files. Loading the client file is a process similar to that performed in the previous section, 3.4, Merchant Processing.

Data conversion usually follows two courses: initial conversion and normal processing. Initial conversion captures, reformats, and adds information about existing clients to the EBT system. This processing should be discussed by the preparer in the Client Eligibility System section (3.3). Normal conversion processing is the ongoing link between the eligibility and EBT systems. On the basis of a pre-established schedule, new clients are added, changed, or deleted on existing EBT client files. In addition, monthly, supplemental, and emergency allotments are transferred to the EBT system. Client information and allotments are reformatted and sent to EBT systems via magnetic tape or over telephone lines.

Information transfer requirements should be specified in the System Design Plan. Client file content and formats used by the EBT system for transaction processing should be provided. Edit criteria need to be defined for each data element. Table shells of processing reports that indicate good transactions, rejects, errors, and processing totals (such as transaction processing counts and amounts) should be provided, together with variable definitions. EBT workstation screen displays and data element edits supporting manual inquiry and update to the client files should be described in detail.

Edit criteria for each field are usually specified as either variable or fixed. Changes to variable data elements, such as name, address, and telephone number, are based on input subject to general editing rules (e.g., spaces, 0-9, A-Z). Fixed field contents, such as program type, allotment amounts, and EBT card number are system processing parameters. Edit criteria for such fields should be specified in the system design.

In summary, this section of the design plan should address the following points:

Client File

- the type of client cases needed
- the number of each type of client case
- the required values in each case
- cross-program client values, if applicable
- interface requirements

Merchant File

- the type of merchant cases needed
- the number of each type of merchant case
- the required values in each case
- interface requirements

Security File

- the levels of security requested by the State agency, e.g., password management, screen time-outs, data encryption, controls on access to system reports and files

Terminal File

- the types of POS terminals in the test
- required number of terminals for all merchant processing
- required number of terminals for all network processing
- size of merchant test groups
- size of networks in test groups
- number of other terminals, e.g., ARUs
- number of administrative terminals

Test Card and PIN Creation

- the number of client accounts
- the number of acceptable card replacements and their generation number

This should not be considered a complete listing as each system design document would determine the type and nature of the system files, and the design of the acceptance tests (as discussed in the next subsection) is a major factor in the development of initial values.

Reviewers should:

- cross reference each file identified in the system design document to its presentation in the Acceptance Test Plan, and,

- ensure that all data elements identified in the system design document are represented in the Acceptance Test Plan. A reviewer would be interested in data elements for which no initial values were established.

As previously mentioned, preparers should also include a schedule describing the timing of each file's initialization. The schedule should allow for two phases of file initialization. There is certain information in each file that can be entered into the system prior to the start of acceptance testing. As an example, this would include general information such as client or merchant census information that would be acquired from the eligibility and/or merchant participation systems. Ideally, system generated reports should present this information with no other values or processing codes included in the file.

The second phase of the initialization would occur at the start of the acceptance test. All remaining initial values should be entered into the EBT system. This should occur either manually, or through an interface with other systems. The Acceptance Test Plan should provide for the files to be initialized in the manner that it would occur during production operations. Prior to entering transactions, a report should be generated which displays these values to allow testers to compare them to the values presented in the Acceptance Test Plan.

The intent of the two phase initialization is to provide evidence to system testers that the system files have been "zeroed out" prior the start of the acceptance test and that there are no erroneous data that could affect the results of the test.

5.3 DEVELOPMENT OF ACCEPTANCE TESTS

The actual determination of the initial values to populate the data files is an integral part of the acceptance test development process. Often, the requirements for these values are not known, in full, until after all acceptance tests have been designed. The acceptance test preparer needs to identify and accumulate the range of values necessary to be able to complete the tests.

In Chapter 3, guidance was provided regarding the development of the various transaction permutations and test scripts to be used in the functional requirements test. At a minimum, initial values need to address the data requirements, e.g., client or merchant information, for conducting this functional requirements test. However, meeting the minimum requirement may be insufficient to support other acceptance testing components such as stress and throughput

testing, and error handling and destructive testing. Preparers must consider all the values necessary to support test procedures developed for these and other components. To illustrate the significance of the effect that these other components will have on the initial value requirements, consider the following.

When conducting system performance testing, a large volume of transactions will be processed against a large number of client records. A test designed to generate transactions at a rate of six (6) per second, sustained over a period of one hour without denials will produce 21,600 transactions. The client file will need to be populated with sufficient information (client accounts, benefit balances, etc.) to accommodate this testing requirement.

The exact determination of the file size would be dependent on how the system design allows for access to client files, the total dollar amount to be included in each client record, the type of transaction being used in the test scenario, and the dollar amount of each transaction. The Acceptance Test Plan would need to address these issues and present the initial values in a format that reviewers and testers could easily understand and trace to system design documents and EBT system reports.

To properly evaluate testing results, it would be appropriate to establish an independent series of "initial values" for each of these acceptance test components. Preparers should segment the presentation of the initial values in the Acceptance Test Plan by acceptance testing component.

5.4 INTERFACES WITH OTHER SYSTEMS

As described earlier in this chapter, certain files, e.g., client and merchant files, can be populated through an interface to another system. Therefore, client file initiation should start with the client eligibility system and merchant file initialization would start with the merchant participation system. Test accounts should be established on these systems, if possible, and transferred by way of the direct interface to the EBT system. Using this approach provides basic assurance that the interface works properly. In a multiple program environment, the workings of each interface can be determined early in the acceptance testing process. Establishing this download with pre-established values may require coordination with other organizations, and the timing should be detailed as was described in Chapter 2 of this document.

An interface's complexity stems from the number of programs participating in EBT processing. In addition, the number of systems processing each program further adds to the

complexity. The number of other systems requiring interface capability vary greatly from State to State. For example, some States will have one integrated eligibility system for all programs, while at the other extreme, some States may have a separate system processing each different program or there may be separate systems at the county level. The greater the number of programs and systems, the greater the number of different formats, program rules, and processing parameters. This will vary greatly as there may be an integrated eligibility system involved which has all programs.

Preparers should provide a brief description of the interface requirements for each relevant system file which should include details of the timing of the initialization. Reviewers should be able to trace this information to the system design document and review the timing of the initialization in context of the overall acceptance test.

5.5 SUMMARY

The Acceptance Test Plan should present the methodology that was used to determine the proper sizing of the initial values for each file identified in the system design document after considering all elements of the acceptance test.

Reviewers can utilize the methodology, scripts, and the system design document to gain an understanding of the file sizes and their adequacy to meet the objectives of the overall acceptance test. For example, a setup of three merchant accounts and ten client accounts would be considered inadequate in most acceptance test situations. Reviewers should consider the following when reviewing the setup of initial values.

- The requirements of the test scripts in order to meet the functional requirements testing.
- The need to use the file in testing areas other than functional requirements testing, e.g., error handling and performance testing.
- The timing of the initialization of the files with the initial values.

Chapter 6

TESTING MAJOR PROCESSING COMPONENT MAINTENANCE FUNCTIONS

As indicated in an earlier chapter, the document entitled Guidelines for Preparation and Review of Online EBT System Design Plans identifies nine processing components inherent in the design of today's EBT systems. Within the design of these processing components there exists various maintenance functions which ensure that the entire EBT system is conforming to pre-determined criteria as specified in the system design document. The processing components discussed in this section are:

- Client Eligibility Systems Processing;
- Merchant Processing;
- Client Processing;
- Reporting; and
- Administrative Processing.

In addition, EBT system security safeguards include maintenance functions which are also discussed in this section.

It is in this section of the Acceptance Test Plan document that preparers should describe the maintenance functions in each processing component and the procedures to test their correct operation. Examples of the types of maintenance functions within these components are:

- validation of individual data elements, terminal devices and their prompt sets, e.g., screen instructions;
- the correct sequencing of simple transaction sets;
- database updates;
- the operations of workstation function keys; and
- terminal and system reporting.

In subsequent chapters of this Guidelines document, transaction processing is presented separately. Preparers should be advised that, in some instances, the testing of maintenance

functionality and the correct processing of transaction sets are not mutually exclusive. For example, in order to test end-of-day settlement processing or to review system generated reports, it will be necessary to have entered numerous transaction sets. For ease of discussion within this document, the testing of maintenance functions is described separately; however, the Acceptance Test Plan should describe how the maintenance testing and transaction processing testing integrate.

6.1 OVERVIEW

The testing of maintenance functions represents the first "real" testing that should occur subsequent to the initialization of system files with initial values. It forms the basis for subsequent testing. Completing this testing validates the results of "establishing initial values."

Defects uncovered through procedures described in this section of the Acceptance Test Plan document represent defects in basic system processing that must be corrected before further testing in the processing component can be exercised. Not performing the testing described in this section, or not correcting defects uncovered, could produce unpredictable results when conducting more complex testing described in subsequent chapters. A defect-free test of maintenance and control functions becomes the springboard for advancing towards these more complex tests.

Each major system processing component described in the system design document that performs maintenance functions should be represented in this section of the Acceptance Test Plan. Preparers should structure the contents of this section of the Acceptance Test Plan to specifically address the processing components identified in the system design document.

This chapter identifies and describes the type of information that should be included in the Acceptance Test Plan regarding the basic editing and processing tests for each major processing component. Where appropriate, it provides examples of the types of tests and procedures contemplated to be performed for each major processing function area.

Guidance for developing and documenting the test procedures identified in this section of the Acceptance Test Plan is provided in Chapter 3, "Development and Documentation of Acceptance Testing Procedures." The use of the matrices presented therein will facilitate the

accumulation of data variables and scenario permutations needed to thoroughly exercise the maintenance functions.

A common procedure that can be applied to test all data element edit maintenance functions is to use both defined and undefined criteria. As examples, entering alpha-numeric in an address field, entering special characters such as an asterisk ("*") or a slash ("/") in a date of birth field, and using alpha characters in a field designated as a numeric.

Preparers should include this type of procedure wherever data element editing functions exist. For conciseness, this procedure is not repeated for each processing area described in the remainder of this chapter. Reviewers should ensure that this type of procedure is utilized when appropriate.

For each processing area described in this section of the Acceptance Test Plan, reviewers would be concerned with whether there is information presented that addresses the following general review points:

- the identification of required data elements, e.g., names, addresses, dollar amount fields;
- the timing requirements associated with when test procedures would occur in relationship to other tests presented in the Acceptance Test Plan;
- the basic transaction processing flows within each area;
- the completeness of the descriptions provided in the Acceptance Test Plan and the extent of referencing to detail provided in the system design document; and
- that the test procedures presented address the maintenance functions described in the system design document.

Also for conciseness, these general review points are not repeated for each processing area described in the remainder of this chapter. Where appropriate, review points specific to that area are identified.

The use by preparers of the techniques identified in Chapter 3 should facilitate the review process.

6.2 CLIENT ELIGIBILITY SYSTEMS

Overview

Client eligibility systems processing encompasses County and State eligibility systems. Eligibility systems form a front-end component for EBT systems as they provide the eligibility and benefit information for each client. For the most part, these systems should be relatively stable environments in that they have been in operation for a number of years and produce predictable results when processing their own data. In some instances, States or Counties may be implementing new eligibility systems at the same time as an EBT system is being implemented. In these circumstances, it may be appropriate to consider more extensive testing of the interface to the EBT system.

In any case, most existing eligibility systems will have required modifications to some extent to be able to transfer eligibility and authorization information required to support EBT processing. The preparer of the Acceptance Test Plan should not include test procedures of the modifications made to eligibility systems. Reviewers of the Acceptance Test Plan, however, would be interested in whether the testing on the modification was performed and the preparer should address this issue in the Acceptance Test Plan. The preparer should indicate who had the responsibility for testing the modifications to the eligibility system.

Each eligibility system from which the EBT system will receive information should have been described in the system design document. Preparers should provide a brief description of each system and specifically reference the relevant section(s) of the system design document where detailed information can be located. In addition, test procedures in the Acceptance Test Plan should address each eligibility system separately. The test procedures should focus on the adequacy of the EBT system's edit and validation routines over the data received from the eligibility system.

The specific areas that should be addressed in this section of the Acceptance Test Plan include the following processing areas:

- **Interface Processing;**
- **Message Formats and Processing Codes; and**
- **Client File Conversion.**

Preparers may modify this listing based on the specific requirements presented in the system design document.

Interface Processing

Interface processing defines the transfer of eligibility and allotment information to the EBT system. The interface processing rules are the subject of this section of the acceptance test. Typically, eligibility system interface will process the following transaction types:

- establishment of client eligibility;
- changes in client eligibility information;
- provide client benefit allotments; and
- changes in client benefit allotments.

Additional eligibility information will be added for more sophisticated client eligibility systems, and those transaction types would be identified in the system design document.

Preparers should provide a description of the interface in this section of the Acceptance Test Plan.

Message Formats and Processing Codes

The system design document will specify the structure and format for each interface record and message. The test procedures in the Acceptance Test Plan should include all message formats and processing codes. Preparers should provide a specific reference to the system design document where this information is located and/or include a listing and description of each in this section of the Acceptance Test Plan. Reviewers should determine whether all formats, record types and codes (initial values) were included as part of the test procedures.

Client File Conversion

Client file conversion includes initial file conversion and ongoing transfers of client information and benefit allocations. Testing in this area would consider the requirements of both

file conversions. In most cases, initial conversions are a test unto themselves, i.e., they must

work properly to start the test cycle and, ultimately, the production cycle. On-going transfers have more variety in content and timing.

The system design document should contain details regarding both the initial and on-going information transfers. This section of the Acceptance Test Plan should describe the conversion processes supporting the EBT system and identify the location of this information in the system design document. Reviewers should determine that the test of client file conversion accommodates all specified requirements.

An Illustrative Testing Procedure

An illustration of one approach that can be taken to test the maintenance functions of the client eligibility processing component follows.

- **Develop values on the eligibility system for the initial transfer as well as subsequent on-going transfers (i.e., develop initial values).**
- **Initiate transfers from eligibility system to EBT system.**
- **Review of EBT system generated reports to ensure that all data elements that were to be captured from the eligibility system, were in fact captured and processed correctly. This would involve the tracing of the values presented to the EBT system to the system generated reports, with particular attention to correct updating of account balances, control totals and system totals. This review should also be performed on workstation screens to ensure their correct collection, editing, and presenting of this information. In order to ensure the integrity of the balance and total information, several on-going transfers should be incorporated into the test procedures at varying intervals to replicate normal conversion processing activities in a production environment. This will not only ensure proper updating, but also that prior balances were not corrupted (e.g., "wiped-out") by these subsequent file transfers from the eligibility system.**
- **At the appropriate times during the acceptance tests (e.g., at end-of-month processing) initiate a file transfer from the EBT system to the eligibility system to update the information of that system (as specified in the system design document).**
- **Review of client eligibility reports produced by the eligibility system to ensure that updates supplied by the EBT system were actually sent and were properly received.**

This sequence of test procedures is very simplistic and should not be considered a complete and satisfactory test unto itself. It is presented to give reviewers an idea of the types of procedures that they may encounter. Preparers need to design test procedures of the interface based on the requirements specified in the system design document.

As indicated in the illustration, preparers need to establish the test data (for initial values and subsequent transfers) on the originating eligibility system to thoroughly exercise the client eligibility systems processing component. The variables that need to be considered include, singularly and in combination:

- Establishment of each client's eligibility
- Change to client eligibility
- Providing client benefit allotments
- Changing client benefit allotments
- Varying the issuance dates
- Use of all processing codes
- Change in processing codes
- Use of all message formats
- Use of all record types
- Use of every client type
- Use of every benefit type

The system design document will have specific information on each variable that is available and should be referenced by preparers of the Acceptance Test Plan.

Reviewers, by reference to the system design document, should ascertain that all data elements, processing rules, and variables specified therein are included in the test procedures.

6.3 MERCHANT PROCESSING

Overview

Merchant processing is concerned with the establishment and maintenance of approved merchants on the EBT system. The requirements for approval of a merchant will be dictated by the programs which are participating in the EBT system. Variations in these requirements necessitate a moderate degree of sophistication in this processing component and will be specified in the system design document.

Moving to an EBT system represents a significant operational change for the participating merchants. Customers' purchase of goods, reconciliation of register activity, depositing of funds, and dispute processing will require operational changes in checkout lane and backroom operations. Migration from a paper-based system requires modification of procedures and controls to support electronic processing. Widespread adoption of POS terminals has made the migration process manageable and understandable for many of the merchants. Nonetheless, merchants will encounter significant changes for their operations.

Because there may be large numbers of program-authorized merchants, the initial conversion of these merchants is likely to be performed using an automated process. If this is the situation, preparers would need to consider, in this section of the Acceptance Test Plan, similar procedures to those described for the Client Eligibility System setup described in Section 6.2. For circumstances where there are small numbers of merchants to be setup, or for merchant account setup after an initial conversion when relatively few merchants will need to be added to the system at any one time, it would more likely to be performed through manual entry.

The methods for accomplishing merchant setup will be identified in the system design document, and preparers of the Acceptance Test Plan should provide a brief description of the merchant setup process and reference the system design document in this section of the Acceptance Test Plan. In addition, test procedures in the Acceptance Test Plan should address each method separately. The Acceptance Test Plan should address the major activities constituting merchant processing described in the system design document. These activities include:

- System Recognition;
- Service Termination;
- Terminal Processing;
- Settlement Processing;
- Funds Transfer; and,
- Dispute Processing.

Preparers should modify this listing based on the specific requirements presented in the system design document.

System Recognition

Before an EBT system can process an on-line transaction, it must verify that the transaction has been initiated from a store that is authorized to accept the EBT card for purchases or benefit withdrawals. This would be accomplished by comparing store and terminal information in the transaction request message with information in the system's merchant and terminal control files.

System recognition testing requires initial values in order to attempt add, change, and delete processing. During testing, values for existing merchants will be changed and new merchants will be added. Therefore, the requirements for testing this area must be considered when establishing initial values (either through an interface or manually). Examples of procedures to test system recognition include:

- processing merchants in each status category, e.g., on hold, active, restricted, and others;
- data element processing by merchant type;
- conducting changes to merchants, e.g., add, change, and delete; and,
- demonstrating system processing parameters to approved merchants.

Preparers should add to these testing procedures based on the complexity of the EBT system.

In addition to the general review points presented earlier, reviewers would also need to ensure that the test procedures included merchants in each status category and that all processing supported by the merchant file has been considered.

Service Termination

Service termination means that the merchant has voluntarily or involuntarily stopped supporting clients under one or more of the specified programs depending upon the program scope of the EBT system. Systems should exhibit the flexibility and capability to support merchant participation in one, multiple, or all programs supported by the EBT system and subsequent terminations in these programs. For example, a merchant may provide POS terminal access to food stamp and AFDC benefit recipients. Deciding to exit the AFDC program and remain in the Food Stamp Program, the merchant's system record is expected to reflect the status change for each program.

The extent of flexibility to make changes in program participation should be included in the system design document. Preparers should include a description of the capabilities in this area in the Acceptance Test Plan, as well as include a reference to the specific section of the system design document.

Service termination testing requires initial values (see Section 5.2 for examples) in order to attempt status changes. During testing, these values for merchants should be changed. Testing system termination includes at least fully exercising all potential combinations of termination status conditions including:

- individual termination categories;
- combination of termination categories; and,
- all service termination categories.

Preparers should add to these testing procedures based on the requirements specified in the system design document.

Subsequent testing of transactions will involve transaction processing against changed status conditions. For example, conducting a food stamp purchase at a valid merchant POS device, changing status to "terminated", and then attempting another food stamp transaction.

Reviewers should consider whether all permutations of termination status conditions have been exercised.

Terminal Processing

Merchants are expected to use a variety of terminals and terminal configurations, (e.g., stand-alone, integrated terminals) in support of POS processing. Functionally, all POS devices are required to support program requirements and transaction sets as specified in the system design document. As examples, these would include:

- the terminal functions including financial (e.g., purchase and refund) and administrative (e.g., balance inquiry and settlement);
- the use of function keys (e.g., an FSP and AFDC function key);
- the steps required for processing each transaction;
- the display messages for manual entry and system responses to transactions (e.g., "transaction denied", "approved"); and
- the requirements for manually entering data elements (e.g., card numbers).

The preparer should include procedures which test each of the above areas individually and in combination to thoroughly exercise the system. Each permutation can be developed and documented in test scripts as described in a previous chapter. If there are commercial activities (e.g., debit or credit) supported by the POS processing functions, they should also be included in the testing. Commercial processing frequently overlaps with EBT processing within the system, and should there be processing errors in one transaction set they could overlap with the other. The EBT system should not authorize attempts to process commercial transactions and should return an appropriate message.

Examples of procedures testing terminal processing would include:

- swiping valid and invalid cards;
- swiping commercial cards;
- exercising all function keys; and,
- correctly and incorrectly following the steps for each type of financial and administrative terminal function.

The preparer should include in the Acceptance Test Plan a listing of all response codes and messages (e.g., prompts, transaction processing codes, and error messages) that the system is capable of generating as well as a reference to the system design document where additional information can be located.

Reviewers need to ensure that all terminal processing capabilities specified in the system design document have been considered in the test procedures and that all permutations have been tested.

Settlement Processing

Merchant settlement processing is narrowly defined as the end of business day balancing between the merchant terminal and the EBT system. Each terminal, throughout the business day, accumulates transaction counts and amounts. At business day end, transaction counts and amounts are compared to those maintained by the EBT system. Settlement processing, then, is comprised of the activities to close the counts and amounts by terminal. Some systems will provide further capabilities for merchant settlement. For example, merchant summaries by groups of terminals, by store, and by chain could be features provided.

All merchant settlement processing capabilities that are included in the system design document should be tested in this section of the Acceptance Test Plan. Preparers should provide a brief description of these capabilities and a reference to the section of the design document where detailed information is located.

As indicated earlier in this chapter, settlement processing is considered a maintenance function, but it cannot be appropriately tested until transaction processing has occurred.

Transaction processing test procedures described in the next chapter should be designed to utilize all terminals in order to generate total information for each. Examples of procedures to test settlement processing include:

- comparing end-of-day totals generated from terminal receipts to system generated reports for all terminal totals and store totals.
- entering of transaction sets both before and after the cutoff time established, over multiple system cycles, to test that the system processes the information in the correct processing periods.

Reviewers should ensure that transaction processing test procedures are distributed over multiple terminals in order that end-of-day receipts are possible from each terminal used in the test. Also, all settlement processing capabilities in the system design document should be included in the test procedures.

Funds Transfer

After EBT system settlement has occurred, funds transfer is the next major processing step. Here, the concern is that the funds that are due to merchants for transactions processed within the cutoff time are posted to their account within the time frame specified in the system design document and the merchant agreement, e.g., next day, two day.

Depending on the design of the EBT system, there may be several funds transfer options available to merchants. Preparers should describe each in this section of the Acceptance Test Plan.

Preparers, through merchant setup, should include merchants with each type of funds transfer option. During the course of the test, these options should be changed to indicate the system's robustness in this area. Examples of testing activities would include:

- producing an ACH file at the end of each business day which would indicate the merchants who settled by the cutoff time and the amounts due to them (the format of this tape should comply with NACHA specifications).
- "dumping" the contents of the file and comparing merchant information to settlement reports.

- verify that merchants not included on the file received credit through an alternative funding option, e.g., check, and that the EBT system produced the correct output to initiate the credit.

Through reference to the system design document, reviewers should verify that all types of funds transfer options had been established and that the comparison to daily settlement reports were included in the procedures. Preparers and reviewers should note that the actual transfer of funds does not occur until the production (live) demonstration portion of the test (see Section 12).

Dispute Processing

Invariably, merchants and EBT system operator's settlement totals will not agree with each other, or funds transferred to the merchant's business account may not match the balanced account. The dispute processing function may be either automated or consist of manual procedures.

Preparers should include a reference to the location in the system design document that contains the description on how dispute processing is handled in the EBT system. Test procedures should develop test circumstances that will demonstrate the operation of the dispute processing methodology. If the methodology includes automated capabilities (e.g., special screens), all data elements displayed and all processing codes should be thoroughly exercised (see Section 6.6).

Reviewers need to assess the adequacy of the tests included in the Acceptance Test Plan based on the method of dispute processing employed.

6.4 CLIENT PROCESSING

Overview

Client processing is concerned with the establishment and maintenance of clients on the EBT system. The requirements for acceptance of a client will be dictated by the programs which are participating in the EBT system. Variations in these requirements necessitate a moderate degree of sophistication in this processing component and will be specified in the system design document. However, regardless of program, clients are established on the system in a similar manner.

Moving to an EBT system produces significant behavioral changes for clients. Clients must now carry a card, remember a PIN, and either retain the last receipt to know the remaining benefit balances or utilize the balance inquiry function at a POS terminal or ATM, if available. Client training becomes a key component to a smooth transition between the two systems. In addition to exercising the maintenance functions of the client processing component, certain training requirements are validated by testing in this section.

The conversion and transfer of client information via the interface with the eligibility system was presented in Section 6.2 of this chapter. This section of the Acceptance Test Plan should address the requirements for manual intervention in the client setup process and the additional values needed in the client file that are not transmitted from the eligibility system, e.g., card number. These requirements will be specified in the system design document and preparers of the Acceptance Test Plan should provide a brief description and reference in this section of the plan. The Acceptance Test Plan should address the major activities constituting client processing described in the system design document. These activities include:

- Initialization and Setup; and
- Card Issuance and PIN Selection.

Preparers should modify this listing based on the specific requirements presented in the system design document.

As indicated at the beginning of this chapter, client transaction processing has not been considered here. Actual transaction processing will be considered in Chapter 7.

Initialization and Setup

As indicated previously, many of the processes involved with the initialization and setup of clients in the system were discussed in Section 6.2. The purpose here is to reiterate the importance of testing each criteria specified in the system design document. This would include all data element edit criteria (see Section 6.1) as well as all reporting requirements. Data values should be established in the system that will result in the production of all processing reports that indicate good transactions, rejects, errors, and processing totals. To the extent that totals are to be displayed on workstation screens, they should agree to the report totals.

Preparers should include a listing of all reports that are to be produced by the system and a reference to the location in the system design document that describes them. Reviewers should determine that all reports have, in fact, been included.

Card Issuance and PIN Selection

In addition to the information that is provided by the eligibility system, adding a client to the EBT system involves card issuance and PIN selection. Cards and PINs are used by the EBT system to recognize and authorize clients' access to benefit allotments.

The procedures surrounding card and PIN issuance vary from EBT system to EBT system. Preparers should include a description of the procedures in this section of the Acceptance Test Plan. In addition, the test procedures should be structured and presented by components within the card issuance process. For instance, in the Maryland EBT system, card issuance and management is comprised of three main components: ordering permanent cards, issuing temporary cards, and replacing cards. Testing activities should be segregated by component to ensure their correct operation.

The key element of this section is the methodology required by the EBT system for entry and security of the client's card number and PIN. This methodology should be specified in the system design document. Ordinarily, the card and PIN of each client on file is related to that client's file record through a workstation screen and PIN pad.

Particular attention should be paid to the entry methods and security over card information processing. Preparers should construct procedures that demonstrate:

- system security features;
- card entry features;
- capability to change or alter PINs; and
- card issuance capability.

Examples of the types of tests to be considered include:

- adding a card to an existing client;

- adding a duplicate card number to same client;
- adding duplicate card number to different client;
- attempt use of card in various statuses (deactivated/canceled, lost/stolen - to test operations of "hot list" capability);
- attempt use of incorrect generation number of card;
- enter PIN and incorrectly re-enter PIN (when issuing card); and
- ensure proper update of all card issuance activities to appropriate reports.

The exact procedures will depend on the system design. Reviewers need to ensure that all specifications that are included in the system design document are included in the procedures.

6.5 REPORTING

Overview

Reporting provides a record of all EBT system processing activities. System processing activities and administrative information are the main topics of reporting. The system design document should include detailed descriptions of all reports to be generated (either manually or automatically by the system) for the following five major reporting groups:

- FNS Requirements;
- MIS Requirements;
- Financial Requirements;
- Processing Requirements; and
- Administrative Requirements.

Preparers should provide a general description of each of these report groups in the Acceptance Test Plan which identifies each report to be generated, how it will be produced (e.g., paper, file and/or microfiche) when it would be produced, how it will be distributed, report numbers, etc. Additional reporting areas identified in the system design document not included in the above listing should also be described in the Acceptance Test Plan in a similar manner. Preparers

should also include a reference to the detailed descriptions of each report in the system design document.

Reviewers should expect the system developer to test the reports, their functions and data elements as specified in the system design document. In earlier sections, the use of the reports was demonstrated as being a component of test procedures in other areas. There is always the potential that, for instance, the eligibility interface operated properly, but the report total algorithm incorrectly totaled the balances. Therefore, for each report, the Acceptance Test Plan preparer includes procedures that:

- validates its use and purpose:
 - through comparison to the description of the report in the system design document, determine whether it accomplishes its objective.
- validates the data elements included on the report:
 - tracing elements displayed on the reports to the originating transaction in the test scripts verifying amounts, values, etc.,
 - tracing elements displayed on the reports to the report's record layout in the system design document ensuring all fields have been displayed, and
 - tracing codes, statuses, messages, etc., that appear on the reports to the system design document to determine whether they are valid. Also, trace from the system design document to the reports to ensure that all codes, statuses, messages, etc., were included in the test procedures and were properly displayed.
- verifies all calculations and algorithms:
 - manual recalculation of rows and columns on a sample basis, and
 - reconciliation of report totals to those on other reports that have logical relationships. For example, the report of credits to merchants is equal to the report of debits to clients on the report of transfers.

In addition to the presentation of testing procedures, reviewers should ensure that the listing of reports in the Acceptance Test Plan is complete by reference in the system design document. Also, reviewers should evaluate whether the testing schedule provides time to review the reports for all system cycles tested on a daily basis. This is often a testing function that is not adequately addressed in terms of time and resources available to actually review the reports.

The remainder of this section provides a brief description of each of the reporting groups identified above. Preparers and reviewers are referred to the Guidelines for Preparation and Review of Online EBT System Design Plans document for a more detailed description of each reporting group.

FNS Requirements

FNS' requirements for system reports include performance-related reports, reports supporting compliance investigations, and reports on program costs and billing.

MIS Requirements

Management information system (MIS) requirements focuses attention to various system processing characteristics of the system. Usually, processing characteristics provide system managers with details that highlight changes in system processing.

Financial Requirements

Financial requirements cover activities associate with the flow of funds, settlement, and reconciliation.

Processing Requirements

Processing reports have the broadest scope of all the reporting groups. POS, ATM, and other terminal transaction activity are addressed by these reports. All EBT processing activity is recapitulated through these reports, and all transactions run through the system should be reflected in these reports. These reports are repeatedly used as an audit trail.

Administrative Requirements

Administrative reporting provides a view of the behind-the-scenes system processing. These reports contain details surrounding system support capabilities, such as system access denial activity or card statistics. System operators will provide administrative reports based on the capabilities of their system.

6.6 ADMINISTRATIVE PROCESSING

Overview

Administrative processing capabilities provide access to several or all system databases. Client and merchant account maintenance and emergency changes to benefit accounts are two typical administrative processing activities supported by EBT systems.

Administrative processing also encompasses system support capabilities required for smooth operations of the system. For instance, system setup information, security and access control, and system performance statistics may be available in the administrative subsystem.

This section of the Acceptance Test Plan should include a brief description of the capabilities of each administrative processing area as well as a reference to the section in the system design document where additional information is located. Generally, administrative processing includes access (which will vary and should be tightly controlled) to the following information:

- participant files, such as merchant and client files;
- control files, such as access security;
- history files, such as client and merchant history;
- processing files, such as daily transaction information; and
- settlement files, such as merchant and settlement totals.

This is by no means a complete list. Additional areas might include allotment files, status of backup transaction reconciliation, and system performance. Preparers should modify this listing based on the specific requirements presented in the system design document.

Usually, as in the case of this section, administrative processing focuses on on-line workstation screen access. However, detailed reports are often available for use in managing administrative processing. The report testing activities described in the prior section (6.5) should be applied to administrative processing reports not tested in that section.

Workstation Screens

Workstation screens provide support staff direct access to the information contained in the files listed above. The workstation screens also provide the framework for interaction with merchants and clients.

Screen development is an area in which system developers employ a certain amount of creative artistry. Therefore, in addition to describing the function and purpose of each screen in the system design document, there should be details concerning each screen's design, structure, method of access, and a complete description of the action that should occur when function (e.g., F1, F2) and special keys (e.g., HOME, PAGE UP, etc.) are depressed.

Preparers should provide a listing of all screens utilized in administrative processing as well as a brief descriptions of each in the Acceptance Test Plan. All actions of function and special keys used on each screen and a specific reference to detailed information in the system design document should also be provided.

Examples of the types of general procedures to be considered to test all screens include:

- correct and erroneous data entry for each data element, e.g., correct and incorrect length account number, alpha/numeric field checking;
- exercising of all function and special keys at all data entry fields, e.g., F1, whether or not defined in the system design for use on the screen;
- perform screen-to-screen navigation using features described in the system design document.

Preparers will also need to provide procedures that test the functionality of features specific to the type of workstation screen being tested. A few examples include:

Participant File

- exercise special functions, e.g., dual custody entry for PIN
- perform client-to-client cross screen navigation using features described in the system design document.

History File

- exercise special search functions, e.g., history ranges.

Preparers are expected to construct procedures that mirror the descriptions provided in the system design document.

Reviewers in this area are concerned whether all workstation screens were subject to the test procedures and that such procedures thoroughly exercised each data element and function and special keys at all possible locations on the screen. Such testing is tedious, but often identifies defects in definition.

6.7 EBT SYSTEM SECURITY

Overview

EBT systems offer an opportunity to improve the security of benefit issuance and redemption procedures, compared to the paper-based systems they replace. Without adequate safeguards, however, EBT systems also introduce potential exposure to error, fraud, and abuse.

Federal EBT regulations specify six general areas pertaining to system security. Two of these areas (the State agency's Security Program for Automated Data Processing Systems and the EBT system's contingency plan) do not need to be addressed in the Acceptance Test Plan. The other four areas include:

- storage and procedural controls;
- communications access;
- message validation; and
- administrative and operational procedures.

System developers should have addressed each of these areas in their system design document. This section of the Acceptance Test Plan should provide a brief description of the security safeguards and procedures incorporated into the design of the EBT system along with the controls (both procedural and hardware or software-based) to ensure that they are working as designed.

The specific areas that should be addressed in this section of the Acceptance Test Plan should include:

- EBT access card;
- personal identification number (PIN);
- network security;
- access security.

Preparers should modify this listing based on the specific areas addressed in the system design document. Preparers are expected to construct test procedures that mirror the security safeguards and controls described in the system design document.

Reviewers should consider the system design's adherence to industry standards, when applicable, and the use of additional vendor or State-developed security procedures for each of the areas listed above, noting in particular when the design did not follow industry standards. This may indicate a need to expand testing in those particular areas that did not adhere to industry standards.

The remainder of this section provides a brief discussion of the areas listed above as well as examples of procedures to test the security and control features in each. Preparers and reviewers are reminded that the procedures presented do not represent an exhaustive identification of all the possible procedures available to test system security and control. Preparers will need to develop the procedures warranted by the system's design.

EBT Access Card

Card issuance to clients usually occurs in two phases: mass or bulk issuance to all clients when converting from paper to EBT; and ongoing, routine issuance or reissuance. EBT system security and control issues relating to the EBT card includes:

- the design and selection, and extent of adherence to industry standards for: material, card dimensions, magnetic stripe, encoding of tracks, and embossing; and
- the extent of card management functions including:
- the protection of blank card stock;
- the capabilities of associating card and client;
- the initial issuance and replacement of cards;
- the deactivation of lost or stolen cards; and
- the transfer of benefits and status to new cards.

Examples of some test procedures for these areas have already been presented when discussing "Client Processing" in Section 6.4 of this document. Other examples of test procedures would include:

- verifying that card numbers are generated for all card orders and have the proper ISO (International Standards Organization), followed by a card number;
- ensuring that cards "ordered" and being used for acceptance test purposes have been included on all appropriate reports, such as a card statistics report and card order report, and that the information (case number, cardholder number, generation number, etc.) agrees with the database;
- verifying that all card information embossed on the cards used in the acceptance test agrees to the database for client name, card number, generation number, etc.;
- generating a card order ensuring that all steps as identified in the system design document are followed;
- requesting the generation of temporary cards and ensuring that they have been established on the system as inactive with no PIN selection;

- attempting to use a temporary card without assignment to a client or selection of a PIN;
- ensuring that the only information on temporary cards is card and generation number;
- ensuring that expiration dates assigned to activated temporary cards do not exceed system design specifications and attempt the use of the card after the expiration date;
- requesting a generation of replacement cards and ensure that they have identical access to the client's benefits that the replaced card had;
- ensuring that the replacement card had same card number with the next generation number of the replaced card;
- ensuring that the first time a replacement or temporary card is used, the status of the card it replaced is set to "deactivated"; and
- ensuring that inventory control procedures account for voided, spoiled or unusable stock.

Personal Identification Number (PIN)

The personal identification number or PIN has been referred to as the "electronic signature" for financial transactions. By relating the PIN to a client's card, the EBT system "recognizes" the use of the card by the client. PIN authentication is therefore one of several criteria for transaction approval.

Security over the PIN is of prime importance in an EBT system. Bypassing the signature in favor of the PIN provides access capability to anyone who knows the PIN. As a result, the PIN is very powerful in its function. Confidence in the system's integrity rests on its ability to protect the secrecy of the PIN. Thus, testing PIN security is critically important in the acceptance test.

The system design document should provide detailed information on PIN selection and storage within the system, the encryption key management used in the system, and the data encryption standard (DES) being used.

Procedures to test the issuance and capability to change the PIN can be included in this section of the Acceptance Test Plan or in the section which describes "Client Processing."

Examples of procedures to test the functioning of the encryption capabilities of the system include:

- entering PINs and then reviewing the contents of the PIN file to ensure that the PIN was encrypted; and
- demonstrating the system's ability to change the "key" used to encrypt PINs at the PIN pad and at the host.

Network Transmission and Message Validation

Transmission of data across telecommunications networks provides an opportunity for data corruption (data received are not identical to data sent) or the introduction of fraudulent or tampered data. The system design document should describe the full range of controls that will be used to ensure telecommunications security for three basic areas presented below.

Eligibility systems to EBT systems - to ensure that issuance files are accurately transferred from the eligibility system to the EBT system, including steps to prevent reprocessing a file that has already been sent.

Examples of test procedures would include:

- attempting to transfer files without passwords;
- terminating a file transfer before completion to determine proper handling of transactions by the EBT system;
- attempting to transfer the same file at various intervals; and
- transmitting files with invalid or missing header and trailer records.

On-line processing across public and private networks - to protect the transmission of data between POS devices and the system (e.g., through the use of control files, PIN encryption, transaction counters, message validation codes, full message encryption, etc.). In order to test some of the control features for this area, it would be necessary to alter the information that is contained as part of the protocol, (e.g., set duplicate or missing transaction counters, and message authentication). Test procedures in this area should be closely coordinated with the system developer.

Backup transaction processing - to ensure the validity and accuracy of backup transactions, including controls over access only by authorized merchants, controls over data entry, and procedures for reconciling backup transactions. Backup transactions bypass the many security features built into an EBT system.

Examples of test procedures would include:

- verification of backup merchant codes; and
- reconciliation of information provided on submitted vouchers to the data entered at the time of the backup transactions.

Additional areas may be identified in the system design document and should be included in the Acceptance Test Plan for appropriate application of test procedures.

Access Security

Data are the key to system processing. Name and address, benefit amounts, terminal locations, and merchant participants are only a few of the information items maintained on the system. Only authorized and appropriate users should be able to add to or update this information, which necessitates access security features capable of limiting and managing system data resources.

The system design document should describe the various methods to access the EBT system and should minimally include the three components described below.

EBT processing terminals - includes POS terminals, ATMs and ARUs. The system design document should provide a complete description of access security, by processing terminal, in the following areas:

- controls within the terminal for recognizing users (e.g., sign-on procedures);
- software and files used for control purposes (e.g., a file of participating merchants and terminals); and
- industry standards employed to support controls.

Examples of test procedures would include:

- attempting access from a POS device of a merchant not on the merchant file;
- attempting access from a POS device not on the terminal file of a participating merchant;
- attempting to sign on and off POS devices using combinations of valid and invalid supervisor and clerk IDs and passwords; and
- attempting settlement functions using combinations of valid and invalid supervisor IDs (for both single lane and in-store controller environments).

EBT processing systems - includes all operating and application software components.

Controls over these areas should address access to and the ability to modify all software components. Examples of test procedures would include:

- review of operations management procedures for restricting access to tape libraries and the computer room; and
- review of procedures for approval and installation of modifications into the production software.

Administrative terminals - includes all workstations used as part of the EBT system.

Basically, controls would include physical and software-controlled access to administrative screens and special functions.

Examples of test procedures would include:

- attempting logon with various combinations of valid and invalid user IDs and passwords (including the use of blank fields and improper length entries); and
- attempting use of all possible functions by authorized and unauthorized users (preparers would need to determine all possible permutations through reference to security tables established in the system); and
- determining whether terminal timeouts are being utilized effectively.

Chapter 7

ERROR CONDITION HANDLING AND DESTRUCTIVE AND RECOVERY TESTING

In addition to the maintenance and control functions described in the previous chapter, EBT systems should have built-in capabilities to detect errors and process them correctly. The system must also be able to withstand disruptions to system components, and if unable to do so, in whole or in part, restart or continue processing without affecting the integrity of the databases. These capabilities are accomplished through:

- error condition handling; and
- recovery processing, respectively.

It is in this section of the Acceptance Test Plan that preparers should describe both the manual and automated capabilities for each of these functions, and the procedures to test their correct operations. Examples of the type of processes that each of these functions performs are:

- identification of an out-of-balance condition; and
- determination of the loss of an input device and generating the correct response.

As was the situation in the prior chapter, the testing procedures identified in this chapter are also presented as discrete processes. This may not be the manner in which the test scenarios for each would necessarily be developed. This method of presentation in this document is for ease of discussion.

7.1 OVERVIEW

EBT systems must display a significant amount of "robustness." They must deal with the unknown without missing a step. The system's error handling capabilities (which includes the system's ability to identify and resolve problems caused by system and/or operations errors), its resiliency to disruptions, and its recovery capabilities are key to the integrity of the databases.

This Guidelines chapter identifies and describes the type of information that should be included in the Acceptance Test Plan regarding each of the functions described above. Where appropriate, examples of test procedures are provided.

Guidance for developing and documenting the test procedures to be included in this section of the Acceptance Test Plan is provided in Chapter 3 of this document. It is likely that there would be more use of the narrative form of documentation in this section, particularly when describing destructive and recovery testing. Whenever possible, however, the specific action or procedure to be used should be sequenced on a test script.

7.2 ERROR CONDITION HANDLING TESTING

Overview

In addition to the thousands of correct conditions or transactions (a correct condition or transaction is defined as one that receives either an approval or denial message or is accepted as a valid transaction) that will be processed, there will be transactions which pass all data element edit functions that should not be allowed by the system to generate an approval or denial message or be accepted as a valid transaction. For example, entering "188.A9" in a numeric field should be identified as an error by the maintenance functions of the system. This transaction should not be allowed to enter the system. However, entering "10,000.00" as the amount of the current month's issuance to a client may pass all edit criteria, but the system should identify, segregate, and report the transaction on an exception report because the amount falls outside an acceptable range for monthly allotments. The system's ability to perform this function is known as its error condition handling capability.

Formally stated, the objective of error condition handling testing is to demonstrate the system's ability to recover from the initiation of incorrect conditions or transactions. System processing should not be adversely impacted when these situations arise, but should isolate the error, provide a response and continue processing. The EBT system's response to an error condition or transaction should be to "segregate" the transaction(s) and report it through the system's exception reports.

The areas in which error condition handling is of particular importance in an EBT system include:

- workstation screens;
- eligibility system to EBT system interface; and
- system security.

Preparers should add to this list based on the specific system design being tested. Preparers should provide a brief description of the error handling capabilities in each of these areas and specifically reference the relevant section(s) of the system design document where detailed information can be located.

Error condition handling capabilities usually involve the system's comparison of the data being entered into the system to value tables or range and threshold checks. "Value tables" contain specific data to which the system's programs refer during processing to determine the acceptability of a transaction value. Data which fall outside the "acceptable" range are identified and reported as an exception. The system design document should contain the value tables, thresholds, and ranges which are pre-programmed or "loaded" into the system. These should be included in the Acceptance Test Plan, and procedures should be designed with transactions which test "above and below" the ranges and thresholds, as well as with values not included on the tables.

Examples of procedures designed to test a system's error handling capability include:

- transferring over the eligibility system interface, issuance amounts in excess of a pre-established threshold, e.g., \$10,000.00;
- enter dates preceding current date for card expiration;
- entering excessive dollar amounts for all numeric value fields on workstation screens; and
- including on the issuance file, issuances with invalid program codes.

Each of the above procedures should result in the capture of the incorrect data on exception reports. Client account balances and merchant business day totals should not have been affected by the transactions. This should be verified by reviewing the appropriate client and merchant reports and history screens before and after the initiation of the transactions.

Preparers of test procedures need to "focus on the negative" when developing all the potential error conditions to include in the testing.

7.3 DESTRUCTIVE AND RECOVERY TESTING

Destructive testing is the active attempt to disrupt the operations of the system. It involves reasonable attempts to "break" the system. Recovery processing is the system's ability to remain in, or return to, an operational status without loss of data integrity.

Destructive testing should entail performing or simulating the actions listed below during

- "pulling the plug" (electrical or telecommunications) on input devices, in-store controllers, LANs and/or multi-lane file server configurations;
- severing or disabling communications lines;
- disabling host computer components (e.g., disk drives); and
- disabling interfaces between computer systems.

The system should demonstrate the ability to isolate the part of the system that may no longer be operational, continue operations in other components, and sending the appropriate response. There should be no loss in data integrity. A simple example of this capability would be the generation of a system reversal when the system does not receive a response from the POS

- all terminals;
- telecommunications networks;
- central site, or host, processing components; and
- cards and card-related equipment.

Once again, preparers need to focus on the negative when designing destructive tests. Preparers also must consider when during the acceptance test it would be appropriate to conduct destructive testing. In order not to interfere with the progression of the acceptance test, preparers may want to consider scheduling destructive testing near the end of the test period.

Destructive testing should include disruptions of all input and output (e.g., report production) operations.

The acceptance test is not expected to include a test of the EBT system's contingency plan. The recovery procedures that would be detailed in a contingency plan are beyond the scope of the acceptance plan as they would include recovery from natural disasters, fires, floods, etc. The extent to which the contingency plan is tested is to be based on contractual agreement between the State agency and the processor.

Chapter 8

TRANSACTION PROCESSING TESTING

EBT systems typically have three transaction processing systems through which clients and merchants access client accounts. They are:

- on-line processing;
- backup processing; and
- audio response unit (ARU) processing.

In addition, transactions such as system reversals are also considered a form of transaction processing. These transactions are system generated and are not available to clients or merchants.

The focus of this chapter is on testing the system's ability to process valid transactions within each of the transaction processing systems presented above. Transaction processing testing, in context of this chapter, does not include edit checking or error handling. Those test areas were covered in previous chapters. Preparers and reviewers are reminded, however, that when constructing test procedures and test scripts that these different test areas are not mutually exclusive.

8.1 OVERVIEW

Transaction processing is one of the reasons why the EBT system was implemented. It is where "the rubber meets the road." From a client's or merchant's view, a transaction is either approved or denied. Transaction processing testing involves the application of specific test procedures to determine whether the EBT system correctly processes a particular transaction and provides the appropriate approval or denial response. The transaction processing test begins with the entering of a transaction through an on-line, backup, or ARU processing system and ends with the transaction being validated against the report that the transaction should appear on.

Each transaction processing system should be described in the system design document. Included for each system would be a description of the transactions available to clients, the

associated processing codes, and processing rules and flows that govern the EBT system's approval or denial of each transaction.

Preparers should include a brief description of the available processing systems in the Acceptance Test Plan along with a reference to the section(s) of the system design document where additional information can be found. Reviewers should ensure that each processing method and functional area described in the system design document is included in the Acceptance Test Plan. A review point would be to ensure that test procedures developed for each processing system include all transaction sets, rules and flows. The test procedures should include the validation of all transactions against client activity, benefit balance, and other applicable reports.

The remainder of this chapter presents a brief discussion of each processing system along with examples of test procedures.

8.2 ON-LINE PROCESSING

On-line transaction processing provides a means of accessing client accounts for cash (non food stamp program) or payment of purchases. It allows clients to purchase goods, return goods, or receive cash. Usually, the transaction sets (or types) supported by on-line processing include:

- balance inquiry;
- purchase;
- cash withdrawal;
- cashback;
- refunds; and
- voids.

All of these transaction sets are usually available through POS devices, while ATMs only support balance inquiry and cash withdrawal.

Test procedures should be designed to generate each type of approval and denial code through the POS and ATMs for each transaction set and combination of transaction sets. Exhibit

8-1 is an example of processing codes. This information was compiled by Deluxe Data Systems, Inc. as part of the detailed system design document of the Maryland EBT project.¹ It provides the codes and messages that can occur when transactions are denied. The Acceptance Test Plan would need to contain test scripts that will generate each denial message, for each transaction set, from each input device, as appropriate.

When developing the test procedures, consideration should also be given to situations where there can be multiple cardholders per case. The array of potential combinations of transaction sets should be captured as described in Chapter 3.

Examples of procedures for testing for "approvals" include performing:

- each transaction set with a successful result; and
- transactions involving multiple benefit periods and credits to ensure that the processing occurs as designed. These transactions should be designed to ensure that:
- multiple benefit credits are dispensed on a consistent basis (e.g., first-in, first-out basis); and
- refunds are restored to the proper benefit period.

Examples of procedures for testing for "denials" include performing transactions:

- from merchants not authorized to participate;
- with invalid PIN numbers and where the number of invalid PIN attempts limit has been exceeded;
- with expired cards;
- against accounts with no benefits or insufficient benefits;
- for client accounts which have been "stated" (e.g., hold);
- prior to benefits becoming available;
- to withdraw cash from a food stamp only account; and
- attempting to process a food stamp return with a zero balance.

¹ "EDGE System: Maryland Department of Human Resources Detail Design," Glendale, Wisconsin: Deluxe Data Systems, Inc., May, 1992.

Exhibit 8.1

Tranz330/340 Merchant Guide Codes

POS Response Codes

The messages that can occur when transactions are denied are defined in the following section. The POS terminal display area will contain the word DENIED and a denial message will also be printed on the client's receipt. The codes displayed at the beginning the receipt messages are for Deluxe internal use only and are used by the Help Desk and the Support staff in handling the denial.

| CODE | SYMPTOM | RECEIPT |
|-------|---|---|
| blank | Accepted transaction | |
| F | Invalid terminal number (database error) | F—Terminal not defined; call Customer Service |
| I | PIN invalid | I—Wrong PIN entered; re-enter; call Customer Service |
| J | Invalid transaction type (database error) | J—Transaction not defined; call Customer Service |
| M | Processor not logged on | M—Host not available; call Customer Service |
| N | Authorizer not available | N—Host not available; call Customer Service (message timeout) |
| P | Card number not found | P—Client not on file; call Customer Service |
| S | No account on file | S—Account not on file; call Customer Service |
| U | Insufficient funds | U—Balance is \$XX.XX; enter lower amount; call Customer Service |
| U | No funds available | U—Balance is \$0.00; call Customer Service |
| ND | Lost/stolen card | ND—Lost/stolen card; call Customer Service |
| NH | Expired card | NH—Expired card; call Customer Service |
| NK | Benefits are on hold | NK—Benefits on hold; call Customer Service |
| NR | PIN tries exceeded | NR—PIN tries exceeded; call Customer Service |
| PE | Function unavailable | PE—Function unavailable; call Customer Service |
| RK | System malfunction | RK—System dysfunction; call Customer Service |
| nn* | System error | nn—System malfunction; call Customer Service |

(*where nn is the 2-digit error code used by Deluxe internal staff in determining the problem)

Used with permission

These procedures are provided only as examples and do not reflect all the types of tests that should be included in the Acceptance Test Plan.

8.3 BACKUP TRANSACTION PROCESSING

Backup transaction processing is an alternative provided to authorize EBT purchases when electronic on-line processing is not available. Factors preventing electronic processing include:

- damage to the EBT card;
- terminal malfunction;
- loss of telecommunications network; and
- failure of the host computer.

Backup transaction processing also can be used for merchants who do not have immediate access to POS devices (e.g., food delivery service).

Backup transactions are sometimes referred to as "manual" or "off-line" transactions. Due to the ambiguity in these other two terms, this document uses the "backup" terminology.

Backup transaction capabilities are not needed at ATMs, because federal regulations requiring backup capability pertain only to food stamp transactions.

The on-line transaction set is usually the basis for backup transactions. System processing capabilities will dictate transaction set availability. Usually, only purchases and refunds would be available for backup transactions; voids are unlikely to be available. The Acceptance Test Plan should include a description of the specific transaction set available for a backup transaction.

The system design document should include a complete description of how backup transaction processing functions within the EBT system. There may be several methods available to conduct a backup transaction. For instance, in some systems, backup transactions may be electronically held by a terminal and released for processing when availability is restored. This is sometimes called "store and forward." Alternatively, backup transactions may be submitted using a manual, paper-based process.

The system design document will also contain the conditions which may exist that would limit the amount of benefits that a client can use. For example, if the host computer has failed, and there is no alternative method to access the client database, then a limit on the amount of the purchase may apply. This is sometimes referred to as a "floor limit." Alternatively, if the POS device is malfunctioning but the host computer is available to access the client database through an administrative terminal, then a limit may not apply. These conditions should also be described in the Acceptance Test Plan.

The preparer of the Acceptance Test Plan should develop procedures to test each method to achieve backup processing and conditions described in the system design document.

All procedures developed for testing on-line transaction processing should be used to test backup transaction processing. Examples of these procedures were presented in Section 8.2. If more than one method to conduct backup processing exists in the system the procedures would need to be performed for each method. The procedures would also need to be performed under the various operational conditions that could exist, e.g., whether or not the administrative terminal could access the host computer. Under different operational conditions there may be dollar limitations which need to be included into the test scenarios, e.g., attempting transactions in excess of pre-established dollar limits. In addition, test scripts should include scenarios where account balances are overdrawn, and attempt a food stamp purchase by a client who did not have food stamp benefits. These type transactions should only occur when the host computer system is not accessible and will usually result in a debit to the State, or processor if the liability was assigned. If included in the system's design, overdrawn account balances should trigger re-presentation processing. The test procedures should then ensure that the overdrawn amounts are of large enough value to test the operations of the EBT system in deducting the appropriate amount from the client's account over multiple periods.

Another component of backup processing involves various controls, such as the timely submission of vouchers within a specified period of time, and the placement of "holds" on an account until the paperwork is received. This is particularly important for the correct processing of vouchers from merchants that do not have immediate access to POS devices. The controls and subsequent adjustments that may ensue should be included in the testing. A few examples of the types of scenarios which could be tested, within the context of the system design, include:

- the continuation of a "hold" amount on a client account when a card is replaced;
- the expiration of a "hold" amount (e.g., not having received the appropriate paperwork within the prescribed time period - 7 or 10 days);
- determining whether the procedures for full and partial matches of the amount on "hold" occur correctly; and
- the correct processing of a multiple "hold" by a merchant on the same transaction.

8.4 ARU PROCESSING

Audio Response Units (ARUs), also called voice response units (VRUs), have traditionally been used within EBT systems to provide balance inquiry and history information to program recipients and participating merchants. However, one pilot site currently uses ARU technology to authorize backup transactions. As this technology continues to advance, other functionality may be added.

The Acceptance Test Plan should include a description of how the ARU is being utilized within the EBT system. Procedures should be included which test this functionality. Similar to the testing of all possible response messages on a POS device, test scripts should include procedures that will generate all possible voice messages available through the ARU for approvals, denials and when input errors occur. The Acceptance Test Plan should include all the possible responses. The reviewer should determine by reference to the system design document whether all message responses would be generated through the test procedures included in the Acceptance Test Plan.

Examples of procedures for testing ARU processing include:

- transactions designed to result with appropriate responses;
- exceeding timeout limitations before entering first digit of card number;
- exceeding timeout limitations between entering each digit;
- attempting entry with invalid card number;
- attempting invalid entries followed by a valid transaction;

- attempting transactions with a valid card number but without a food stamp account;
- attempting transactions with a bad card status; and
- attempting a transaction and hanging up in the middle of the transaction.

8.5 SYSTEM-GENERATED TRANSACTIONS

The type and extent of system-generated transactions will vary from system to system. The system design should include a description of the system's capabilities in this area. One of the more common system-generated transactions involve system-generated reversals. These reversals typically arise as a response to system processing disruptions. For each transaction set, recovery from disruptions at each processing component is to be described.

The Acceptance Test Plan should include test procedures for each type of system disruption that can occur. The reviewer should determine by reference to the system design document whether each type of disruption had been included for testing. As examples of test procedures, the test scripts could include:

- timing out terminals (e.g., not entering information within thresholds established); and
- disconnecting input devices before receiving a response.

As a reminder to test plan preparers and reviewers, all reports that would be affected by the system-generated transaction should be reviewed for proper postings.

Chapter 9

SETTLEMENT PROCESSING TESTING

Settlement is the process by which funds are exchanged between the government and the retailer, or in the case of cash benefits, the bank that "owns" the ATM. Food stamp settlement is usually a two-step process. In the first step, funds are transferred from the project account at a concentrator bank to each retailer's account at their respective financial institution. In the second step, funds are transferred from the government to the concentrator bank. Settlement processing describes each of the steps undertaken to accomplish, control and manage each aspect of funds transfer.

9.1 OVERVIEW

Reconciliation and reimbursement processing define settlement activities. Settlement processing considerations include:

- settlement types and flow of funds;
- participant cutover and impacts on flow of funds;
- balancing, reconciliation, and funds transfer; and
- reporting.

Each of these considerations should be addressed in the system design document.

Tests of various aspects of settlement processing are incorporated in functional requirements testing and maintenance testing as described in prior chapters. Each transaction that results in a change to the balance in a client or merchant account affects settlement. Verification of the proper posting of client accounts was described as part of the test procedures to be performed during transaction processing testing in Chapter 8. Verification of the proper posting of merchant accounts and the preparation of the ACH file was described as being an integral part of the merchant processing testing described in Chapter 6. This testing also included tests of the proper accounting for cutover times. As mentioned in a prior chapter, preparers and reviewers should note that the actual transfer of funds does not occur until the production (live) demonstration portion of the test (see Chapter 12).

This section of the Acceptance Test Plan should address tests to ensure that the settlement process correctly accommodates merchant holdovers and crediting of backup transactions. The remainder of this chapter addresses these two areas.

9.2 HOLDOVER PROCESSING

Holdovers occur when the merchant's settlement time is different from the processor settlement time. Holdovers are those transactions that occur between these different settlement times. Settlement times are commonly referred to as "cutover" times and holdovers are sometimes referred to as "suspended transactions." If the merchant cutover time is earlier than the processor cutover time, all transactions for the 24-hour period ending with the merchant's cutover time are settled on the current processing day. Transactions occurring after the merchant cutover time and before the processor's cutover time are held over until the next processing day for settlement to the merchant's account.

If the merchant cutover time is later than the processor cutover time, the transactions that occur through the merchant's cutover time are held over for settlement on the next processing day. If the merchant cutover time and the processor cutover time are the same, then there should be no holdovers.

This section of the Acceptance Test Plan should address the tests that will be performed to ensure that holdovers are correctly accounted for and that subsequent merchant credits are properly calculated. For example, transactions should be run at merchants that have a cutover time earlier than the processor cutover time. The sum of transactions occurring before the merchant cutover time, assuming a zero holdover balance from the previous day, should equal the merchant credit as identified on the ACH output. Transactions occurring after that time should be reflected in a "holdover" account which should be added to the next day's credits. The tests should be represented in multiple day processing scripts. These scripts should reflect at least three days of processing and should clearly demonstrate that each day's holdover amount appears in the next day's credit. The scripts should include merchants that have cutover times before, after, and the same as the processor.

This section of the Acceptance Test Plan should also include any tests to prove the adequacy of weekend holdover processing. If the processor settles on a five-day basis, then all

transactions from "end of day" Friday through "end of day Monday" should be reflected in Monday's settlement to merchants.

Test procedures should include review of all applicable reports and comparison to ACH output files.

9.3 BACKUP TRANSACTION PROCESSING CREDITS

As described in Section 8.3, backup transactions occur when the system is not available or when merchants do not have immediate access to POS devices (e.g., food delivery service), and the merchant receives telephone authorization. Depending upon the design of the system, the processor may provide credit for backup transactions on the day of the transaction based upon the telephone or ARU authorization or they may hold credit until the merchant submits the paper voucher. If credit is provided on the day of the transaction, the Acceptance Test Plan should include tests to ensure that the transaction amount is held in a "suspense" account until it can be reconciled with the paper voucher upon submission from the merchant, and that this submission does not result in a duplicate credit. If the processor holds the credit until the voucher is submitted, the tests should ensure that the authorized amount is held in a suspense account until the voucher is submitted and that credit is passed at that time.

Test procedures should include review of all applicable reports and comparison to ACH output files.

Chapter 10

CONCURRENT PROCESSING TESTING

System functions tend to be viewed and used separately within an EBT system. In a production environment, however, functions are exercised in a random manner creating the opportunity to be exercised simultaneously. This random and simultaneous exercise of seemingly isolated functions should not interact in such a manner as to produce unexpected results.

10.1 OVERVIEW

Concurrent processing testing serves to structure testing activities to observe the results when apparently unrelated functions are exercised simultaneously. The goal is to better simulate a production environment.

The system design document should describe the processing hierarchy when simultaneous transactions occur between:

- two workstations;
- two POS devices; and
- a POS device and a workstation.

Preparers should add any other possible concurrent processing situations to this list that may exist in their EBT system environment. Also, the processing hierarchy may indeed vary depending on the nature of the transaction(s) being conducted concurrently. This should also be described in the system design document.

The Acceptance Test Plan should contain procedures designed specifically to address the array of possible concurrent processing situations. Reviewers should determine whether the concurrent processing procedures address each condition described in the system design document. Concurrent processing test procedures should incorporate all of the possible transaction types, account statuses, etc., into the test scenarios.

The functional matrices and scripts described in Chapter 3 should be used to determine all potential permutations to be used to test concurrent processing.

The remainder of this chapter provides examples of test procedures for concurrent processing.

10.2 TEST EXAMPLES

Some examples of the types of procedures that can be conducted to test concurrent

- two users attempt to cancel the same benefit;
- two users attempt to place a hold on the same benefit;
- two users attempt to change hold on the same benefit; and
- two users attempt to order a replacement card for the same client.

A POS device and a workstation:

- a workstation user attempts to cancel a benefit during a POS transaction;
- a workstation user attempts to hold a benefit during a POS transaction; and
- a workstation user attempts to hold part of a benefit during a POS transaction.

Two POS devices:

- one user attempts a purchase using the card, while another user attempts a purchase by manually entering the card number; and

Chapter 11

STRESS AND THROUGHPUT TESTING

Federal regulations for State EBT systems include standards for operating performance.¹ One of these performance standards covers "system processing speeds." Processing speed performance parameters refers to the speed with which the system processes transactions at various volumes. In other words, processing speed issues include response time and throughput. There is a significant difference between these two components of processing speed.

Pure response time is defined as the interval between pressing "enter" or "send" and the receipt of the response/message at the input device. The system's response time is measured at input points such as ATMs, POS devices, administrative terminals, and ARUs. The required response time for POS devices is specified in the federal regulations. For devices using leased lines for communications with the central computer, the standard is that 98 percent of all EBT transactions shall be processed within 10 seconds or less and that all EBT transactions shall be processed within 15 seconds. For POS devices using dial-up lines, 95 percent of all transactions shall be processed within 15 seconds or less, and all transactions shall be processed within 20 seconds. These same standards apply whether the POS device communicates directly with the EBT system's computer or through a third-party processor. There are no specifications in the regulations for other input devices.

Throughput is the accumulation of processing activity measured over a period of time, such as an hour. When discussed however, it is usually referred to in terms of the number of transactions per second. The required throughput performance of an EBT system is not specified in the federal regulations. It is entirely predicated on meeting the response time standards at whatever the number, or rate, of transactions that are being run through the EBT system at any point in time. Therefore, it can be considered the system's capacity to meet the response time requirement.

¹ Part 274.12, Electronic Benefit Transfer Issuance System Approval Standards; Section (h), Performance and Technical Standards.

The transaction rates to be achieved should have been established early in the system development life cycle and included in the system design document. It is the EBT system developer's responsibility to ensure that the system has the capacity to process transactions through the system at the pre-established rate(s) in order to satisfy the response time requirements. This is typically achieved by stressing the system's capacity to arrive at the proper configuration. The main objectives of stress and throughput testing are to ensure that the EBT system processes transactions:

- at a rate that meets response time criteria; and
- processes them correctly.

In this section of the Acceptance Test Plan, preparers should describe the stress test scenario including the procedures that will be employed to ensure that the EBT system will meet the system processing speed criteria as promulgated by the federal regulations. Included should be the timing and resource requirements associated with performance of the test procedures.

11.1 OVERVIEW

Generally, stress testing entails the entering of transactions sets at varying rates. These transactions sets should be pre-determined and documented in the Acceptance Test Plan using one of the methods described in Chapter 3 of this document.

The system design document should provide the background information which addresses the processing speed performance characteristics (e.g., estimates of peak hour volume during the month and expected system throughput capacity at the peak hour, transaction and system growth projections, etc.) and the methodology used to determine them (e.g., poisson calculations). Using this information, along with other information regarding the hardware and software components of the system, the preparer of the Acceptance Test Plan should be able to construct stress test procedures that demonstrate the system's ability to meet and exceed these characteristics and federal regulations.

Throughput testing actually occurs continuously during the acceptance test. Each day's MIS reports should include system performance statistics which indicate the high, low and average response times and transaction rates for that day. If during the functional requirements

testing portion of the acceptance test (a period of very slow entry of transactions as all are done manually by a limited number of test participants) these statistics do not meet the federal standards, then it may indicate that the EBT system is not "production equivalent."

To date, most on-line EBT system "official" stress testing has occurred in multiple phases over several weeks time. This is usually the result of the amount of resources needed to properly plan and conduct the test procedures. For instance, a stress test may consist of the following phases:

- A "limited" stress test of the host computer environment. This typically involves the use of only the resources available (people and terminals) to test the functional requirements during the acceptance test. Test participants should run transactions simultaneously, and determine whether the system returned the appropriate responses within the required response time. This can be measured with both a stop watch and by review of MIS reports.
- A "full" stress test of the host computer environment. This typically involves the use of a stand-alone "driver" software package which attaches to the host computer, emulates input devices, and generates pre-determined transaction sets at pre-determined transaction rates.
- A stress of the host computer and the telecommunications network. This will usually involve the setup of terminals (POS devices, etc.) with special "load image" that will automatically dial over the network, send a pre-defined transaction set, complete the transaction, and then repeat the cycle until canceled. This phase of the testing is usually set up in the State or County where the clients will be redeeming benefits in order to properly test the system end-to-end.
- A "batch" stress test of all batch file transfers, to and from the EBT system, e.g., client eligibility processing interface. This typically involves the stress testing of large file transfers which would update clients' accounts during a month. In addition to determining the correct processing of the information, a batch stress test is used to determine whether the batch can be transferred within an acceptable period of time.

At the conclusion of each phase, the review of reports (e.g., FNS and MIS reports) is an important part of the test to ensure the proper processing of the transactions. The actual results need to be compared to expected results noting discrepancies in account balances and transaction rates. It has been observed in the past that systems, nearing or exceeding their processing capacities, have "dropped" transactions while appearing to operate smoothly. This can be a

particular problem when data are being passed between components within the host computer environment (e.g., links between processors or database files) or over external interfaces (e.g., the eligibility interface).

Determining the exact number of phases and the goals to be accomplished within each phase will vary depending on the unique characteristics of each EBT system. Preparers need to develop the overall methodology (the phases, goals, and sequence) based on the specific needs of their EBT system environment.

Regardless of the number of phases included, the methodology should address stress testing on at least the following levels:

- the input device level;
- the in-store equipment configuration level;
- the host computer, at the internal processing capacity, interface, and batch processing levels; and
- the network level.

Reviewers should be concerned with whether the methodology addresses each of these levels. The reviewer should utilize the system design document to determine whether all levels have been included. In addition, the methodology should address the following considerations for each phase presented.

- the timing of each phase;
- the hardware that will be used;
- the communications network;
- the software to be used;
- initial values needed; and
- the people to be involved.

Preparers may add to these test design considerations based on the special circumstances of their EBT system environment and the requirements presented in the system design document. One consideration worth pointing out in this document concerns the design of stress test procedures

for capacity levels which may not be achieved for many months or years, e.g., full implementation. The approach to testing will be very much determined by the design of the system as described in the system design document. As described earlier in this chapter, the system design document should include both the expected transaction levels at full implementation as well as the capacity of the computer system(s) being used, in its current configuration and its future capacity (achieved via expansion or upgrade). Recognizing that there are many intricacies in configuring systems, e.g., disk storage and access methods, a basic rule of thumb would be to stress test the system at full implementation transaction levels if they are less than the capacity of the EBT system, as configured. If the full implementation levels exceed the capacity of the EBT system, as configured, the stress test should test to the capacity of the EBT system. Test procedures should then also include projections of system growth and capacity needs, developed using test results and published system capacity documentation, which could be compared to the expansion/upgrade plans documented in the system design document to determine if they are realistic.

The remainder of this chapter focuses on a discussion of these considerations. Reviewers should determine whether each consideration was addressed for each different phase presented in the Acceptance Test Plan.

11.2 TIMING CONSIDERATIONS

This section of the Acceptance Test Plan should address when the various phases of stress testing will occur. This should be included in the overall acceptance testing time line that is provided as a part of the management plan. Typically, it is best performed subsequent to the testing of the functional requirements; after the system has demonstrated the capability to properly process transactions.

Stress testing may occur in the period of time following the functional requirements testing. However, the decision as to when it occurs is usually a function of availability of the other considerations presented above (i.e., people, terminals, host computer configuration, and communication lines). For example, when preparing for a full stress test of the host computer environment, there usually will be a "ramp-up" (gradual increase) to the transaction rate specified in the system design document. This is done in order to gradually "tune" the

configuration of the host computer and peripheral equipment to a size that will be able to process the volume in an adequate manner. Once the target transaction rate is achieved, the full stress test can be conducted.

Reviewers should determine that a schedule is provided and that it includes time to allow for the review of system generated reports. Adequate time should be provided to allow for retesting should problems be encountered.

11.3 HARDWARE CONSIDERATIONS

This section of the Acceptance Test Plan should describe the hardware components that will be used in each phase of stress testing. The considerations in this area center around the terminal devices and the host computer system. All configurations of terminals that will be used in the production environment must be included in the test. This includes POS devices, administrative terminals, ARUs, and ATMs. A procedure to stress each device should be included. Also, as indicated in earlier chapters, the test environment should not only include every type of terminal device, but the terminals should also be set up in every type of configuration that will exist in the stores, e.g., single lane configurations and multi-lane, in-store controller configurations, in the production environment.

The preparer should provide descriptions of the hardware environment in which the stress test will be performed along with a reference to the section of the system design document where additional information regarding the EBT system hardware can be located. Reviewers should be concerned with whether the test environment mirrors the environment that will be present in the production environment.

11.4 NETWORK CONSIDERATIONS

This section of the Acceptance Test Plan should describe the communications network components that will be included in each phase of the stress test. Included would be information about each different network configuration (e.g., the number of nodes, the type and number of lines, location of concentrators and multiplexors) as well as the method of generating transactions over each network to stress test them. Each different network configuration should be tested independently. For example, an ARU may have a separate 800 number configuration

through which it is accessed. It would then be necessary to conduct a separate stress test directly over these lines. All backup networks should also be included in the stress test.

Using the phases presented earlier in the chapter as a reference point, very little network stress testing would be accomplished during the first two phases. The first phase (limited stress test) normally would not generate sufficient transactions to stress the network, if the functional requirements testing were running over the network at all. The second phase (full stress testing) is primarily accomplished through a direct connection from a separate computer. The third phase (a combined stress test) is where the network would be stressed.

Preparers should provide descriptions of each network augmented with graphics depicting the network. Preparers should cross reference this information to the system design document to ensure that all networks and their components are included in the stress test.

11.5 SOFTWARE CONSIDERATIONS

This section of the Acceptance Test Plan should provide a description of the software that will be tested during the stress test. This should include all host applications software, POS software, PC based software used in administrative terminals (e.g., Windows) and communications software.

In addition to the software that will be tested, the Acceptance Test Plan should address the use of either proprietary or third-party software packages that will be used as tools to assist in the stress testing. This type of software would be used to stress the host environment. This "driver" software attaches to the host computer through another computer, emulates input devices, and generates pre-determined transaction sets at pre-determined transaction rates.

POS devices can also be initialized with a special load image that could be used to stress both the communications network and host computer environment. These loads direct the POS device to automatically dial over a pre-determined network facility, send a pre-defined transaction set, complete the transaction, disconnect and then repeat the cycle until canceled.

The preparer should provide a description of all the software that will be subjected to stress testing. A reference to the section(s) of the system design document where additional information is located regarding the software should be provided. Reviewers should ensure that

all software of the EBT system is subjected to stress testing by cross referencing to the system design document. A description of the proprietary or third-party software that is being used should also be included in the Acceptance Test Plan in order to give the reviewer and testers an understanding of its use and its part in the stress test.

In addition, the preparer should describe the methods that will be employed to ensure that the software being subjected to stress testing was the same software that underwent functional requirements testing. As in every part of the test, the objective is to use the same software that will be used in the production environment. While this may seem to be a very elementary statement, it is not unusual for one version of the software to have undergone functional requirements testing and yet a vastly different version to be subjected to stress testing. This seems to result from the elapsed time from the completion of the functional requirements testing to the conduct of the various phases of the stress test. This is especially true with the "load image" in POS devices. As is more fully explained when discussing regression testing in Chapter 13, software version and modification identification is an extremely effective control mechanism to track changes to software.

11.6 INITIAL VALUES

In order to conduct stress testing, an appropriate quantity of initial values should be established on the EBT system. As was presented in Chapter 5, it may be prudent to establish these values independent of values established for other aspects of the acceptance test and independent of each phase of stress testing in order to preserve the integrity of the test database for each segment of the acceptance test.

This section of the Acceptance Test Plan should provide a description of the values to be established on the system. The Acceptance Test Plan should include a procedure that requires that, prior to conducting the tests, a report should be generated that displays these values for comparison to the Acceptance Test Plan document.

As an example of the magnitude of the initial values required to conduct a stress test of a host environment, Appendix D presents the initial value setup used for the Maryland EBT system.

11.7 PEOPLE

The management plan should identify the participants to each phase of the stress test. It is not required that the same individuals be present for each phase. The important aspect is that the resource is identified and can be present at the proper location at the proper time.

Chapter 12

PRODUCTION (LIVE) DEMONSTRATION

As a final end-to-end check of the system processing during the functional requirements testing portion of the acceptance test, a sample of volunteer clients should access their program benefits in a completely live environment. Transactions created during this time should be processed through the settlement stream, and FNS and merchant accounts should be updated.

12.1 OVERVIEW

The production demonstration brings to the forefront of the testing activities the meeting of clients, merchants, and the EBT system in a live environment. It is a miniature test of client training, merchant training, and system processing capabilities. During this demonstration, clients will be given an EBT card and issued a pre-determined amount of benefits which they can "spend" within the designated merchant's store. The clients are to conduct the business of purchasing items as they would once the EBT system becomes operational in their County. The EBT system is completely "live" and will not only process these transactions, but will produce settlement information that will eventually lead to the crediting of the merchant's bank account. Prior EBT system production demonstrations have resulted in clients using all available benefits.

In this section of the Acceptance Test Plan, preparers should provide a description of the structure of the production demonstration which is briefly discussed in the remainder of this chapter.

12.2 STRUCTURE

The description of the structure of the production demonstration should include information on at least the following:

- the timing of the demonstration - the production demonstration usually will be held on one of the final days of the test, after the EBT system has demonstrated the capability to properly process transactions. This demonstration should be included in the overall acceptance test time line that is provided as a part of the management plan.

- the merchants to be included - if possible, the demonstration should include merchants utilizing different equipment configurations, e.g., single lane POS device, and a multi-lane merchant using an in-store controller.
- the clients to be included - the number of clients to participate in the test should be determined and included in the Acceptance Test Plan. The number will be dependent on the number of merchants participating in the test as well as the total dollar amount that is available to be allocated to each benefit card. The funding source for the clients' accounts also need to be determined.
- initial value requirements - in order to conduct the test, client, merchant, and benefit amounts will need to be determined and entered into the system. The State or County should "issue" benefits and transmit them over the eligibility processing interface for posting to the clients' accounts. The State will need to establish a benefits letter of credit and advise the FNS of the amount of funds that will be needed to accommodate this portion of the test.
- card issuance - cards should be issued to clients following the procedures described in the system design document.
- training - if training had not already occurred as part of the overall EBT system implementation, the Acceptance Test Plan should include provisions for training of clients and merchants participating in the production demonstration.
- staging - the Acceptance Test Plan should indicate how the clients will get to each of the stores and back home with their groceries.
- transaction sets - the Acceptance Test Plan should include the types of transactions that the clients should attempt. In addition to purchases, balance inquiries, refunds, and voids should be attempted.
- participants to the test - certain observers will be present at the production demonstration. Their role is to observe how well clients and merchants handle EBT transactions. The number of observers which can attend may be limited by the size or location of the merchants' stores. Whether interviews of the merchants or clients should occur during the production demonstration should be included in the Acceptance Test Plan.
- the interface with FNS' Minneapolis Computer Support Center (MCSC) - retailer redemption information will need to be sent to MCSC. This information will also need to be reconciled to settlement activity.

- pre-note and ACH - the Acceptance Test Plan should include provision for the pre-note process for each of the merchants in the production demonstration to ensure that they will receive credit for all transactions.
- reports review - all EBT system reports should be reviewed for proper processing of transactions, including retailer settlement and Federal net settlement. MIS operating performance should also be reviewed for compliance with the federal regulations.

Preparers should add to these elements as necessary to fully describe the production demonstration structure.

Reviewers should determine whether the information provided allows for the various in-store equipment configurations and that the production demonstration's timing is appropriate within the context of the overall test.

Chapter 13

REGRESSION TESTING

Changes made to the EBT system, whether the result of correction of defects or planned modifications, need to be tested to verify that the intended result was achieved. Inherent in any system change is the possibility that the change will introduce defect conditions in processing components that were previously tested and found to have no processing errors. In addition to testing the change made to the system, regression testing involves the re-testing of previously tested processing components to verify that changes have not affected their "defect free" status.

The intent of regression testing is to achieve some reasonable assurance that changes introduced into the EBT system did not induce problems in previously defect-free processing components. Regression testing is principally comprised of re-running test procedures that previously did not result in defects. It would be expected that the change(s) made did not introduce new defects and the re-running of these procedures would not result in defects. Regression testing also requires a decision on the amount of re-testing required of existing functions subsequent to the implementation of changes to the EBT system.

In this section of the Acceptance Test Plan, preparers are to describe the regression testing methodology to be employed during the acceptance test and during production operations. This is necessary to provide some assurance that the system's integrity will be maintained for on-going modifications or changes subsequent to the acceptance test. The methodology should include a description of:

- the methods to control changes made and tested;
- the decision criteria to determine the magnitude regression testing; and
- the timing of when regression testing will occur during the acceptance test.

Preparers should add to this listing based on the specific circumstances of the acceptance test.

Reviewers should ensure that the regression testing methodology is presented and addresses, at least, each of the above listed areas.

The remainder of this chapter provides guidance on each of the areas to be included in the regression testing methodology.

13.2 METHODS TO CONTROL CHANGES MADE AND TESTED

Two common methods used in the software industry to control changes made and tested include the use of:

- **version and modification identification on software modules, screens, etc.;**
and
- **the updating of, or provision of, new system documentation.**

Version and modification identification represents a hierarchical method of tracking the most up-to-date release of a software module, screen, etc. It involves the use of a numbering sequence on each module, screen, etc., that is updated after each change or group of changes is made.

Version numbers are updated when major changes or modifications are made to the system. For instance, priority 1 and 2 type defects, as described in Chapter 4 of this document, could result in major system modifications. Modification numbers will be updated after minor changes are made, e.g., all other priority levels described in Chapter 4. The version and modification numbers are used to control which software is ultimately used in the production environment and to ensure that the correct version and modification is subjected to regression testing. For example, a priority 3 defect is discovered in version 5, modification 2 of the EBT software. Once the correction is made, the labelling of the software becomes version 5, modification 3. It is this version and modification that should be subjected to regression testing. It is the system developer's responsibility to define precisely how their software version and modification numbering sequence will operate.

Every change or modification should be documented in the system documentation. The system developer should be adhering to pre-established documentation standards which are referenced in the system design documentation and should be included in the Acceptance Test Plan by reference.

13.3 REGRESSION TESTING DECISION CRITERIA

There are probably three key criteria that should be considered when determining "how much" re-testing of a processing function is necessary. The first is the defect-severity classification, as described in Chapter 4, that is assigned to a defect. A priority 2 classification should be more fully re-tested than priority 3 defect. A priority 2 classification is considered a major malfunction of a processing component and would probably require the rerunning of all test procedures involving the particular processing component. A priority 3 classification is described as a minor function problem and probably requires the rerunning of the procedure that induced the defect and a few dependent test processes to determine whether any "cascading" affect occurred from the change. For example, rerunning of subsequent test scripts which relied on the correct processing of the procedure that produced the defect, and reviewing of reports indicating correct processing of the procedure and subsequent transaction sets.

The second criterion is the total number of defects discovered in a processing component, as described in Section 4.4 of this document. The number of defects discovered within a single processing component may be indicative of a more significant underlying problem with the processing component. A change may induce defects in subsequent testing of that processing component.

The third criterion is the system's design. The relationship of the programming structure in various modules needs to be considered. Whether a change in one module will affect the programming structure in other modules should be reviewed. For example, expanding a data element field length could affect other software routines that use that data element, or this field length change may affect the way the information appears on a report.

13.4 TIMING OF REGRESSION TESTING

The decision as to when regression testing can be performed is usually a function of:

- the severity of the defect;
- when in the acceptance test the defect is discovered;

- when the cause of the defect is determined; and
- when the defect can be corrected.

Regression testing should be conducted as soon as it is practical to do so. It is usually more efficient to perform regression testing after a number of changes are made rather than on a one-for-one basis. In order to maintain control of its sequencing, regression testing should occur at a set point in each day of the acceptance test. For instance, the Acceptance Test Plan might state that regression testing will occur first thing each morning for all defects previously discovered and corrected, but not previously tested.

Should a defect be either a priority 1 or 2, the acceptance test, or a major portion of it, may have to be rescheduled. Likewise, if a significant number of total defects are discovered, a similar rescheduling may be warranted.

Chapter 14

"WHAT-IF" TESTING

The Acceptance Test Plan should provide a "what-if" component to permit the opportunity for observers and participants to the acceptance test to test possible scenarios in a free-form manner. The basis for the scenarios will be the observer's and participant's observations of the testing.

14.1 OVERVIEW

The only boundary with "what-if" testing is the tester's imagination. This is the opportunity during the acceptance test where testers can attempt all those "wild and crazy" transactions that they have dreamt about, as well as transactions, or combinations of transactions, that they believe were not included in the scripts but should have been.

Since "what-if" testing does not require any pre-developed scripting of test procedures, the Acceptance Test Plan should only need to address planning issues. These planning issues include:

- the timing as to when "what-if" testing will occur;
- the documentation of the tests conducted; and
- the availability of initial value elements (client accounts, merchants and cards) to conduct the tests.

Reviewers only need to ensure that the Acceptance Test Plan addresses these issues. The remainder of this chapter focuses on a discussion of these planning issues.

14.2 TIMING

The opportunity to conduct "what-if" testing should be provided throughout the acceptance test. This type of testing is sometimes disruptive, and is better accommodated by scheduling it at a regular time, such as at the end of each day. In this manner, all "what-if"

scenarios can be accumulated from the entire acceptance test team. It would also be possible to "brainstorm" with other test team participants to develop that one perfect "what-if" scenario.

14.3 DOCUMENTATION

All "what-if" scenarios should be converted into test scripts by the test coordinator. This will aide in the correct performance of the procedures, the tracing to system generated reports, and with the resolution of any unexpected results. It also provides a mechanism to be able to replicate the procedure, if necessary, at subsequent intervals. The results of "what-if" testing should be documented and reported as described in Chapter 4.

14.4 INITIAL VALUES

In order to maintain control and the integrity of client accounts, merchant totals, and cards being used in existing test scripts, it may be necessary to isolate the processing of "what-if" transactions to select pre-determined clients, merchants and cards. This "reserve" of client accounts (with issuances), merchants, and cards should be identified in the Acceptance Test Plan.

Chapter 15

NETWORK CERTIFICATION

Third-party networks and processors provide an alternative entry point into the EBT system. There are many different possible configurations of third-party processors and networks and, therefore, this section addresses generic certification requirements that should be tailored to each certification. In general, third-party processors drive the terminals in the merchant location, capture and route transaction data, and provide settlement services. Third-party processors and networks provide a link between merchant locations and ATMs that accept commercial credit and/or debit transactions and the EBT host.

Third-party certification may occur at different times from the functional requirements testing portion of the acceptance test or may be performed concurrently. This decision should be based upon the number of merchants utilizing third parties and when third parties will be provided access to the system.

Preparers and reviewers of Acceptance Test Plan documents should note that the test policy on third-party certification is still evolving. Nevertheless, at this time there needs to be some assurances that both the interface and stand alone components of third-party systems are capable of meeting all functional requirements and performance standards prescribed for the Food Stamp Program.

15.1 OVERVIEW

Certification of third-party networks and processors is required to ensure Food Stamp Program or other benefit transactions are processed consistent with State and Federal regulations. Specifically, the certification of each third-party network and processor should address each of the following three components:

- **Terminal Device** - the device must be able to capture all information necessary for an EBT transaction and to accept and encrypt PINs according to Federal regulations;
- **Transaction Processing System** - the network and processor must be able to process all types of EBT transactions within the performance requirements as specified in the EBT regulations; and

- Settlement - the third-party processor must be able to provide retailer credit according to regulation.

All third-party networks and processors that will be interfacing with the EBT system should be described in the system design document along with information for each of the three components listed above. This information should include appropriate documentation from the third-party to ensure an understanding of processing, reconciliation and settlement procedures.

Preparers should provide a description of these components for each third-party network and processor relationship. Through reference to the system design document, reviewers should ensure that testing procedures for each relationship are included in the Acceptance Test Plan.

The remainder of this chapter provides a discussion of the three components listed above.

15.2 TERMINAL DEVICE

Examples of terminal devices are POS devices and ATMs. Because of the wide range of devices available on the market, each device designated to process EBT transactions must be capable of meeting EBT requirements. Examples of these requirements include the ability to encrypt the PIN at the PIN pad, the ability to print the remaining balance on the receipt, and the ability to differentiate a food stamp purchase from other purchases.

The Acceptance Test Plan should address how the processor will certify the capabilities of the third-party devices. These tests should include:

- a visual verification of the function keys available on the terminal along with their providing the minimum functionality defined in the system design document;
- a review and testing of the device time-out characteristics;
- a review of the method of PIN encryption and key management; and
- a review of the methods used to process transactions.

Testing of the actual devices separate from the processing system may be difficult and could cause disruption to the merchant location. However, if warranted, certain tests could be performed such as monitoring communications between the PIN pad and the terminal and between the terminal and the network to ensure that minimum security requirements are met.

15.3 TRANSACTION PROCESSING

This section of the Acceptance Test Plan should provide the reviewer with information regarding what tests will be performed to ensure that the third party can accept and process all types of EBT transactions within the specified performance requirements. These tests should be similar to the transaction set tests performed on the complete EBT system as described in Chapter 8.

The tests of the third party should begin with an isolated test of each type of transaction. For example, the first test may be a purchase transaction. The test should include a review of the terminal functionality, a review of response time and a review of the printed receipt. Similar to the test of the full EBT system, failure of the system to meet any of the specifications would result in a system defect that would need to be corrected and re-tested. Examples of other transaction types that would be included in this stage of the testing would be a void, a refund, and a balance inquiry. The methods used to develop and document the test procedures should include the use of matrices and scripts as was described in Chapter 3. The full extent of transaction types would depend upon the design of the system.

The second stage of the testing should include transaction set tests that present different sequences of transactions in different permutations. These transaction set permutations should mirror the scripts prepared to test the full EBT system, as described in Chapter 3. It may not be necessary to test administrative functions such as client file management and merchant file management, since these functions have been tested as part of the full EBT system test. However, the reviewer should ensure that the tests are sufficient to ensure that transactions processed at a particular device location are credited to the appropriate merchant account.

The third stage of testing should address response time and capacity management. Response time should be measured consistent with measurements used in the full system test. This time is generally measured as the time increment between pushing the "enter" button and the return of an authorization message that initiates the printing of the receipt. Performance testing of third-party processors is in some ways more difficult than performance testing of the full EBT system. It may not be possible to link into the third-party network with transaction generating software to "pump" large numbers of transactions through the system. Fortunately, depending upon the expected volume of the third party, this type of test may not be necessary.

One method of performing a limited capacity test is to initiate simultaneous transactions through multiple terminals operated by the third party at the same time that the capacity test is being run on the full EBT system.

Similar to the range of tests performed on the full EBT system, tests of the third party should be conducted in each type of merchant environment. These environments may include a single lane configuration, a multi-lane configuration, stand-alone balance inquiry terminals, etc. Host EBT reports should be reviewed to ensure that the third-party processor and/or network has provided all required information with each type of transaction.

Reviewers of the Acceptance Test Plan should expect to see a discussion of how the certifier will ensure the backup capability of the third party. This discussion should include a review of alternate communications links from the POS or ATM as well as how either manual transactions or store and forward transactions will be accommodated.

The fourth stage of testing should include "what-if" testing and limited destructive testing. For the same reasons as these tests are critical in the acceptance test of the full EBT system, these tests are critical when certifying third-party processors. The Acceptance Test Plan should address the types of tests that will be conducted and the timing of tests. These tests should be limited to tests of transaction sets and tests within the merchant environment. Unless the third party will be a major carrier of EBT transactions (such as in a highly piggybacked environment), extensive testing of the third-party processing site may not be required.

15.4 SETTLEMENT PROCESSING

The types of tests described in Chapter 9 should be performed with third parties as well. These tests will ensure that all transactions are properly credited based upon the merchant and EBT host cutover times. Third-party certification requires two additional points of testing. The first occurs if the third party has a separate cutover time from the EBT host. This difference would result in holdovers either at the host location or at the third-party location. For example, if the third-party cutover is at 4:00 pm and the EBT host cutover is at 5:00 pm, then the third party will hold over transactions performed in the one hour interval until the next business day. This situation is further complicated if the merchant has a different cutover time than the third party. For example, the merchant may cut over at 3:30 pm. Then the merchant will hold over

transactions that occur between 3:30 pm and 4:00 pm. The Acceptance Test Plan should include sufficient tests to ensure that each stage of holdover processing is correctly accounted for and that the EBT host system settles with the third-party processing system and that the third-party processing system settles with the merchant.

The second type of additional settlement processing testing that is required with third-party certification is assurance of proper credit to the merchant. This assurance includes certification that the amount credited equals the sum of the processing day's transactions as well as the timing of the credit. The EBT host may settle with the third-party processor, and the third party processor may settle with the merchant. Therefore, the tests should include a review of the credit flow between the third-party and the merchant.

Chapter 16

ACCEPTANCE TEST REPORT

The State agency must submit a separate report after the completion of the acceptance test which documents the results of the test. According to the Federal regulations, this report "shall summarize the activities, describe any discrepancies, describe the proposed solutions to discrepancies, and the timetable for their retesting and completion. In addition, the report shall contain the State agency's recommendations regarding implementation of the EBT system in the pilot site."

There are several purposes served through this report. The first is that it provides a formal record of the results of testing. Second, the results included therein form the basis for the recommendation regarding implementation of the EBT system. Third, it communicates the results to interested parties who did not participate in all or parts of the acceptance test.

A sample table of contents for an Acceptance Test Report is provided as Exhibit 16-1. The sample table of contents consists of three sections and at least one appendix section which contains the completed test scripts. The actual contents of an Acceptance Test Report may vary depending on the level of detail provided. It is expected by FNS, however, that the Acceptance Test Report contain at least the information addressed in the sample table of contents. A brief description of each section is provided below.

Section 1 - Introduction - This section provides an overview of the entire acceptance test similar to the Acceptance Test overview described in Sections 2.2 and 2.3 of this document.

Section 2 - Test Results and Findings - This section should describe the types of tests performed and the results of each test separately and in the aggregate. It should include an affirmative statement that all tests delineated in the Acceptance Test Plan were, in fact, performed. Included in this section would be the completed defect summarization forms identified in Chapter 4 and Appendix C of this document. Also to be included would be descriptions of any corrective actions and the planned timetable for regression testing if it had not already taken place.

Exhibit 16-1

Sample Table of Contents for an Acceptance Test Report

Section 1 — Introduction

- A. Acceptance Test Overview**
- B. Participants to the Test**
- C. participant Roles and Responsibilities**
- D. Test Schedule**
- E. Problems Encountered and Their Resolution**

Section 2 — Test Results and Findings

- A. Functional Requirements Testing**
 - 1. Maintenance and Control**
 - 2. Transaction Processing**
 - 3. Settlement Processing**
 - 4. Concurrent Processing**
 - 5. Production (Live) Demonstration**
 - 6. "What-if" Testing**
- B. Error Condition Handling and, Destructive and Recovery Testing**
- C. Stress and Throughput Testing**
- D. Third-party Network Certification**
- E. Regression Testing**
- F. Defect Reporting Forms and Summaries**

Section 3 — Recommendation Regarding Implementation

Appendix I — Completed Test Scripts

Section 3 - Recommendation Regarding Implementation - This section should include a recommendation regarding whether the EBT system should be implemented. This decision should be based on two factors. The first is how well the EBT system satisfied the requirements as presented in the system design document, and the second is how well the system design satisfies the requirements of the Food Stamp Program. While it should never come down to the acceptance testing, there may be situations where the expectation of what is to be provided by the design is not what the tests reveal to be the case. Naturally, it is expected that the results of the testing, as presented in the previous sections of this Acceptance Test Report, clearly support the recommendation.

Appendix A

TEST SCRIPT EXAMPLE

Card 11

Description: Pan = 6005289000000118

Cardholder status = ' '

Cardholder name = Joe Black

Generation number = 1

Pin = 0118

| Accessible Benefits | Beg. Balance |
|-------------------------------|--------------|
| General Public Assistance | \$375.00 |
| Food Stamps—Public Assistance | \$200.00 |

Period 1 Transactions

| Tran Type | Amount | Expected Response | Expected Balance | Actual Response | Balance Returned |
|---------------|----------|-------------------|----------------------|-----------------|------------------|
| Bal Inquiry | \$ 0.00 | Approved | \$200.00 \$375.00 | | |
| FS Purchase | \$10.87 | Approved | \$189.13 | | |
| Void Last | \$10.87 | Approved | | | |
| Cash Withdrwl | \$200.00 | Approved | \$175.00 | | |
| Void Last | \$200.00 | Approved | | | |
| Bal Inquiry | \$ 0.00 | Approved | \$200.00 \$375.00 | | |

Used with permission

Appendix B

DEFECT REPORTING FORM EXAMPLES

NATIONAL PROCESSING COMPANY, INC.

EBT Project - Acceptance Test Incident (ATI)

| | | | |
|----------------------------|------------------|------------------|--------------|
| Date: | S/W Area: | Version # | ATI # |
| Tester Name: | | Script # | |
| Problem Description | | | |
| | | | |

Documentation Attached: (Y or N)

Category: (1 = Stop Test, 2 = Major Component, 3 = Minor component, 4 = Cosmetic)

Assigned To: **Date:**

Problem Resolution:

Fix Version #: **Date:** **Approved(EBT MGR Inits).**

Fix Verified by: **Date:**

| | | |
|---------------------------|---------------------------|--------------|
| Closure Approvals: | NPC Test Director: | Date: |
| | FNS Test Director | Date: |

Used with permission

Appendix C

SUMMARY DEFECT REPORTING EXAMPLES

1. Cumulative summary (updated daily) of all defects

| Number | Priority | Status | Description |
|--------|----------|--------|-------------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

2. Summary of all defects by processing component

| PROCESSING COMPONENTS | PRIORITY LEVELS | | | | | |
|--------------------------------|-----------------|-----|-------|------|------|-------|
| | ONE | TWO | THREE | FOUR | FIVE | TOTAL |
| Client Eligibility | | | | | | |
| Merchant processing | | | | | | |
| Client Processing | | | | | | |
| On-line transaction processing | | | | | | |
| Backup transaction processing | | | | | | |
| ARU processing | | | | | | |
| Settlement processing | | | | | | |
| Reporting | | | | | | |
| Administrative processing | | | | | | |

Used with permission

Appendix D

STRESS TEST EXAMPLE

MARYLAND EBT SYSTEM STRESS PROPOSAL

SETUP

10,000 cards: 6005289000100000 through 600528900010999

One case for each card: 0000000000 through 0000000999

Create benefits for each case for a total of 20,000 benefits.

Food Stamps \$1000 available balance
Authorization numbers 0000000000 - 0000009999

Cash \$1,000 available balance
Authorization numbers 1000000000 - 1000009999

1,000 vault cards: 6005289000180000 through 6005289000189999

1,000 authorization numbers for assignment of emergency benefits
Authorizations numbers 8000000000 - 8000009999

600 Tranz 330 devices: MD0001 through MD0600

600 Stores 00001n through 00600n (n=valid check digit)

Each store has one terminal. All stores will share a FRDABA number but each store will have its own account number. -

120 ATM devices Intercept attached - 9901 pseudo terminal number.
AT0001 through AT0120 actual terminal numbers

2 ARU devices: AR0001 through AR0002

6 administrative terminal devices and operators, all full function from any device.

Used with permission

MARYLAND EBT SYSTEM STRESS PROPOSAL

SCRIPT

POS Tranz 330

Obtain a random card number within the valid range
Randomly pick either a food stamp purchase or cash withdrawal transaction
Transaction amount = \$5.00

Every Terminal will have the same encryption keys

ATM

Obtain a random card number within the valid range
ATM cash withdrawal - type 11
Transaction amount = \$4.00
Encrypted PIN
Every Terminal will have the same encryption keys

ARU

Obtain a random card number within the valid range
Balance inquiry function

Used with permission

MARYLAND EBT SYSTEM STRESS PROPOSAL

Administrative Terminal

The following will be executed, in order, from each device:

Transaction History

Select a store at random from the valid range of stores
Request history by store using a very wide date range but not today
Receive reply record(s)

Transaction History

Select a store at random from the valid range of stores
Request history by store using only today as a date range
Receive reply record(s)

Add a case

Select a new case at random outside the valid range of cases
Add case to system

Add a client to the above case

Add a client to the case - The system will assign a new client number

Issue a vault card to the above case

A list of valid vault cards appears above

Add benefits to the case

Food stamp benefit
Choose next valid authorization number from above list

Case inquiry

Select a case at random from the valid range of cases(including any added)
Retrieve case

Card inquiry

Use the first card number returned in the above case inquiry

Case inquiry (done a second time)

Select a case at random from the valid range of cases(including any added)
Retrieve case

Used with permission

MARYLAND EBT SYSTEM STRESS PROPOSAL

A minimum of three different tests will be conducted. All of the tests will be identical except for the transaction rates. Transaction rates will start at a low level and will be increased until the desired rate has been achieved and fluctuations in rate are at a minimum. Once the specified rate has been established, the test will run for 30 minutes. We will attempt to achieve the following in each test cycle:

Test 1:

| | |
|----------|-----------------------|
| ATM Link | 1 transactions/minute |
| POS Link | 1 transactions/minute |
| ARU Link | 1 transactions/minute |
| IWS Link | 1 transactions/minute |

Test 2:

| | |
|----------|-----------------------|
| ATM Link | 0 transactions/second |
| POS Link | 2 transactions/second |
| ARU Link | 1 transactions/minute |
| IWS Link | 1 transactions/minute |

Test 3:

| | |
|----------|-----------------------|
| ATM Link | 1 transactions/second |
| ARU Link | 1 transactions/minute |
| IWS Link | 2 transactions/minute |
| POS Link | 3 transactions/second |

Test 4

| | |
|----------|-----------------------|
| ATM Link | 2 transactions/second |
| ARU Link | 2 transactions/minute |
| IWS Link | 2 transactions/minute |
| POS Link | 4 transactions/second |

Used with permission

Appendix E

SUMMARY OF INFORMATION TO BE INCLUDED IN EBT SYSTEM ACCEPTANCE TEST PLANS

INTRODUCTION

Numerous references have been made throughout this document to material or information that an Acceptance Test Plan should contain, along with examples of test procedures that have been used in prior EBT acceptance testing. This appendix provides a summary of that information. Reviewers can use this summary as a quick reference aid when reading sections of an Acceptance Test Plan.

The summary is organized along the chapters included in the main Guidelines document. For ease of reference between the summary and the document, each section of the summary indicates the corresponding chapter and section in the document where a full discussion of the topic may be found.

Chapter 2 ACCEPTANCE TEST MANAGEMENT PLAN

This section of the Acceptance Test Plan should contain information which documents the planning and management of the acceptance test. The management plan should contain several components:

Acceptance Test Overview (2.2)

The overview section should provide sufficient information so that a reader will gain a general understanding of the:

- activities comprising the test; and
- overall EBT system architecture and major processes performed.

Organization (2.3)

This section should provide information regarding:

- the participants to the test;

- each participant's role and responsibility during the test; and
- the test schedule, including:
 - delivery, set-up and testing of all equipment at all test locations;
 - a daily schedule of testing events; and
 - the locations of the test activities.

It is important that the schedule include multiple system cycles (days) as a means to accelerate the testing of all components and functions of the system.

Coordination with Other Organizations, Systems, and Persons (2.4)

A listing of the organizations, systems, and persons whom the processor will need to interact with as part of the acceptance test should be included in this section. A brief description of each along with the nature of the interaction should be provided.

Test Environment Description (2.5)

The Acceptance Test Plan should include in this section a full description of the test environment, including exact configurations for:

- State and processor computers;
- POS devices;
- administrative terminals; and
- telecommunications networks.

The above information should be provided for each component of the acceptance test. Any deviations from a "production" mode of operations should be detailed and the implications, if any, that the deviation would have on the test results should be presented.

Test Techniques, Methods and Tools (2.6)

Acceptance testing techniques, methods and tools will vary based on the type of test being performed. This section of the acceptance test plan should provide a description of each. Examples would include:

- transactions entered at POS devices to test functional requirements;
- pre-programmed POS devices to simulate or stress in-store controllers or the telecommunications network;
- files of test data to test batch edit programs on interfaces;
- use of data dictionaries to generate data for edit checking; and
- proprietary software to simulate POS devices generating numerous transactions per second to test system throughput and ability to properly process high volumes of transactions.

Chapter 3 DEVELOPMENT AND DOCUMENTATION OF ACCEPTANCE TESTING PROCEDURES

The chapter describes methods which can be used to assist in developing and documenting testing procedures. They include the use of:

Functional Matrix (3.2)

A functional matrix provides a method to identify all potential permutations of functional and transaction sequences that can occur in a particular processing component. Therefore, for each processing component, the acceptance test plan should include a functional matrix which is inclusive of all transaction types specified for the processing component in the system design document.

Reviewers of the matrices should also determine the comprehensiveness of the permutations identified by considering the combinations presented and identifying those that are missing.

Test Scripts (3.3)

Tests scripts are a means to complete the process of developing and documenting test procedures that began with the identification of transaction permutations via use of the functional matrix. Test scripts will minimally include the following information:

- card or PAN being used
- the cardholder name
- the cardholder status
- the card generation number
- the PIN
- retailer and clerk ID
- POS device or other device being used to enter the transaction
- test case number
- the type of transaction
- the amount of the transaction
- the expected response
- the expected balance
- spaces to record observation of the actual system response and the balance returned

Preparers need to take the development of test cases a step further than simply transposing the permutations identified in the functional matrices. An EBT system is much more complex, and preparers should develop test scripts which take into consideration the myriad of conditions and circumstances under which each transaction set can occur in the "real" world and, therefore, need to be tested. As examples, this would include:

- conditions which generate approvals and denials, e.g., sufficient and insufficient balances in a recipient's account or the use of the correct and then incorrect generation card;

- the processing of each transaction set, at each type of retailer environment and on each type of POS device;
- processing over multiple benefit periods or months and calendar years; and
- processing sequences of transactions at multiple merchants (e.g., perform a purchase at one merchant and attempt a refund at another).

These conditions and circumstances should be specifically identified in the EBT system's design document and the preparer must provide test scripts for each. Preparers should bear in mind that testers will need to trace the results generated from the test scripts to on-line history files and daily reports and should incorporate this into their test procedures. Preparers may develop variations on the test script in order to accommodate all the functions and requirements which need to be tested.

Requirements Verification Matrix (3.4)

A requirements verification matrix is another method that can be utilized to ensure that all specifications have been tested. This matrix serves multiple purposes in that it requires the preparer to cross-reference the specifications and the system design to test procedures and their results. A requirements verification matrix could include:

- all specifications as promulgated by the State and FNS;
- system design document references that address each specification;
- the acceptance test procedure(s) that will test the EBT system design; and
- the results of the acceptance test procedures.

The matrix could be further segregated by major functional requirement areas as described in the Federal regulations for State EBT systems.

Narratives (3.5)

Narratives should be used:

- when test scenarios need more descriptive information than can be provided by the previously presented methods; and
- when test procedures do not lend themselves to being documented by way of test scripts, e.g., stress and throughput tests.

Chapter 4 DOCUMENTING AND EVALUATING TEST RESULTS

This chapter focuses on providing a format for documenting discrepancies, evaluating the significance of each discrepancy, and the control and follow-up required that should be included in the Acceptance Test Plan. Included is information regarding:

Defect Reporting Procedures (4.2)

These procedures would include:

- how to document the defect (e.g., a multi-sectioned reporting form);
- to whom to report the defect; and
- when to report the defect.

Defect-Severity Rating System (4.3)

A rating system should be used that includes logical "categories" or "priority levels" to which defects can be assigned.

Acceptance Criteria and Defect Evaluation (4.4)

The acceptance test plan should include an estimation of a range of the acceptable number of defects, by defect-severity level and processing component, that can be detected by the test procedures and still result in a "go" decision.

Defect Classification (4.5)

The process to determine the cause of the defect and the corrective measure should be started by the system developer upon the uncovering of the defect. The entire test team should participate in reaching a consensus as to each defect's severity level. The test plan should include a description of the defect evaluation procedures that will be used ensuring that the test schedule provides adequate time at the end of each day to review each defect and its resolution.

Chapter 5 ESTABLISHING INITIAL VALUES

This chapter identifies and describes the purpose of establishing initial values as well as the key factors that will determine the initial value requirements for acceptance testing purposes. The key factors include:

Types of System Files (5.2)

For all file types the acceptance test plan should specify:

- the types of static and dynamic files;
- what values, or codes, will populate the files; and
- when the files will be populated with the values or codes.

Development of Acceptance Tests (5.3)

The requirements for initial values are usually not known, in full, until after the development of all acceptance test procedures, when the range of values necessary to complete the tests are known.

Initial values should be presented separately in the acceptance test plan for each acceptance test component.

Interfaces with Other Systems (5.4)

This section of the acceptance test plan should describe any interfaces which would be used to present initial values into the EBT system along with details of the timing of the transfer of these values.

Chapter 6 TESTING MAJOR PROCESSING COMPONENT MAINTENANCE FUNCTIONS

This section of the acceptance test plan should describe the maintenance functions in each processing component and the procedures to test their correct operation. Examples of the types of maintenance functions within EBT system components are:

- validation of individual data elements, terminal devices and their prompt sets, e.g., screen instructions;
- the correct sequencing of simple transactions;
- database updates;
- the operations of workstation function keys; and
- terminal and system reporting.

The Acceptance Test Plan should specify each system processing component that performs maintenance functions. For each, the test plan should be sufficiently detailed so that the following general review points are satisfied:

- the identification of required data elements, e.g., names, addresses, dollar amount fields;
- the timing requirements associated with when the test procedures would occur in relationship to the other tests presented in the test plan;
- the basic transaction processing flows within each area;
- the completeness of the descriptions and reference to the system design document are adequate; and
- the test procedures presented address the maintenance functions described in the system design document.

Processing components which usually contain maintenance functions include:

Client Eligibility Systems (6.2)

The test procedures in this area should focus on the adequacy of the EBT system's edit and validation routines over the data received from the eligibility system. The specific areas that

should be addressed in this section of the Acceptance Test Plan include the following processing areas:

- Interface Processing;
- Message Formats and Processing Codes; and
- Client File Conversion.

The Acceptance Test Plan should not include tests of any modifications that may have been necessary to the eligibility system in order to accommodate the EBT system.

Merchant Processing (6.3)

The Acceptance Test Plan should address the major activities constituting merchant processing described in the system design document. These activities include:

System Recognition and Service Termination

These activities require initial values in order to attempt add, change, and delete processing. During testing, values for existing merchants will be changed and new merchants will be added. Therefore, the requirements for testing this area must be considered when establishing initial values (either through an interface or manually). Examples of procedures to test these activities include:

- processing merchants in each status category, e.g., on hold, active, restricted, and others;
- data element processing by merchant type;
- conducting changes to merchants, e.g., add, change, and delete; and,
- demonstrating system processing parameters to approved merchants.

Terminal Processing

Merchants are expected to use a variety of terminals and terminal configurations, (e.g., stand-alone, integrated terminals) in support of POS processing. Functionally, all POS devices

are required to support program requirements and transaction sets as specified in the system design document. As examples, these would include:

- the terminal functions including financial (e.g., purchase and refund) and administrative (e.g., balance inquiry and settlement);
- the use of function keys (e.g., an FSP and AFDC function key);
- the steps required for processing each transaction;
- the display messages for manual entry and system responses to transactions (e.g., "transaction denied", "approved"); and
- the requirements for manually entering data elements (e.g., card numbers).

The preparer should include procedures which test each of the above areas individually and in combination to thoroughly exercise the system. Examples of procedures testing terminal processing would include:

- swiping valid and invalid cards;
- swiping commercial cards;
- exercising all function keys; and,
- correctly and incorrectly following the steps for each type of financial and administrative terminal function.

Settlement Processing

Merchant settlement processing is narrowly defined as the end of business day balancing between the merchant terminal and the EBT system. Each terminal, throughout the business day, accumulates transaction counts and amounts. At business day end, transaction counts and amounts are compared to those maintained by the EBT system. Settlement processing, then, is comprised of the activities to close the counts and amounts by terminal. Some systems will provide further capabilities for merchant settlement. For example, merchant summaries by groups of terminals, by store, and by chain could be features provided.

Examples of procedures to test settlement processing include:

- comparing end-of-day totals generated from terminal receipts to system generated reports for all terminal totals and store totals.
- entering of transaction sets both before and after the cutoff time established, over multiple system cycles, to test that the system processes the information in the correct processing periods.

Funds Transfer

Examples of testing activities would include:

- producing an ACH file at the end of each business day which would indicate the merchants who settled by the cutoff time and the amounts due to them (the format of this tape should comply with NACHA specifications).
- "dumping" the contents of the file and comparing merchant information to settlement reports.
- verify that merchants not included on the file received credit through an alternative funding option, e.g., check, and that the EBT system produced the correct output to initiate the credit.

Dispute Processing

Test procedures should develop test circumstances that will demonstrate the operation of the dispute processing methodology.

Client Processing (6.4)

This section of the Acceptance Test Plan should address the requirements for manual intervention in the client setup process and the additional values needed in the client file that are not transmitted from the eligibility system, e.g., card number. The Acceptance Test Plan should address the major activities constituting client processing described in the system design document which include:

Initialization and Setup

Many of the processes involved with the initialization and setup of clients in the system are discussed in other sections of this document (see Sections 6.1 and 6.2). Each criterion specified in the system design document should be included as part of the initialization and setup testing process to ensure that it operates as designed.

Card Issuance and PIN Selection

In addition to the information that is provided by the eligibility system, adding a client to the EBT system involves card issuance and PIN selection. Cards and PINs are used by the

EBT system to recognize and authorize clients' access to benefit allotments. Test procedures should be structured and presented by components within the card issuance process.

The key element of this section is the methodology required by the EBT system for entry and security of the client's card number and PIN. Particular attention should be paid to the entry methods and security over card information processing. Procedures that demonstrate:

- system security features;
- card entry features;
- capability to change or alter PINs; and
- card issuance capability.

Examples of the types of tests to be considered include:

- adding a card to an existing client;
- adding a duplicate card number to same client;
- adding duplicate card number to different client;
- attempt use of card in various statuses (deactivated/canceled, lost/stolen - to test operation of "hot list" capability);
- attempt use of incorrect generation number of card;
- enter PIN and incorrectly re-enter PIN (when issuing card); and

Reporting (6.5)

Reporting provides a record of all EBT system processing activities. For each report, the Acceptance Test Plan should include procedures that:

- validates its use and purpose;
- validates the data elements included on the report; and
- verifies all calculations and algorithms.

Reports review should occur on a daily basis and include all system cycles.

Administrative Processing (6.6)

This section of the Acceptance Test Plan should include a brief description of the capabilities of each administrative processing area as well as a reference to the section in the system design document where additional information is located. Generally, administrative processing includes access (which will vary and should be tightly controlled) to the following information:

- participant files, such as merchant and client files;
- control files, such as access security;
- history files, such as client and merchant history;
- processing files, such as daily transaction information; and
- settlement files, such as merchant and settlement totals.

Usually administrative processing focuses on-line workstation screen access. Examples of the types of general procedures to be considered to test all screens include:

- correct and erroneous data entry for each data element, e.g., correct and incorrect length account number, alpha/numeric field checking;
- exercising of all function and special keys at all data entry fields, e.g., F1, whether or not defined in the system design for use on the screen;
- perform screen-to-screen navigation using features described in the system design document.

Preparers should provide a listing and brief description of all screens used in administrative processing. They will also need to provide procedures that test the functionality of features specific to the type of workstation screen being tested. A few examples include:

Participant File

- exercise special functions, e.g., dual custody entry for PIN
- perform client-to-client cross screen navigation using features described in the system design document.

History File

- exercise special search functions, e.g., history ranges.

EBT System Security (6.7)

This section of the Acceptance Test Plan should provide a brief description of the security safeguards and procedures incorporated into the design of the EBT system along with the controls (both procedural and hardware or software-based) to ensure that they are working as designed. The specific areas that should be addressed in this section of the Acceptance Test Plan should include:

EBT Access Card

Examples of test procedures would include:

- verifying that card numbers are generated for all card orders and have the proper ISO (International Standards Organization), followed by a card number;
- ensuring that cards "ordered" and being used for acceptance test purposes have been included on all appropriate reports, such as a card statistics report and card order report, and that the information (case number, cardholder number, generation number, etc.) agrees with the database;
- verifying that all card information embossed on the cards used in the acceptance test agrees to the database for client name, card number, generation number, etc.;

- generating a card order ensuring that all steps as identified in the system design document are followed;
- requesting the generation of temporary cards and ensuring that they have been established on the system as inactive with no PIN selection;
- attempting to use a temporary card without assignment to a client or selection of a PIN;
- ensuring that the only information on temporary cards is card and generation number;
- ensuring that expiration dates assigned to activated temporary cards do not exceed system design specifications and attempt the use of the card after the expiration date;
- requesting a generation of replacement cards and ensure that they have identical access to the client's benefits that the replaced card had;
- ensuring that the replacement card had same card number with the next generation number of the replaced card;
- ensuring that the first time a replacement or temporary card is used, the status of the card it replaced is set to "deactivated"; and
- ensuring that inventory control procedures account for voided, spoiled or unusable stock.

Personal Identification Number (PIN)

Examples of procedures to test the functioning of the encryption capabilities of the system to protect the PIN include:

- entering PINs and then reviewing the contents of the PIN file to ensure that the PIN was encrypted; and
- demonstrating the system's ability to change the "key" used to encrypt PINs at the PIN pad and at the host.

Network Transmission and Message Validation

Procedures should include tests of the full range of controls to be used to ensure telecommunications security for three areas:

- Eligibility systems to EBT system;
- On-line processing across public and private networks; and
- Backup transaction processing.

Examples of test procedures would include:

- attempting to transfer files without passwords;
- terminating a file transfer before completion to determine proper handling of transactions by the EBT system;
- attempting to transfer the same file at various intervals; and
- transmitting files with invalid or missing header and trailer records.
- verification of backup merchant codes; and
- reconciliation of information provided on submitted vouchers to the data entered at the time of the backup transactions.

Access Security

Procedures should include tests of every method of accessing the EBT system, including the following three methods:

- EBT processing terminals;
- EBT processing systems; and
- Administrative terminals.

Examples of test procedures would include:

- attempting access from a POS device of a merchant not on the merchant file;
- attempting access from a POS device not on the terminal file of a participating merchant;
- attempting to sign on and off POS devices using combinations of valid and invalid supervisor and clerk IDs and passwords; and

- attempting settlement functions using combinations of valid and invalid supervisor IDs (for both single lane and in-store controller environments).
- review of operations management procedures for restricting access to tape libraries and the computer room; and
- review of procedures for approval and installation of modifications into the production software.
- attempting logon with various combinations of valid and invalid user IDs and passwords (including the use of blank fields and improper length entries); and
- attempting use of all possible functions by authorized and unauthorized users (preparers would need to determine all possible permutations through reference to security tables established in the system); and
- determining whether terminal timeouts are being utilized effectively.

Chapter 7 ERROR CONDITION HANDLING AND, DESTRUCTIVE AND RECOVERY TESTING

The Acceptance Test Plan should include a description of the EBT system's built-in capabilities to detect errors and process them correctly and to withstand disruptions to system components without compromising the integrity of the databases.

Error Condition Handling Testing (7.2)

Error condition handling testing demonstrates the system's ability to recover from the initiation of incorrect conditions or transactions and report such via exception reporting. The essence of the procedures to test this capability usually involves the entering of data which exceeds, or is outside of, an acceptable range. For example:

- transferring over the eligibility system interface, issuance amounts in excess of a pre-established threshold, e.g., \$10,000.00;
- entering dates preceding the current date for card expiration;
- entering excessive dollar amounts for all numeric value fields on workstation screens; and
- including on the issuance file, issuances with invalid program codes.

Destructive and Recovery Testing (7.3)

Destructive testing is the active attempt to disrupt the operations of the system. It could entail performing or simulating the actions listed during all phases of system processing:

- "pulling the plug" (electrical or telecommunications) on input devices, in-store controllers, LANs and/or multi-lane file server configurations;
- severing or disabling communications lines;
- disabling host computer components (e.g., disk drives); and
- disabling interfaces between computer systems comprising the EBT system.

Destructive testing should include all hardware and communications components described in the system design document which would generally include:

- all terminals;
- telecommunications networks;
- central site, or host, processing components; and
- cards and card-related equipment.

The test plan should include information regarding the proper time to perform destructive testing so that test results can be properly monitored.

The acceptance test is not expected to include a test of the EBT system's contingency plan.

Chapter 8 TRANSACTION PROCESSING TESTING

Transaction processing testing involves the application of specific test procedures to determine whether the EBT system correctly processes a particular transaction and provides the appropriate approval or denial response.

This chapter presents the three transaction processing systems through which clients and merchants access client accounts along with examples of general test procedures. Also included

is a description of system-generated transactions, which are considered a form of transaction processing.

On-line Transaction Processing (8.2)

On-line transaction processing provides a means of accessing client accounts for cash (non-Food Stamp Program) or payment of purchases. It allows clients to purchase goods, return goods, or receive cash. Usually, the transaction sets (or types) supported by on-line processing include:

- **balance inquiry;**
- **purchase;**
- **cash withdrawal;**
- **cashback;**
- **refunds; and**
- **voids.**

Test procedures should be designed to generate each type of approval and denial code through the POS and ATMs for each transaction set and combination of transaction sets.

Examples of procedures for testing for "approvals" include performing:

- **each transaction set with a successful result; and**
- **transactions involving multiple benefit periods and credits to ensure that the processing occurs as designed. These transactions should be designed to ensure that:**
 - **multiple benefit credits are dispensed on a consistent basis (e.g., first-in, first-out basis); and**
 - **refunds are restored to the proper benefit period.**

Examples of procedures for testing for "denials" include performing transactions:

- **from merchants not authorized to participate;**

- with invalid PIN numbers and where the number of invalid PIN attempts limit has been exceeded;
- with expired cards;
- against accounts with no benefits or insufficient benefits;
- for client accounts which have been "stated" (e.g., hold);
- prior to benefits becoming available;
- to withdraw cash from a food stamp only account; and
- attempting to process a food stamp return with a zero balance.

Backup Transaction Processing (8.3)

Backup transaction processing is an alternative provided to authorize EBT purchases when electronic on-line processing is not available. Factors preventing electronic processing include:

- damage to the EBT card;
- terminal malfunction;
- loss of telecommunications network; and
- failure of the host computer.

Backup transaction processing also can be used for merchants who do not have immediate access to POS devices (e.g., food delivery service).

The on-line transaction set is usually the basis for backup transactions. The Acceptance Test Plan should include a description of the specific transaction set available for a backup transaction.

The system design document should include a complete description of how backup transaction processing functions within the EBT system. There may be several methods available to conduct a backup transaction.

The preparer of the Acceptance Test Plan should develop procedures to test each method to achieve backup processing and conditions described in the system design document. All procedures developed for testing on-line transaction processing should be used to test backup transaction processing. Examples of these procedures were presented in Section 8.2. If more than one method to conduct backup processing exists in the system the procedures would need to be performed for each method.

ARU processing (8.4)

Audio Response Units (ARUs), also called voice response units (VRUs), have traditionally been used within EBT systems to provide balance inquiry and history information to program recipients and participating merchants. However, one pilot site currently uses ARU technology to authorize backup transactions. As this technology continues to advance, other functionality may be added.

The Acceptance Test Plan should include a description of how the ARU is being utilized within the EBT system. Procedures should be included which test this functionality. Similar to the testing of all possible response messages on a POS device, test scripts should include procedures that will generate all possible voice messages available through the ARU for approvals, denials and when input errors occur. The Acceptance Test Plan should include all the possible responses. Examples of procedures for testing ARU processing include:

- transactions designed to result with appropriate responses;
- exceeding timeout limitations before entering first digit of card number;
- exceeding timeout limitations between entering each digit;
- attempting entry with invalid card number;
- attempting invalid entries followed by a valid transaction;
- attempting transactions with a valid card number but without a food stamp account;
- attempting transactions with a bad card status; and
- attempting a transaction and hanging up in the middle of the transaction.

System-Generated Transactions (8.5)

The type and extent of system-generated transactions will vary from system to system. The system design should include a description of the system's capabilities in this area. One of the more common system-generated transactions involve system-generated reversals. These reversals typically arise as a response to system processing disruptions. For each transaction set, recovery from disruptions at each processing component is to be described.

As examples of test procedures, the test scripts could include:

- timing out terminals (e.g., not entering information within thresholds established); and
- disconnecting input devices before receiving a response.

Chapter 9 SETTLEMENT PROCESSING TESTING

Settlement is the process by which funds are exchanged between the government and the retailer, or in the case of cash benefits, the bank that "owns" the ATM. Tests of various aspects of settlement processing are incorporated in functional requirements testing and maintenance testing as described in prior chapters. This section of the Acceptance Test Plan should address tests to ensure that the settlement process correctly accommodates merchant holdovers and crediting of backup transactions.

Holdover Processing (9.2)

Holdovers occur when the merchant's settlement time is different from the processor settlement time. Holdovers are those transactions that occur between these different settlement times. If the merchant cutover time and the processor cutover time are the same, then there should be no holdovers.

This section of the Acceptance Test Plan should address the tests that will be performed to ensure that holdovers are correctly accounted for and that subsequent merchant credits are properly calculated. This section of the Acceptance Test Plan should also include any tests to prove the adequacy of weekend holdover processing.

Test procedures should include review of all applicable reports and comparison to ACH output files.

Backup Transaction Processing Credits (9.3)

As described in Section 8.3, backup transactions occur when the system is not available or when merchants do not have immediate access to POS devices (e.g., food delivery service), and the merchant receives telephone authorization. Depending upon the design of the system, the processor may provide credit for backup transactions on the day of the transaction based upon the telephone or ARU authorization or they may hold credit until the merchant submits the paper voucher. The Acceptance Test Plan should include procedures which test:

- the holding of the credit;
- the proper release of the credit;
- the amounts released; and
- the timing of the credit.

Test procedures should also include review of all applicable reports and comparison to ACH output files.

Chapter 10 CONCURRENT PROCESSING TESTING

Concurrent processing testing serves to structure testing activities to observe the results when apparently unrelated functions are exercised simultaneously. Procedures should be developed which test the processing hierarchy described in the system design document when simultaneous transactions occur between:

- two workstations;
- two POS devices; and
- a POS device and a workstation.

Chapter 11 STRESS AND THROUGHPUT TESTING

The main objectives of stress and throughput testing are to ensure that the EBT system processes transactions:

- at a rate that meets response time criteria; and
- processes them correctly.

The test plan needs to include a test methodology which addresses stress testing on the following levels:

- the input device level;
- the in-store equipment configuration level;
- the host computer, at the internal processing capacity, interface, and batch processing levels; and
- the network level.

The methodology should also address each of the following considerations:

Timing (11.2)

This section of the Acceptance Test Plan should address when the various phases of stress testing will occur. This should be included in the overall acceptance testing time line that is provided as a part of the management plan. Typically, it is best performed subsequent to the testing of the functional requirements; after the system has demonstrated the capability to properly process transactions. Adequate time should be provided to allow for retesting should problems be encountered.

Hardware (11.3)

This section of the Acceptance Test Plan should describe the hardware components that will be used in each phase of stress testing. The considerations in this area center around the terminal devices and the host computer system. All configurations of terminals that will be used in the production environment must be included in the test. This includes POS devices,

administrative terminals, ARUs, and ATMs. A procedure to stress each device should be included. The test environment should not only include every type of terminal device, but the terminals should also be set up in every type of configuration that will exist in the stores, e.g., single lane configurations and multi-lane, in-store controller configurations, in the production environment.

Network (11.4)

This section of the Acceptance Test Plan should describe the communications network components that will be included in each phase of the stress test. Included would be information about each different network configuration (e.g., the number of nodes, the type and number of lines, location of concentrators and multiplexors) as well as the method of generating transactions over each network to stress test them. Each different network configuration should be tested independently. All backup networks should also be included in the stress test.

Software (11.5)

This section of the Acceptance Test Plan should provide a description of the software that will be tested during the stress test. This should include all host applications software, POS software, PC based software used in administrative terminals (e.g., Windows) and communications software.

In addition to the software that will be tested, the Acceptance Test Plan should address the use of either proprietary or third-party software packages that will be used as tools to assist in the stress testing. This type of software would be used to stress the host environment.

The preparer should provide a description of all the software that will be subjected to stress testing. A description of the proprietary or third-party software that is being used should also be included in the Acceptance Test Plan in order to give the reviewer and testers an understanding of its use and its part in the stress test.

In addition, the preparer should describe the methods that will be employed to ensure that the software being subjected to stress testing was the same software that underwent functional requirements testing.

Initial values (11.6)

This section of the Acceptance Test Plan should provide a description of the values to be established on the system. The Acceptance Test Plan should include a procedure that requires that, prior to conducting the tests, a report should be generated that displays these values for comparison to the Acceptance Test Plan document.

People (11.7)

The management plan should identify the participants to each phase of the stress test. It is not required that the same individuals be present for each phase. The important aspect is that the resource is identified and can be present at the proper location at the proper time.

Chapter 12 PRODUCTION (LIVE) DEMONSTRATION

The acceptance test plan needs to describe the structure of the production demonstration and should include information on at least the following:

- the timing of the demonstration;
- the merchants to be included;
- the clients to be included;
- initial value requirements;
- card issuance;
- training;
- staging;
- transaction sets;
- participants to the test;
- interface with Minneapolis Computer Support Center (MCSC);
- pre-note and ACH; and
- reports review.

Chapter 14 "WHAT-IF" TESTING

The acceptance test plan should provide a component to permit the opportunity for observers and participants to the acceptance test to test possible scenarios in a free form manner. Since "what-if" testing does not require any pre-developed scripting of test procedures, the test plan only needs to address planning issues. These planning issues include:

- the timing as to when testing will occur (14.2);
- documentation required of the tests conducted (14.3); and
- initial values required to conduct the tests (14.4).

Chapter 15 NETWORK CERTIFICATION

FNS test policy on third-party certification is still evolving, but at this time there need to be some assurances that both the interface and stand alone components of third-party systems are capable of meeting functional requirements and performance standards prescribed for the food stamp program. Specifically, the certification of each third-party network and processor should address each of the following three components:

Terminal Device (15.2)

The test plan should address how the processor will certify the capabilities of terminal devices deployed on the network to meet the functional requirements delineated by the federal regulations. Test procedures should be similar to those for terminal devices deployed by the EBT system processor.

Transaction Processing (15.3)

The test plan should provide information regarding what tests will be performed to ensure that the third party can accept and process all types of EBT transactions within the specified performance requirements. These tests should be similar to the transaction set tests performed on the complete EBT system as described in Chapter 8 and elsewhere in the Guidelines document. Included would be:

- test procedures to generate each type of approval and denial code through each type of access device, e.g., POS and ATMs, for each transaction set and combination of transaction sets;
- tests which address response time and capacity management;
- tests procedures which will ensure the backup capability of the third party; and
- "what-if" testing.

Settlement Processing (15.4)

The test plan needs to provide for similar tests to those described in Chapter 9 which will ensure that all transactions are properly credited based upon the merchant and EBT host cutover times. Two additional areas that need to be the focal point of testing then transactions are processed through a third party are:

- cutover times which differ from the EBT hosts' cutover time; and
- proper crediting to the merchant within the terms of the merchant agreements.

The test plan will also need to address how the testing of these three components will be conducted when the third party is in the production mode of operations.

Chapter 16 ACCEPTANCE TEST REPORT

The State agency must submit a separate report after the completion of the acceptance test which documents the results of the test. The purposes served by the report include:

- the providing of a formal record of the results of testing;
- the results form the basis for the recommendation regarding implementation of the EBT system; and
- it communicates the results to interested parties.

The form and content of the report may vary depending on the level of detail provided and deemed necessary under the specific circumstances of the acceptance test.