Assessing Reliability Of Computer Output

Audit Guide

18923.

FOREWORD

GAO's economy and efficiency, and program results audits often involve computer-based systems that produce data used in analyzing a wide range of activities. Generally accepted government auditing standards require a review of both general and application controls in these data processing systems that support the activity being audited.

Even though situations may occur where compliance with these auditing standards is not feasible, GAO audit policy places responsibility on the auditor for performing sufficient evaluation work to provide reasonable assurance that computer-processed information is relevant, accurate, and complete. This validation responsibility applies whether the information is provided to us by the activity being audited or whether it is independently retrieved by GAO.

To help generalist auditors comply with this policy requirement, we developed a reliability assessment guide. It includes detailed procedures to help auditors assess the reliability of computer-processed information, or stated another way, it helps determine the degree of risk in using information that may be inaccurate. Terminology is generally nontechnical; however, this guide does require a base-level knowledge of automatic data processing.

Use of this guide will help provide minimum required audit coverage in situations where compliance with generally accepted government auditing standards is not feasible. GAO has developed other guides for more detailed reviews of computer-based systems. They include

--Audit Guide For Reliability Assessment of Controls In Computerized Systems (Financial Statement Audits), May 1978, and

--Evaluating Internal Controls In Computer-Based Systems, June 1981.

Suggestions for revising this guide are welcome and should be addressed to the Director and Chief Accountant, Accounting and Financial Management Division, U.S. General Accounting Office, 441 G Street, N.W., Washington, D.C. 20548.

Acting Comptroller General
of the United States

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INTRODUCTION

When computer-based systems are involved in GAO's economy and efficiency audits and program results audits, generally accepted government auditing standards published in a booklet on "Standards For Audit of Governmental Organizations, Programs, Activities, and Functions," 1981 revision, require the auditor to review both the general and application controls in data processing systems that support the activity being audited. There may be situations, however, where it is not feasible to comply with these standards. For example, the auditor may conclude that the audit can be performed more efficiently by some other means, or the auditor may be called upon to provide services other than audit, such as simply gathering information about an activity. Standards should be followed to the extent possible; however, in situations where it is not feasible, GAO audit policy places responsibility on the auditor for performing sufficient evaluation work to provide reasonable assurance that computer-processed information is relevant, accurate, and complete.

This audit guide presents an approach for complying with these GAO policy requirements. Detailed procedures included in the guide should help auditors assess the reliability of computer-processed information, or stated another way, help determine the degree of risk in using information that may be inaccurate.

GAO AUDIT POLICY

In discussing automatic data processing (ADP), GAO's audit policy places responsibility for determining the extent of reliability assessment squarely on the auditor:

--When ADP is an important integral part of agency operations which we are auditing, our work should include an appropriate examination of the functioning of the ADP system.

--Further, if computer products or output are to be used in a report or in support of a finding, we should make an appropriate examination to provide reasonable assurance that the information is reliable consistent with its intended use.

--In determining the extent of examination, the auditor should consider the importance of the computer-processed information in relation to the point being developed, and the degree of risk in using information that may contain inaccuracies.

--On each assignment, the auditor must determine whether there would be a serious adverse effect on the accomplishment of our audit and reporting objectives if the information being used were incomplete or inaccurate in any material respect. The auditor is responsible for performing sufficient evaluation work to provide reasonable assurance that information, whether processed by computer or otherwise, is relevant, accurate, and complete.

On all audits, auditing objectives remain the same whether ADP is employed or not. Auditing procedures required to accomplish these objectives, however, may be changed by the method of data processing used and may require the auditor to employ specialized ADP expertise.

RISK OF USING COMPUTER PRODUCTS

Products of any information system, whether computerized or not, can be inaccurate or incomplete. There has been a tendency for some auditors to accept computer products as reliable simply because they are deceptively neat, which suggests

accuracy, and also because there is a perception that computers never make mistakes. Auditors should not accept computer products at face value for a number of reasons. First, alterations made to data in computer files are not readily apparent when reviewing a computer product. Second, computer product reliability is affected by data processing controls which are seldom consistently used in agency systems. Third, these products are produced by a technology in which continuous changes in equipment and techniques hinder long-term credibility of a system.

The reliability of computer-based products must, therefore, be evaluated to determine the risks in using such products. It should be remembered that reliability assessment helps determine only the potential for error; the actual dollar value or number of errors must still be determined through regular audit tests.

AUDIT APPROACH

The objective of a reliability assessment is to determine the degree of risk in using computer-processed data. Auditors must decide whether to test computer data for reliability whenever they find the data will be used in a GAO report. This approach does not mean that a reliability assessment should be performed on every audit involving computer output. Instead, a reliability assessment needs to be performed only when the accuracy or reliability of computer output is important in accomplishing assignment objectives.

Reliability tests

The auditor is encouraged to use data verification procedures similar to those used in audits that do not involve computers, and

to inquire into the functioning of computer controls only in sufficient depth to judge the reliability of the data processed.

This guide presents various tests for data reliability that should satisfy the auditor's data validation requirements without extensive, time-consuming work. Each succeeding section describes detailed work that is to be done only if necessary, depending on how the computer data will be used in the report. It usually will be necessary to

--identify computer data that will be used,

--determine the importance of the data to the audit,

--determine the source of the data and understand
   its flow through the system, and

--conduct brief tests for data reliability.

Decision to do additional work

After completing each section in this guide, the auditor must decide whether additional work is necessary. This decision will be based on

--the importance of computer-processed data to the audit,

--the potential for obtaining more reliable data from
   other sources,

--the practicality of performing additional work, in
   light of overall job objectives, and

--the need for information about systems controls to
   support a recommendation for conducting a separate
   computer system review.

Working Papers

GAO policy for documenting reliability assessments is as follows:

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Work performed and the auditor's conclusions
about the functioning of the ADP system and the
reliability of computer processed data included
in a GAO report or used in support of findings,
conclusions, and recommendations should be
recorded in the working papers. When work is
performed by use of computerized techniques in-
cluding data processing and statisitical programs,
the step-by-step process should be sufficiently
documented to permit the process to be repeated.

The working papers should be prepared, indexed, and reviewed the
same way as other audit working papers. They should also be a
complete, self-contained file. Further, they should include

--specific computer-processed data used in a GAO report,

--descriptions of document flow used in processing,

--data that was tested,

--kinds of tests conducted,

--amount of testing,

--results of tests, and

--dates of tests.

Summary memorandum

When reliability assessment work is completed, the auditor
should prepare a memorandum summarizing work done and conclusions.
If data is not reliable or doubt still exists, limitations on its
use must be included in the scope section of any report along
with a clear explanation of the reasons for the limitations.
Section VI includes an outline of a summary memorandum.

An overview of the reliability assessment approach is in-
cluded as exhibit 1.

RELIABILITY ASSESSMENT APPROACH   EXHIBIT I
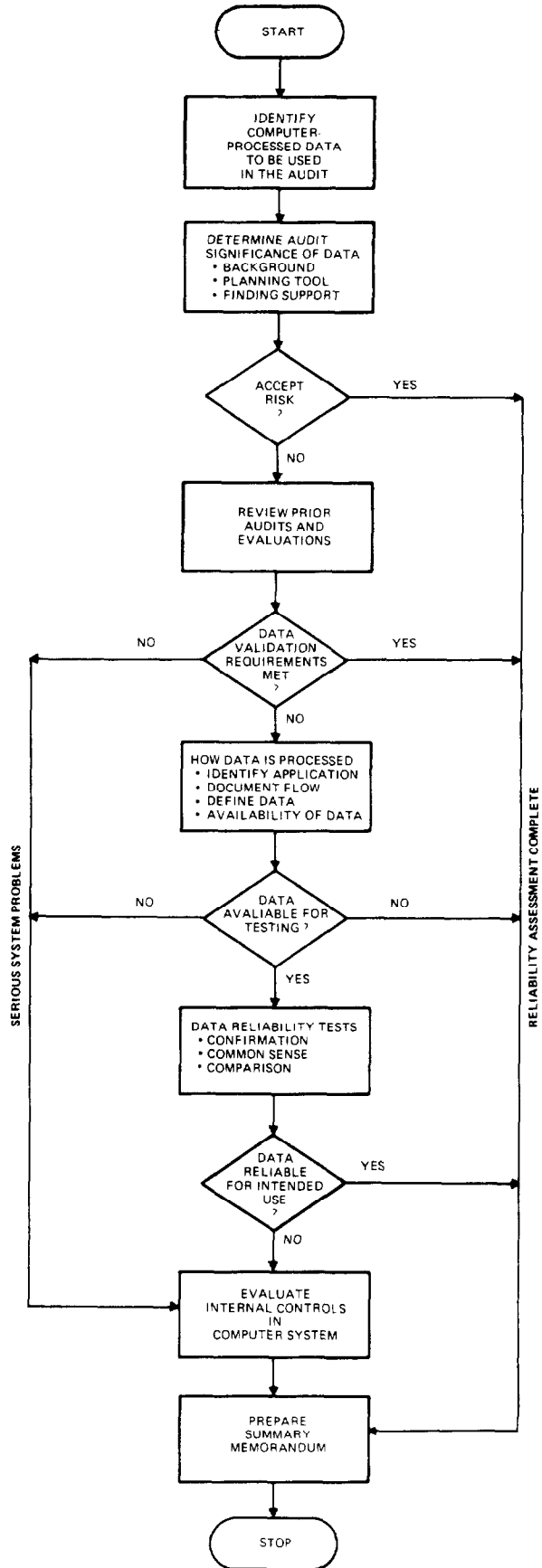
SECTION I
IMPORTANCE OF
COMPUTER-PROCESSED DATA

```
                              ( START )

                         ┌──────────────────┐
                         │   IDENTIFY        │
                         │   COMPUTER-       │
                         │   PROCESSED DATA  │
                         │   TO BE USED      │
                         │   IN THE AUDIT    │
                         └──────────────────┘

                         ┌──────────────────┐
                         │ DETERMINE AUDIT   │
                         │ SIGNIFICANCE OF DATA│
                         │ • BACKGROUND      │
                         │ • PLANNING TOOL   │
                         │ • FINDING SUPPORT │
                         └──────────────────┘
```

SECTION II
PRIOR AUDITS AND
EVALUATIONS

```
                            ◇ ACCEPT        YES ──────────────►
                              RISK
                              ?
                              │ NO

                         ┌──────────────────┐
                         │   REVIEW PRIOR    │
                         │   AUDITS AND      │
                         │   EVALUATIONS     │
                         └──────────────────┘
```

SECTION III
UNDERSTANDING HOW
COMPUTER DATA IS PROCESSED

```
          NO ◄────────────── ◇ DATA            YES ──────────►
                               VALIDATION
                               REQUIREMENTS
                               MET
                               ?
                               │ NO

                         ┌──────────────────┐
                         │ HOW DATA IS PROCESSED│
                         │ • IDENTIFY APPLICATION│
                         │ • DOCUMENT FLOW   │
                         │ • DEFINE DATA     │
                         │ • AVAILABILITY OF DATA│
                         └──────────────────┘
```

SECTION IV
TESTING DATA
FOR RELIABILITY

```
          NO ◄────────────── ◇ DATA            NO ──────────►
                               AVALIABLE FOR
                               TESTING ?
                               │ YES

                         ┌──────────────────┐
                         │ DATA RELIABILITY TESTS│
                         │ • CONFIRMATION    │
                         │ • COMMON SENSE    │
                         │ • COMPARISON      │
                         └──────────────────┘
```

SECTION V
EVALUATING INTERNAL
CONTROLS IN
COMPUTER-BASED SYSTEMS

```
                            ◇ DATA           YES ──────────►
                              RELIABLE
                              FOR INTENDED
                              USE
                              ?
                              │ NO

                         ┌──────────────────┐
                         │   EVALUATE        │
                         │ INTERNAL CONTROLS │
                         │      IN           │
                         │ COMPUTER SYSTEM   │
                         └──────────────────┘
```

SECTION VI
SUMMARY MEMORANDUM
ON RESULTS OF
RELIABILITY ASSESSMENT

```
                         ┌──────────────────┐
                         │    PREPARE        │
                         │    SUMMARY        │
                         │   MEMORANDUM      │
                         └──────────────────┘

                              ( STOP )
```

SERIOUS SYSTEM PROBLEMS

RELIABILITY ASSESSMENT COMPLETE

SECTION I

IMPORTANCE OF COMPUTER-PROCESSED DATA

The first steps in reliability assessment involve (1) iden-
tifying computer data that will be used during the audit, (2)
determining the data's importance in relation to its intended
use, and (3) deciding whether to continue reliability assessment.
Computer-processed data, for example, may be extremely important
in terms of audit significance and less error tolerant because
it will be used to support a finding in a GAO report, or it may
not be so important and therefore more error tolerant because
it will be used simply as background information.

USING COMPUTER-PROCESSED DATA
IN AUDIT REPORTS

Computer-processed data, as defined in this guide, falls
into the following broad categories:

--Output from automated accounting, benefit payment,
inventory, payroll, and management information
systems. This category includes routine or
special agency reports, computerized data files,
letters, forms, and checks.

--Reports manually prepared from computer-generated
information.

--Special reports or information obtained by the
agency or GAO using agency computerized data files
and software packages, i.e., data retrieval.

Use of data and its importance to the final audit report
will dictate how detailed a reliability assessment is needed.
Generally, computer-processed data is used by GAO auditors as

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background information, as a tool for audit planning, or as support for findings. The auditor must keep in mind how the audit report will be affected if computer data is incomplete or inaccurate.

Background information

Data used only for background or informational purposes may not be critical to the report. For example, a report may cite the number of recipients in a benefit payment program. In such a case, an exact figure is not needed, since inaccurate data would not lead to an erroneous finding or conclusion.

However, the audit staff should be alert for background data that indirectly supports a finding. For example, a report introduction may specify the total dollar expenditures for a medical program, while the report body shows total incorrect reimbursements. To place the misspent amount in proper perspective, it must be compared with the total spent. Thus inaccurate background data could significantly alter the impact of a finding.

Audit tool for planning

Computer data is often used in planning the direction of an audit or in setting its scope. Because the auditor may base critical decisions on such data, errors could lead to inefficient use of audit resources. For example, an analysis of computer data may show potential problems in agency management of medical payments. To preclude a review that turns out to be unnecessary, the auditor should assess the computer data's reliability before additional resources are committed to the review. Decisions based on inaccurate or incomplete data could prove very costly.

As another example, an agency may provide a computer listing of medical payments for a specified period. To evaluate management of the payment system, the auditor may select cases from the listing for detailed review. If the listing omits critical cases, the review may be biased. (Note: This category does not include random samples taken to project results for a universe. Computer data used for statistical sampling is considered support for a finding, as discussed below.)

Support for findings

Analyses of computer data or figures taken directly from agency computer reports or files often support GAO audit findings. Such data is extremely sensitive; inaccuracies or unreliability would significantly weaken the final audit product. For example, a GAO report may cite data from an agency's computer system to show the status of a worker protection program. Inaccurate or incomplete data could portray a distorted picture of program results.

In other instances, statistical estimates based on a sample of agency computer records may be used to support a finding. Usually such estimates support criticisms of agency management. For example, an analysis of welfare payments to ineligible recipients might demonstrate procedural problems. Unreliable data could cause the auditor to reach invalid conclusions.

Analysis of cost-benefit data used to justify a new program is another example. Often, such data will employ a computer model to project program effects. Therefore, the reliability of such data becomes important to the auditor's evaluation.

On some audits, GAO staff may retrieve data from agency computer files. In these cases, the auditor is still responsible for assessing the reliability of the agency's data base from which the data was extracted.

AUDIT PROCEDURES

1. Identify and describe the specific computer-processed data to be used during the audit.

2. Identify computer systems (accounting, payroll, management information, etc.) which process the data.

3. Determine how data will be used in the final audit report.

4. Determine what impact data accuracy and reliability have on its use in a planned GAO report.

ACCEPT RISK OR CONTINUE RELIABILITY ASSESSMENT

Having determined the audit significance of computer data, the auditor must decide whether reliability assessment will be continued. Reasons for decisions made should be explained and documented. The auditor has the following options:

--If data is not significant and there is little or no

risk in relying on it, prepare the summary memorandum

outlined in Section VI and stop.

--If data is signficant, go to the next section.

SECTION II

PRIOR AUDITS AND EVALUATIONS

The results of previous audits and evaluations of computer-
processed data may satisfy the auditor's data validation require-
ments included in GAO audit policy and preclude the need for
further reliability assessment work. Accordingly, previous work
should be reviewed by the auditor.

REVIEWING PRIOR AUDITS AND EVALUATIONS

The auditor should first determine if prior audits and evalu-
ations are sufficiently current to satisfy data validation re-
quirements. If sufficiently current, the auditor must carefully
consider limitations of these studies. For example, previous
studies may not have included an evaluation of the same computer-
processed data that is currently in question, or the same
computer-processed data may have been evaluated, found to be
risky, and a qualified GAO report issued. GAO approvals of
accounting systems do not guarantee data reliability because GAO
bases these approvals on evaluations of planned system design
and documentation, not on actual operations and data. Further,
system evaluations by consulting firms must be carefully reviewed
for content and objectivity because these firms are employed by
the agency under audit. This review may require the assistance
of an ADP auditor or computer specialist if the consultant's study
is highly technical.

AUDIT PROCEDURES

1. Identify and obtain copies of pertinent reliability
   assessments, summary memoranda, and reports, or

system evaluations that have previously been
prepared by GAO, internal auditors, external
auditors, or consulting firms.

2. Review these reports and evaluations to verify
   that they are pertinent to the computer-processed
   data in question.

3. Determine if previous audits and evaluations satisfy
   current data validation requirements.

ACCEPT RISK OR CONTINUE RELIABILITY ASSESSMENT

Having determined whether previous audits and evaluations
satisfy data reliability requirements, the auditor must decide
if reliability assessment will be continued. Reasons for
decisions made should be explained and documented. The auditor
has the following options:

--If previous reliability assessments satisfy GAO's
  data reliability requirements, prepare the summary
  memorandum outlined in Section VI and stop.

--If previous reliability assessments do not satisfy
  data validation requirements or were not conducted
  at all, and it is impossible or impractical to assess
  reliability (whether due to staffing or time constraints,
  overall job objectives, or audit conditions), the auditor
  should

    --prepare the summary memorandum outlined
      in Section VI including reasons for not
      testing data reliability, and

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--report the limitations on use of the data in

the scope section of any report along with a

clear explanation of the reasons for the

limitations.

--If a decision is made to continue reliability

assessment, go to the next section.

--If the auditor has gathered specific knowledge about

major computer systems problems, include in the

summary memorandum outlined in Section VI appro-

priate recommendations for a separate review of the

computer system.

SECTION III

UNDERSTANDING HOW COMPUTER DATA IS PROCESSED

To continue with reliability assessment, the auditor should obtain an understanding of how the computer system generates the data--from preparation of source documents through final distribution and use of output. While learning how the system works, the auditor should identify potential areas for testing, using familiar audit techniques such as

- --reviewing agency documentation including system documentation files, input preparation instructions, and users' manuals;

- --interviewing agency personnel including users, systems analysts, and programmers; and

- --inspecting, comparing, and analyzing agency records.

PREPARING DOCUMENT FLOW

To understand document flow, certain background information must be obtained through discussions with agency officials, from previous audits or evaluations, or from system documentation files. Because this information may not be current or complete, it should be verified with the responsible programmer or analyst. The auditor will need to obtain

- --name (title) of the computer product,

- --purpose of the product,

- --system name and identification number,

- --date the system was implemented,

- --type of computer used (manufacturer's model) and location,

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--frequency of processing and type of processing

    (batch, online), and

--person(s) responsible for the computer application

    and data base which generates the computer product.

An agency user or other person in the computer center may already have a document flow diagram showing the origin of data and how it flows to and from the computer. (<u>This diagram should not be confused with either a system flow chart which shows detailed computer processing of data, or a program flow chart which describes a computer program.</u>) More often than not, the auditor will have to develop document flow in a familiar format, whether it is a narrative description, a block diagram using simple symbols, a flow chart using standard symbols, or some combination. The document flow diagram or narrative de-scription should show

--each source document by title and ID number (copies

    should be attached),

--the point of origin for all source documents,

--each operating unit or office through which data

    passes,

--the destination of each copy of the source document

    and action taken (i.e., document filed, audited,

    keypunched),

--actions taken by each unit or office through which

    the data passes (i.e., items recorded in a ledger,

    unit prices added and extensions computed, control

    numbers recorded and checked),

--controls over the transfer of source documents between

units or offices to assure none are lost, added, or

changed (i.e., record counts, control totals, arithmetic

totals of important data, etc.), and

--recipients of computer outputs.

Document flow <u>should not describe the actual computer</u>

<u>processing inside the "black box"</u>; this is beyond the scope

of reliability assessment. If computer output is the product

of more than one input, this condition should be clearly noted

in the document flow description.

Document flow in a typical payroll system is shown in

Appendix I which is a block diagram with rectangular symbols;

Appendix II shows the same document flow in narrative form.

DEFINE DATA TO BE EVALUATED

The auditor must clearly understand what is being recorded

by the agency information system; therefore, the individual

elements of data must be defined. Titles can be deceptive.

For example, is a cost amount the current period or cumulative

cost? Is the cost accrued or incurred? What are the components

of the cost amount? Has the composition of cost changed during

the fiscal periods covered by our reviews?

The agency's data element dictionary is a good source for

these definitions; however, if one is not available, a record

layout may contain the needed definitions. Appendix III includes

a simple record layout.

In many instances there is no one-to-one relationship between

data elements and the data in a computer-processed report or file.

Some common differences are shown in Appendix IV.

AVAILABILITY OF DATA FOR TESTING

To test reliability, the auditor must have access to input source documents and the system which produced the computer-processed data or other corroborative information. Many ADP systems, however, are not centrally located. For example,

--input source documents may be located in another region or headquarters,

--source documents may be processed at centers scattered throughout the country, and

--data may be input into a regional online system via computer terminals connected to a headquarters computer which produces the report.

In dealing with these logistics problems, the auditor has several alternatives: (1) perform tests at other regions or headquarters, (2) request GAO regional or headquarters assistance, (3) test a sample of records at various processing centers, (4) request that data be transmitted to the audit staff for testing, if feasible, (5) develop some other method to test reliability, (6) use the computer information with a qualifier that logistics problems prevented testing data reliability, or (7) substitute other known reliable data in place of computer data. The approach selected will depend on the ease and timeliness with which the auditor can perform adequate tests for reliability, consistent with the data's intended use.

The auditor may also encounter situations where an agency obtains data processing from a private service center or other source. After GAO's authority to review such data is determined

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(we generally have access if the program being audited is fed-
erally funded), the auditor should (1) determine what the
service center or outside source does to assure itself of
reliable data, (2) verify those assurances by following,
to the extent possible, the work steps in this guide, and
(3) decide whether the assurances are adequate to support
the data's reliability for GAO's use.

AUDIT PROCEDURES

1. Identify and obtain background information on the
   specific computer application that generates the data
   being reviewed.

2. Prepare a document flow diagram or narrative descrip-
   tion of computer processing.

3. Verify document flow accuracy and completeness by
   "walking" typical transactions through the system
   and observing actions actually performed on the
   documents. Any discrepancies identified between the
   previously prepared document flow and actual operations
   should be resolved with agency personnel.

4. Define data elements in data files used to generate
   the computer product being reviewed.

5. Determine if the computer product is generated by
   computing data (additions, multiplications, etc.),
   summarizing data (totals, averages, etc.), or by
   some other form of data manipulation.

6. Determine if sufficient information or other cor-
   roborative data is available for testing.

ACCEPT RISK OR CONTINUE RELIABILITY ASSESSMENT

Having determined the availability of sufficient information
to permit testing or that other corroborative data is available,
the auditor must decide whether reliability assessment will be
continued. Reasons for decisions made should be explained and
documented. The auditor has the following options:

--If sufficient information is not available to permit

testing, if other corroborative data is unavailable,

or if it is impossible or impractical to assess re-

liability (whether due to staffing or time constraints,

overall job objectives or audit conditions), the

auditor should

--prepare the summary memorandum outlined

in Section VI including reasons for not

testing data reliability, and

--report the limitations on use of the data

in the scope section of any report along

with a clear explanation of the reasons

for the limitations.

--If a decision is made to continue reliability

assessment, go to the next section.

--If the auditor has gathered specific knowledge about

major computer systems problems, include in the summary

memorandum outlined in Section VI appropriate

recommendations for a separate review of the

computer system.

SECTION IV

TESTING DATA FOR RELIABILITY

The procedures described in this section provide the auditor with a systematic approach for testing the data's reliability. Although the suggested procedures are presented in logical sequence, there is no requirement that all work steps be completed. The auditor should do only what is necessary to satisfy data validation requirements.

Some suggested tests for data reliability are listed below. The auditor may use any or all of these tests or develop some other means to test the computer data. The key is to perform enough tests to support an opinion on the data's reliability.

CONFIRMATION TESTS

On economy and efficiency, and program results reviews, the internal controls evaluation will usually follow confirmation tests. (Controls are evaluated in a separate review of the agency's computer system.) Since the auditor must select elements of data to be confirmed without knowing internal control strengths and weaknesses, emphasis should be placed on selecting data which, if found to be incomplete or inaccurate, would distort audit conclusions. Confirmation sources include the following.

Regular users of computer data

The auditor should begin confirmation tests with principal users because they use the information often and are directly affected by inaccuracies in the information. Exhibit 2, on page 30, should help identify names and locations of principal users.

Typically, users of computer products have varying knowledge about the product's quality. To obtain confidence in confirmation responses, the auditor should interview enough users, using Exhibit 3, User Satisfaction Questionnaire, on page 31, to develop a general idea about the computer output's usefulness.

When there are a large number of principal users or several users at different locations, it may be impractical to interview each one personally. In these cases the auditor may (1) select a sample of users based on number, location, or some other suitable criteria, (2) interview users by telephone, or (3) distribute the questionnaire for users to complete. If users complete questionnaires, the auditor must maintain control over the questionnaires and conduct some followup to assure accurate responses.

When conducting interviews, it is especially important to obtain evidence of incomplete or inaccurate data mentioned by users. The auditor should

--identify the nature of the problem. Look for overstated or understated amounts, incorrect totals, incomplete data fields and negative balances which should be positive.

--determine the frequency of errors. They may be isolated instances or recurring.

--determine if users can explain why errors are occurring. Since data errors affect users, they may have conducted studies to show the magnitude and cause of errors.

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--determine if users keep manual records for use in lieu
of computer reports or other output. Manually maintained
records in a computer environment can mean poor quality
of computer output and unnecessary expenditures for
duplicate recordkeeping. The auditor may also find that
manual records better satisfy the need for reliable
audit evidence.

Internal auditors

A number of internal auditors are reviewing the development
of new systems to determine whether necessary audit trails and
controls have been incorporated to assure the reliability of
processing. This review ordinarily includes testing of computer
products and requires detailed knowledge of system design and
operation. Thus, internal auditors may have the best overall
knowledge of the system and its products.

If internal auditors recently audited the data, this work
can minimize reliability tests. If internal auditors have not
recently audited the data, they can help evaluate computer
products by

--identifying personnel who have the best ability to
confirm the contents of a report--not necessarily
the current user of a report,

--identifying information sources against which the data
can be compared--other files, reports, studies, manual
records, etc., and

--helping with "common sense tests" discussed in detail
in a later section. What may appear incorrect to an

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external reviewer can sometimes be explained by

an internal auditor without extra work.

Third parties

Confirming data with third parties is beneficial because
the third party is often independent of the information system
which generated the data. Some examples include the following:

--Banks - cash balances on hand, numbers or amounts

of loans.

--Warehouses - assets stored, volume of transfers.

--Training institutions - number of students serviced,

dollar volume of contracts.

--Common carriers - rates for freight shipments,

volume of passengers between selected locations.

--Medical facilities - daily rates for patient

care, types of outpatient services available.

--Private business concerns - billings for utility

services, wholesale prices of generic drugs.

--Other Government agencies - checks cancelled by

a U.S. Treasury Department disbursing center,

statistics on another agency's use of GSA

automobiles.

Suppliers of input data

Persons or organizations supplying input to the computer
system were identified earlier in the document flow diagram.
If they are not the same as regular users of the system output,
they may be contacted to confirm the accuracy and completeness
of the data they prepared for system processing.

ADP department personnel

The auditor should contact ADP department personnel to determine the history and number of errors associated with a specific application or product of a system.

Computers are almost always programmed to edit data that is entered for processing. These edits help determine whether the data is acceptable. If the data contains errors or fails to meet established edit criteria, it is rejected. A computer record of rejected transactions should be available from the control group responsible for reviewing output. Errors shown on this record can be related directly to the application being processed.

The auditor should exercise care in reaching conclusions about edit tests because a system with many rejected transactions may produce reliable information. For example, a system with insufficient computer edits may routinely accept erroneous data and print out few rejected transactions, while a system with extensive edits may reject many transactions but actually produce a far more accurate final product.

The point is that the auditor can use these edit reports to identify problems that users are having with the system and the length of time users are taking to correct these errors.

COMMON SENSE TESTS

Through discussions with internal auditors and data users, the auditor should have developed criteria to judge the data's reasonableness. For instance, the following kinds of questions help:

--Are amounts too small? (cost per mile to operate

   a 1-ton truck = $.004; 3 universities in the State

   of New York)

--Are amounts too large? (accrued annual leave balance

   for 1 employee = 3,000 hours; a single student loan

   for $150,000)

--Are data fields complete? (social security payments

   listed for only 46 States; all 9 Federal census

   regions listed but no program enrollment data shown

   for 2 of them; checks listed in numerical order but

   one group of checks within the series not accounted

   for)

--Are calculations correct? (columns of data include

   4-digit items but the column total includes only

   3 digits; unit cost extension for 1,200 items which

   should be for only 120 items)

These common sense tests can be done quickly and can alert
the auditor to data reliability problems.

COMPARISON TESTS

GAO audits are usually "first-time" investigations, which
precludes comparing current period data with previous data
collected by the auditor. Certain comparisons, however, can
be useful. This is especially true if the data being compared
comes from independent sources. Some of the more typical
sources of information against which the auditor may compare
data include the following:

Source documents

Any time information in a computer-processed report, listing, or file can be compared with data on the original source documents, the auditor should consider doing so. However, because of computation, summarization, and other data manipulation which may occur as the data passes through the system, the end product may not be readily compared with the raw data which entered the system. One example is salary check. Source data for a salary check will usually consist of (1) a time and attendance record for hours worked, (2) a W-4 form for tax exemptions, (3) other forms authorizing various payroll deductions, and (4) personnel forms showing employment grade, promotion actions, etc. Obviously, the net amount of a salary check cannot be directly compared to any one of these source documents.

Physical counts and inspections

A physical count can be made to verify information concerning the quantities, types, or conditions of any tangible assets. When this technique is used, the comparison should be made both ways-- from the record to the physical count and from the physical count to the record.

Computed amounts

This test requires an independent calculation of an amount which can then be compared with the amount shown in the computer report or file. Examples include computations of

--benefit payments for selected categorical grant
recipients,

--investment repayment balances on government construction
projects,

--loan balances and delinquent amounts, and

--resale prices of foreclosed and repossessed properties.

Records, files, and reports from other sources

The validity of recorded data may also be checked by comparing it with the same type of information obtained from another independent source. Reports on government programs and activities issued by outside contractors, universities, internal audit groups, privately funded foundations, and others may contain useful information.

If these third party reviewers, however, obtained information from activities they are evaluating, it may be the same information which the auditor has chosen to review for reliability. This precludes its use for data comparison purposes unless the third party organization has itself evaluated the reliability of the information. Experience has shown that this type of reliability testing is seldom done, and the auditor should never assume it has been done.

AUDIT PROCEDURES

1. Confirm computer-processed data with independent sources such as regular users of the data, internal auditors, third parties, suppliers of input data, and ADP department personnel.

2. Review the computer-processed data for reasonableness.

3. Compare the data with independent sources, such as source documents, physical counts and inspections, computed amounts, and other records, files, or reports.

ACCEPT RISK OR CONTINUE RELIABILITY ASSESSMENT

Having completed the above reliability tests, the auditor should be able to decide whether or not the data is sufficiently reliable for its intended use. This decision depends, however, upon the results of tests, extent of tests performed, and the significance of computer-processed data in relation to its intended use. If the auditor determines the problems to be insignificant in light of the data's use in the report, further evaluation may not be necessary. If the problems are significant, an evaluation of the computer system may be necessary. In any event, the auditor's evaluations of the risk in using the data and his willingness to accept the risk determines the course of action.

When computer-processed data is used only as background information or for planning purposes, it is generally less sensitive or more error tolerant than data used for other purposes. However, the auditor must determine whether there would be an adverse impact on the planned product if the data is incomplete or inaccurate. In any case, the auditor must make sure the scope and type of reliability tests were sufficient to reveal any discrepancies. When computer-processed data is used to support a finding or is itself a finding, further evaluation is generally required to complete development of the finding. Decisions made by the auditor should be fully documented and explained. The auditor has several options:

--If tests do not disclose major problems with data
   reliability, complete the summary memorandum outlined
   in Section VI and use the data as planned.

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--If tests cast doubt on the data's reliability, the
auditor could

    --use other reliable data if found during the review,

    --report the limitations on use of the data in the
        scope section of any report along with a clear
        explanation of the reasons for the limitations,
        and/or

    --recommend a separate review of the computer system
        as described in Section V.

In any case, the auditor should complete the summary memo-
randum outlined in Section VI.

EXHIBIT 2   EXHIBIT 2

PRINCIPAL USERS

Computer Product				User		
Name	Number	Type	Purpose	Name	Function	Comments

EXHIBIT 3   EXHIBIT 3

USER SATISFACTION QUESTIONNAIRE

This questionnaire is designed to obtain user evaluation of computer products. It includes questions on product format, sufficiency and accuracy of reported information, necessity for the product, and possibilities for product improvement. Since computer output is generated for users, responses to this questionnaire can be considered strong indicators of whether computer products are accurate and reliable.

Product identification

1.   Title of product.   _____

2.   Data processing identification
     number.   _____

3.   Type of product.   _____

4.   Part of product to be
     evaluated.   _____

     _____

     _____

5.   Frequency of product.   _____

User identification

6.   Name.   _____

7.   Date.   _____

8.   Title.   _____

9.   Organization.   _____

10. Phone number/address.   _____

11. Extent of knowledge about
     product.   _____

     _____

     _____

     _____

     _____

     _____

EXHIBIT 3   EXHIBIT 3

User evaluation of output product

12. For what purpose do you use
     the product?

                                                    <u>YES</u>   <u>NO</u>

     --Initiate transactions.
     --Authorize changes to the system.   ___   ___
     --Operate computer terminal.   ___   ___
     --Maintain data controls.   ___   ___
     --Design/program application.   ___   ___
     --Other. (Explain.) _____

     _____   ___   ___

13. In relation to the work of your office or department, the
     product is

Not important   Very important

   1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10

14. The product's contents are

Very difficult   Very easy
to understand   to understand

   1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10

15. Can the product be used as is without correction, further
     identification or analysis?   ____ YES   ____NO

16. In your judgment, is the product

                                                    <u>YES</u>   <u>NO</u>

     --Accurate and reliable?
     --Available when needed?   ___   ___
     --Current and up-to-date?   ___   ___
     --Useful?   ___   ___
     --Understandable?   ___   ___

For each "no" answer, please explain below and provide examples.

_____

_____

_____

_____

_____

EXHIBIT 3   EXHIBIT 3

17. In your opinion, should the product

	YES	NO
--Provide more data?	___	___
--Provide less data?	___	___
--Be combined with other output products?	___	___
--Be considered obsolete?	___	___
--Be improved to make your job easier?	___	___

For each "yes" answer, please explain below.

_____

_____

_____

_____

18. If you maintain manual records to supplement computer-
     processed information, briefly explain why.

_____

_____

_____

19. Does the product duplicate any other information you
     receive?   ____YES   ____NO

If "yes," briefly explain._____

_____

_____

20. Can you readily obtain, from other sources, the information
     contained in the product?   ____YES   ____NO

If "yes," list the other source(s)._____

_____

_____

21. Do you supply the raw data (input) for this product?
                                           ____YES   ____NO

22. Do you check this product for quality when you receive it?
                                           ____YES   ____NO

EXHIBIT 3   EXHIBIT 3

If "no," please identify the person or group performing this function. _____

_____

23. Is the product ever rerun by the data processing
     department?   ____YES   ____NO

     If "yes,"

     --How frequently?   _____
     --Why were reruns necessary?   _____
     --How do you make sure that
       rerun material is correct?   _____

24. If you have/had problems with this product, with whom would/
     did you discuss them?

     _____

     _____

Is this person authorized to make changes to the product?
                                           ____YES   ____NO

25. Do you maintain correspondence with the data processing
     department or other user departments concerning the
     product?   ____YES   ____NO

     If "yes," attach copies of recent correspondence.

26. Could you effectively perform your duties:
                                             YES   NO

     --Without this product?   ___   ___
     --If this product were produced
       less often?   ___   ___

27. Did you or anyone within your department help design
     the product?   ____YES   ____NO

28. Does it save you any clerical effort?
                                           ____YES   ____NO

Explain. _____

_____

29. Can this product be improved to make your job easier?
                                           ____YES   ____NO

Explain. _____

_____

EXHIBIT 3   EXHIBIT 3

30. How often do you refer to this product?

	YES	NO
--Daily.	___	___
--Weekly.	___	___
--Monthly.	___	___
--Annually.	___	___
--Never.	___	___
--Other. (Explain.) _____		
_____	___	___

31. How long is the product kept after receipt?

	YES	NO
--1 day	___	___
--1 week	___	___
--1 year	___	___
--Other (Explain.) _____		
_____		

Where is the output product filed? _____

_____

SECTION V

EVALUATING INTERNAL CONTROLS IN

COMPUTER-BASED SYSTEMS

The preceding sections provide detailed procedures to help the auditor

--identify computer data that will be used,

--determine importance of the data in relation to

   its intended use,

--understand data flow through the system, and

--conduct tests to determine if the data is reliabile.

If after completing the above tests the auditor is not satisfied with data reliability, limitations on use of the data must be included in the scope section of any report or further evaluation of the computer system must be performed. This review should be performed in accordance with generally accepted government auditing standards. GAO's audit guide on "Evaluating Internal Controls in Computer-Based Systems," may be used. A brief overview of this audit guide follows.

PURPOSE OF THE AUDIT GUIDE "EVALUATING INTERNAL CONTROLS IN COMPUTER-BASED SYSTEMS"

This audit guide was developed to provide a structured approach for auditing internal controls in a computer-based system. This "systems approach" helps evaluate the total system-- from origination of source documents to final distribution of output products. Primary emphasis is placed on assessing a computer application's reliability in processing data in a timely, accurate, and complete manner. This is accomplished by evaluating both manual and automated internal controls and by performing tests to substantiate their existence and effectiveness.

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AUDIT APPROACH

The guide is presented in an order that auditors would normally follow in reviewing a system:

--Collect background information on the agency, the ADP department, and the computer application being evaluated.

--Review agency internal controls: management controls, general controls over the data processing function, and application controls over the computer application.

--Prepare a detailed data flow diagram to help evaluate documentation, internal controls, and processing efficiency.

--Observe both the manual and automated processing pro-cedures to make sure they conform with established procedures.

--Determine the usefulness of computer output reports by interviewing users.

--Conduct additional tests which may include

    --test data analysis,

    --computer program analysis,

    --data retrieval and analysis, or

    --job accounting data analysis.

--Report on control deficiencies and their effect on agency operations and make recommendations for corrective action.

--Suggest additional work based on observations made during this review.

Because of the complexity of this audit work, the "general-ist" auditor would normally not be expected to perform detailed evaluations of computer-based systems. Staff must have proficiency adequate for the tasks required.

SECTION VI

SUMMARY MEMORANDUM ON

RESULTS OF RELIABILITY ASSESSMENT

The purpose of a reliability assessment is to determine the risk in relying on computer data. After completing audit steps in previous sections of this guide, the audit staff should be able to make an informed judgment on the data's reliability. They should prepare a memorandum summarizing results of work done and conclusions reached.

SUMMARY MEMORANDUM OUTLINE

A summary memorandum should include the following:

--Introduction. Identify the specific computer-processed data being used and comment on its sensitivity; i.e., what impact incomplete or inaccurate data would have on the final audit product. If the auditor concludes that a reliability assessment is not required, the reasons should be clearly stated.

--Background. Include a brief statement about the agency program being audited, the computer system used to maintain the data, and the purpose for which the data is being used by agency personnel.

--Work performed. Briefly describe work performed to establish reliability of the data.

--Results. Summarize results of the reliability tests performed.

--Conclusion. Include a statement about the reliability of the data being used in the final audit product. If data is not reliable or doubt still exists, limitations

on its use must be included in the scope section of any report along with a clear explanation of the reasons for the limitations. If the auditor decides not to use the computer data, reasons for this decision should be fully disclosed.

The summary memorandum should be completed, signed, and dated by the site supervisor and audit/project manager.

REPORTING TO THE AGENCY

If tests for data reliability disclose deficiencies in agency operations, the audit staff should inform the agency promptly through the standard exit conference and reporting process. Also, any useful suggestions and comments obtained from the User Satisfaction Questionnaire in exhibit 3 should be presented at this time.
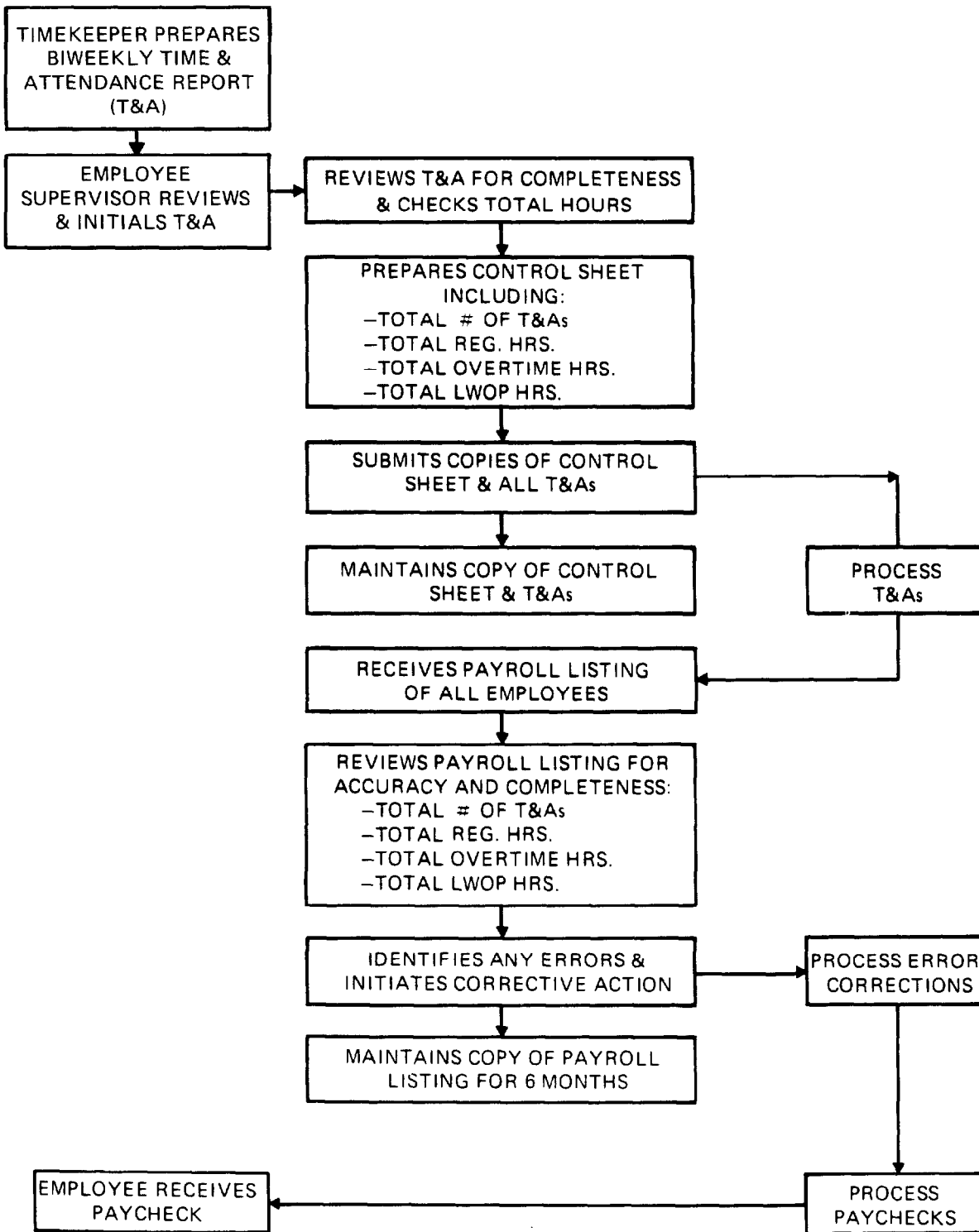
AUDIT PROCEDURES

1. Prepare the summary memorandum as outlined above.
2. Report to the agency any deficiencies found during the reliability assessment.

DOCUMENT FLOW DIAGRAM OF PAYROLL PROCESS

ORIGINATING DEPARTMENT   PAYROLL DEPARTMENT   DATA PROCESSING

```
┌─────────────────────┐
│ TIMEKEEPER PREPARES │
│   BIWEEKLY TIME &   │
│ ATTENDANCE REPORT   │
│       (T&A)         │
└──────────┬──────────┘
           ▼
┌─────────────────────┐    ┌──────────────────────────┐
│     EMPLOYEE        │    │ REVIEWS T&A FOR COMPLETENESS│
│ SUPERVISOR REVIEWS  │───▶│   & CHECKS TOTAL HOURS     │
│  & INITIALS T&A     │    └────────────┬─────────────┘
└─────────────────────┘                 ▼
                         ┌──────────────────────────┐
                         │ PREPARES CONTROL SHEET   │
                         │      INCLUDING:          │
                         │  —TOTAL # OF T&As        │
                         │  —TOTAL REG. HRS.        │
                         │  —TOTAL OVERTIME HRS.    │
                         │  —TOTAL LWOP HRS.        │
                         └────────────┬─────────────┘
                                      ▼
                         ┌──────────────────────────┐
                         │ SUBMITS COPIES OF CONTROL │──────────┐
                         │    SHEET & ALL T&As       │          │
                         └────────────┬─────────────┘          ▼
                                      ▼                 ┌──────────────┐
                         ┌──────────────────────────┐   │   PROCESS    │
                         │ MAINTAINS COPY OF CONTROL │   │    T&As      │
                         │      SHEET & T&As         │   └──────┬───────┘
                         └──────────────────────────┘          │
                         ┌──────────────────────────┐          │
                         │ RECEIVES PAYROLL LISTING  │◀─────────┘
                         │     OF ALL EMPLOYEES      │
                         └────────────┬─────────────┘
                                      ▼
                         ┌──────────────────────────┐
                         │ REVIEWS PAYROLL LISTING FOR│
                         │ ACCURACY AND COMPLETENESS:│
                         │  —TOTAL # OF T&As         │
                         │  —TOTAL REG. HRS.         │
                         │  —TOTAL OVERTIME HRS.     │
                         │  —TOTAL LWOP HRS.         │
                         └────────────┬─────────────┘
                                      ▼
                         ┌──────────────────────────┐   ┌──────────────┐
                         │  IDENTIFIES ANY ERRORS &  │──▶│ PROCESS ERROR│
                         │ INITIATES CORRECTIVE ACTION│   │ CORRECTIONS  │
                         └────────────┬─────────────┘   └──────┬───────┘
                                      ▼                        │
                         ┌──────────────────────────┐          │
                         │ MAINTAINS COPY OF PAYROLL │          │
                         │  LISTING FOR 6 MONTHS     │          │
                         └──────────────────────────┘          │
                                                               ▼
┌─────────────────────┐                              ┌──────────────┐
│ EMPLOYEE RECEIVES   │◀─────────────────────────────│   PROCESS    │
│    PAYCHECK         │                              │  PAYCHECKS   │
└─────────────────────┘                              └──────────────┘
```

Narrative Document Flow of Payroll Process

The following procedures are used to process a biweekly employee payroll:

--At the end of the pay period, a timekeeper completes a time and attendance (T&A) report.

--The employee's supervisor reviews and initials the T&A and submits it to Payroll Department.

--Payroll clerk reviews T&A for completeness and checks total hours reported.

--When all the T&A reports are received, the payroll clerk prepares a control sheet which shows totals for number of T&A reports, number of regular hours, overtime hours, and LWOP hours.

--Payroll clerk keeps the originals and sends a copy of the control sheet and all T&A reports to Data Processing.

--Data Processing enters the payroll data on the terminal.

--At the compeletion of payroll processing, a listing of all employees paid is sent to the payroll clerk.

--The payroll clerk reviews the listing for completeness and accuracy, which includes a comparison of the number of T&A reports, regular hours, overtime hours, and LWOP hours with the control sheet totals.

--Any discrepancies are researched and resolved. Errors affecting pay are corrected and resubmitted to Data Processing for immediate action. Errors in leave are corrected in the subsequent pay period.

--The payroll clerk keeps the payroll listing for 6 months.

--The payroll process also prints the paycheck and mails it directly to the employee.

RECORD LAYOUT

DESCRIPTION OF PAYROLL DATA FILE

Data Element	Position in Data File	Data Element Description
SSN	1-9	Social Security Number
Name	10-29	Name - Last, First, Middle Initial
Grade	30-31	Payee's Grade
Salary	32-37	Yearly Salary
Taxes	38-43	Weekly Tax Deduction
Insurance	44-49	Weekly Insurance Deduction
Bond Code	50	Bond Deduction Code

Bond Code	Bond Amount	Weekly Deduction
1	$ 100	$ 2
2	200	4
3	500	10
4	1,000	20

Hours	51-52	Hours worked during current pay period.

EXAMPLES OF DIFFERENCES BETWEEN COMPUTER
OUTPUT AND DATA ELEMENTS

Differences	Explanation of the difference
Total deductions on a payroll report might represent an addition of several data elements (taxes + health insurance + bonds + . . .).	The computer program used to produce the report adds the individual deductions and prints the total.
Bond deductions might be represented by a 1-character code on the data file.	The computer program converts the 1-character code to a dollar amount (e.g., 1 = $100 bond, 2 = $200 bond, etc.).
Weekly salary appears on the report and only annual salary is found in the data file.	The computer program converts the yearly salary into a weekly amount through division by weeks.
Average annual salary appears as an individual statistic while annual salaries are recorded in the data file.	The computer program totals all annual salaries in the file and divides the total by the number of records.
A report might show details and summary statistics for GS-12s while the data base contains payroll information for all grade levels.	The computer program selects only GS-12 records for printing and summarization.