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<p>(54) Title: MULTI-PROCESSING FINANCIAL TRANSACTION PROCESSING SYSTEM</p>		
<p>(57) Abstract</p> <p>A financial transaction processing system in which much of the transaction processing logic is stored in a database, resulting in a relatively small executable file. Each transaction is described by a transaction data descriptor that includes a series of subtransaction data descriptions of actions that can be performed independently of one another, permitting parallel processing on multiprocessor computers. Additionally, control columns in certain tables allow balance checking, thereby providing an indication of the integrity of the current data. Moreover, any changes to financial data can be traced for any period of time into the past, allowing full auditability.</p>		

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MULTI-PROCESSING FINANCIAL TRANSACTION PROCESSING SYSTEM

FIELD OF THE INVENTION

The present invention relates to a financial transaction processing system, and in particular, to such a system that is capable of decomposing transactions into subtransactions and multi-processing subtransactions simultaneously.

BACKGROUND OF THE INVENTION

Computerized data processing systems for processing financial transactions have become increasingly more complex as further strides toward automation have occurred. Such complexity has generated a number of related difficulties for the financial data processing industry. In particular, complex financial transaction processing systems may have subtle programming defects or errors that may go unnoticed for long periods of time before the extent of the problems thereby generated are fully recognized. For example, the number of positions allotted for the dating of transactions has recently been problematic, wherein the dates for the millennium starting at the year 2000 can be problematic for many financial transaction processing systems.

In addition, such complex financial transaction processing systems also are typically incapable of being fully audited. That is, it is common practice in the financial data processing industry to provide only partial auditability in that it is generally believed that the amount of data required to be stored for full auditability is so large as to not be cost effective.

Further, in many circumstances, the rate of transaction increase is becoming problematic in that progressively larger computers are required for processing financial transactions at an acceptable rate. This problem is exacerbated by the fact that such transaction processing systems are not architected for use on multi-processing machines having a plurality of processors. Thus, the advantages of parallel-processing computers cannot be fully utilized by such systems.

Accordingly, it would be advantageous to have a financial transaction processing system that alleviates the above difficulties, and that additionally, provides flexibility to adapt to the changing business needs of business enterprises so that the transactions processed and the respective reports generated may be modified easily according to business constraints and demands.

SUMMARY OF THE INVENTION

The present invention is a financial transaction processing system that achieves substantial increases in auditability and processing efficiency. In particular, the present invention provides auditable trails or history in a number of different ways. For example, financial data within transactions is used in the present invention to update various control fields in different tables or files so that cross-checks of system financial integrity can be performed for assuring that, for example, cash fields, total units fields, and cost fields balance appropriately across system data tables provided by the present invention.

Additionally, the present invention provides a full range of auditable history files for each system data table having information that is required during auditing.

The present invention also performs financial transaction processing using a novel computational paradigm. That is, the financial transaction processing system of the present invention has an architecture wherein financial transactions can be decomposed into corresponding collections of independent subtransactions, such that for each input transaction, the corresponding collection of subtransactions are performed by operations that are independent of one another. Thus, the subtransactions can be performed in any order, including in an overlapping fashion, such as may occur during multiprocessing of these subtransactions on a computer having multiple processors.

Further, note that each of the subtransactions is described by a relatively short (e.g., less than 8 characters) text string that can be straightforwardly interpreted as an operation (e.g., either plus or minus) together with a series of operands, in particular, a first operand having a value to be used in modifying a data table field (column) specified by a second operand. Such high level descriptions of subtransactions provide both compact conceptualization and a reduction in the total size of the executable code for the present invention. Accordingly, when one of the subtransactions is performed, not only is its corresponding operation performed on the operands, but additionally, control fields such as those mentioned above are updated appropriately in various data tables for the present invention to enhance auditability of the financial data resulting from the transaction processing. Further, note that since the subtransactions are independent of one another and their executable code is relatively small, there is no need for lengthy and complex flow of control transaction processing modules. That is, the size of the code for the present invention may be up to 100 times smaller than many prior art transaction processing systems. Accordingly, this has a substantial positive impact on the efficiency of the present invention in that the swapping of program elements in and out of primary computer memory is substantially reduced.

In another aspect of the present invention, the financial transactions of a plurality of business enterprises can be processed in an interleaved manner. In particular, since the present invention is substantially data driven, including the descriptions of the transactions and their related subtransactions, the present invention can be easily modified to incorporate both different or updated versions of transactions and associated data tables for an existing business enterprise (e.g., also denoted "licensee" hereinafter). Additionally, the transactions and related data tables for an entirely new or different business enterprise (licensee) may be straightforwardly incorporated into the present invention so that its transactions can be interleaved with the transactions of other business enterprises. Thus, transaction processing may be performed by the present invention for business enterprises having different transactions, different account record structures and differently organized general ledgers substantially without modifying the program elements of the transaction processing system.

For example, the present invention can be used to simultaneously process transactions for:

- (1) a single software application such as an investment management or telecommunications billing system,

- (2) multiple disparate software applications such as investment management, and telecommunications billing, paying agencies, etc., all with disparate definitions.

Accordingly, the present invention may be viewed as a software engine, or a user-definable transaction processing tool that can be adapted to a variety of industry specific software application needs without changing the actual program code.

5 That is, by surrounding the present invention with application specific software for inputting transaction data to the multi-processing financial transaction processor of the present invention and retrieving data from the multi-processing financial transaction processor of the present invention, a particular business enterprise can have substantially all of its financial records in condition for auditing on a daily or weekly basis.

10 The present invention may be further characterized along the following dimensions: flexibility, auditability, multiprocessing, efficiency and size, these dimensions being discussed, in turn, hereinbelow.

Flexibility is achieved by permitting a business enterprise to define:

- (1) a series of "reference" tables (also denoted "master tables") that describe the appropriate management decision-making, accounting structure, and regulatory information for the specific application;
- 15 (2) a series of audit controls and system procedures that provide for complete control of all processing and prevent the overwriting of any original data;
- (3) a series of institutional and customer reporting files, known as the "driven" tables; and
- (4) the specific processing content of each individual transaction to be processed via a series of table definitions, known as the "driving" tables.

20 Thus, transactions may be customized according to the business needs of a business enterprise.

Auditability is achieved by:

- (1) providing separate control columns for cash, units and cost basis (if any) in detail records generated and stored for each financial transaction;
- (2) repeating these three control columns, or variations thereof, in at least three different tables so that
25 subsequent summations of each of the four tables will result in similar balances and thus prove that no critical data has been lost in the course of processing, as one familiar with auditing and financial transactions systems will understand;
- (3) adding appropriate data columns:
 - 30 (a) to each reference table or master row for maintaining a history of the effects of add, change and delete commands in a current database as well as an archive database;
 - (b) to each original file record (i.e. table row) that represents an add to a current database as well as the periodic archive and purge to a permanent database;

(c) to tables for retaining transaction processing data representing error identification, error negation and error correction.

Thus, auditability of transaction records is achieved by four sets of files for a specific period. These are: (a) a snapshot of all the reference files at the end of the period; (b) snapshots of a history file for each master table, wherein the corresponding history file (table) contains all changes to the master table during the specific period; (c) a snapshot of all financial transactions for the specific period, and (d) a snapshot of all of the "driven" tables at the end of the period.

Multiprocessing is achieved by:

- (1) decomposing the processing of the present invention into a series of separate and independent subprocesses that may be simultaneously performed on any number of simultaneous processors, and
- 10 (2) decomposing input transactions into a series of subtransactions that are processed by independent processes, which may be executed in any particular order, with complete auditability.

For example, multiprocessing can be achieved by allocating the next prescribed subtransaction process to the next available processor.

Efficiency is achieved by:

- 15 (1) Defining and utilizing only four standard processing models that perform all prescribed functionality and auditability of the present invention. The models are:
 - (a) Processing Model 1 provides an architecture for maintaining historical transaction data so that financial changes can be traced through time;
 - (b) Processing Model 2 provides an architecture for automatically maintaining data columns such as Units, Debits and Credits for cross checking table sums to assure that the financial records for a business enterprise balance;
 - (c) Processing Model 3 provides an architecture for automatically maintaining financial records relating to financial instruments such as stocks, bonds, real estate, etc.; and
 - (d) Processing Model 4 provides an architecture for producing a common processing format for maintaining customer and institutional data tables.
- 20 (2) Defining only four primary program modules for controlling functionality of the present invention, these modules being:
 - (a) a transaction processing controller module for receiving transactions to be processed, and controlling the processing thereof;
 - 25 (b) a preprocessor and decomposer module for determining the validity of a received transaction, assuring that all data tables and rows thereof are available for processing the transaction, and retrieving the appropriate subtransactions data descriptions to be processed;
- 30

(c) a subtransaction scheduling module for scheduling instantiations of the subtransaction processing module on each of one or more processors; and

(d) a subtransaction processing module for performing each subtransaction retrieved by the preprocessor and decomposer module.

- 5 (3) Utilizing a number of software switches to control which tables within collection of "driven" tables are to be updated when a specific type of transaction is to be processed.

Thus, by providing a small number of processing models, decomposing input transactions, and supplying only the necessary subtransaction descriptions, the reliability of the transaction processing system of the present invention is substantially increased.

10 The software for the present invention is small in size (both source code and object code) due to the following:

- (1) defining business enterprise financial data processing methods, accounting structures, and regulatory definitions as data rather than program code;
- (2) reducing the processing content to a series of individual transactions; and
- (3) reducing all financial transactions to a collection of subtransactions wherein each subtransaction
15 includes an operator and two or more operands in an 8-character string.

Thus, the financial processing by the present invention may be performed on several transactions at a time, one transaction at a time, or different processors within a multiprocessor context. Or, the subtransactions for a specific transaction may be spread over several simultaneous processors. This means that the business enterprise is afforded a large number of options in tailoring the present invention.

20 Hence, by defining the accounting structure and processing functionality as data rather than actual program code, the size of the total code required to process a specific industry application may be substantially reduced compared to prior art transaction processing systems. For example, the executable code for the present invention may be less than one megabyte (1MB). Thus, since the secondary cache attached to each processor in multiprocessing personal computer servers can be one megabyte, substantially the entire executable for the present invention can be provided to each processor. Thus, the positive
25 impact on total system efficiency is believed to be substantial in that secondary cache is typically about four times faster than normal cache, so productivity gains of about three-hundred percent would not be unreasonable. In other words, the executable code for the present invention can reside in the secondary cache of each processor, thereby allowing the off-loading of any processing function to any processor with relative ease. Additionally, given that a typical RAM memory for a personal computing devices is 16 megabytes, it is believed that such a device will have the capability to process the back office financial
30 transactions of a major money center financial institution or communications billing system.

Additional features and benefits of the invention will become evident from the detailed description and the accompanying drawings contained herein.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a high level block diagram illustrating the present invention conceptually.

5 Figs. 2A and 2B is another block diagram of the present invention illustrates: (a) the high level transaction processing modules, and (b) the data tables (represented by the symbols with arcuate vertical sides) provided and maintained by the present invention. Furthermore, the present figure shows the data flows as solid arrows and control flows as dashed arrows. Moreover, this figure also indicates the data tables effected by process models No. 2 and No. 3 of the present invention.

10 Fig. 3 is another high level block diagram of the present invention during activation of the preprocessor and decomposer 54 wherein the solid arrows are illustrative of the data flows that occur during the activation of the preprocessor and decomposer 54. Moreover, the tables within boxes represent tables having a process model No. 1 representation, and the tables having account balancing control fields include the identifier, "CNTLS."

Figs. 4-A through 4-E illustrate the steps of a flowchart for initializing the database tables of the present invention for a new business enterprise licensee that is to have its financial transactions subsequently processed by the present invention.

Fig. 5 is a block diagram illustrating process model No. 1 of the present invention.

15 Fig. 6 is a high level flowchart of the steps of an embodiment of the transaction processing controller 52 of Fig. 2A.

Figs. 7-A through 7-D show the high level steps performed by an embodiment of the preprocessor and decomposer 54 of Fig. 2A.

Figs. 8-A and 8-B show the steps of a flowchart for obtaining indexes or pointers to particular rows of a general ledger table wherein the rows are used in processing a transaction.

20 Figs. 9-A and 9-B show the steps for a flowchart of an embodiment of the subtransaction processing module 64 (Fig. 2A).

Fig. 10 is an embodiment of a flowchart of the steps performed for processing income cash transactions by the present invention.

25 Fig. 11 is an embodiment of a flowchart of the steps performed for processing principal cash transactions by the present invention.

Fig. 12 is an embodiment of a flowchart of the steps performed for processing invested income transactions by the present invention.

Fig. 13 is an embodiment of a flowchart of the steps performed for processing invested principal transactions by the present invention.

30 Fig. 14 is an embodiment of a flowchart of the steps for performing custom accounting such as income expenses, and cash flow for a business enterprise.

Fig. 15 is an embodiment of a flowchart of the steps for maintaining a business enterprise's balance sheet related to buys and sells of financial entities or instruments.

DETAILED DESCRIPTION OF A
PREFERRED EMBODIMENT OF THE INVENTION

Figure 1 shows a high level conceptual block diagram of a transaction processing system 50 according to the present invention. In particular, the present invention is conceptualized in the present figure as including five functional components, these being:

(a) transaction processing controller 52 for: (i) receiving transactions 58 from business enterprises, (ii) controlling the processing of such transactions, including the scheduling of subtransactions to be performed, and (iii) writing of transaction details to, for example, a transaction journal file or table;

(b) a transaction preprocessor and decomposer 54 for initially receiving a transaction 58 from any one of a plurality of business enterprises as shown, wherein the preprocessor and decomposer 54 decomposes transactions into subtransactions;

(c) a subtransaction processing module 64 for performing the instructions for each subtransaction determined by the transaction preprocessor and decomposer 54. In particular, the subtransaction processing module 64 utilizes a collection of subtransaction programmatic data descriptions 66 that can be independently scheduled and performed for processing each transaction 58 provided to the transaction processing system 50;

(d) a subtransaction scheduler 62 for scheduling the execution of each subtransaction output by the preprocessor and decomposer 54;

(e) a collection of databases 70 containing financial information for each of the one or more business enterprises. Note that the term "database" in the present context includes both the data therein as well as database management functional elements and data structure definitions.

Another illustration of the present invention is provided in Figure 2. This figure is a block diagram providing both the processing components of Figure 1, and additionally, greater detail is provided of the tables or files within the databases 70. However, to simplify the discussion hereinafter, the database terminology used will be that of a relational database. Accordingly, files may also be equivalently referred to as tables, records may also equivalently be referred to as rows, and record fields may also be equivalently referred to as columns. Thus, all the data storage symbols having the collective label of 70 are provided within the like numbered databases of Figure 1. It is worth noting, however, that in one embodiment of the present invention, the data tables for distinct business enterprises may be provided in the same collection of tables such as those represented in Figure 2. That is, it is an aspect of the present invention that the accounting and transaction processing of the present invention can use the same plurality of financial data tables for business enterprises having substantially different financial transactions and accounting categories. Thus, although Figure 1 illustrates the databases 70 as being

distinct for each business enterprise, many of these databases (if not most) may be combined into a single database having a plurality of data tables such as those labeled collectively "70" in Figure 2, these tables being discussed in detail hereinafter.

Referring still to Figure 2, a high level view of the processing performed when processing a transaction 58 is provided. In particular, the transaction processing controller 54 receives an input transaction 58 and invokes the preprocessor and decomposer 54. The preprocessor and decomposer 54 subsequently performs, for each transaction 58, the following functions:

(a) determines, using input from the business enterprise databases 70, whether all necessary data for performing the transaction is available and otherwise rejects the transaction without performing any portion thereof. In particular, the transaction preprocessor and decomposer 54 determines that all data tables to be accessed are available;

(b) retrieves the data needed to perform the transaction;

(c) checks to determine that the transaction operation(s) requested is available, and that the transaction is legitimate to be performed on the data for the input transaction 58;

(d) retrieves the subtransaction data descriptors for decomposing the input transaction 58 into subtransactions.

Accordingly, the preprocessor and decomposer 54 retrieves into the working storage 72 (shown in Fig. 3) of a host computer (not shown), upon which the transaction processing system 50 is operating, substantially all data and table rows that are necessary to process the transaction 58. Additionally, note that as one skilled in the art will understand, if some portion of the required data to process the transaction is unavailable, then the preprocessor and decomposer 54 terminates processing and subsequently writes appropriate error messages and/or details of the transaction into the reject table 74 (Fig. 2).

Assuming that the preprocessor and decomposer 54 successfully performs the gathering of information for the decomposing of the transaction into subtransactions appropriately, then control is returned to the transaction processing controller 52, wherein this controller then writes the details of the transaction to the transaction journal 78 along with identification data uniquely identifying the transaction (e.g., a transaction sequence number and/or time and date stamp).

Following this, the transaction processing controller 52 invokes the subtransaction scheduler 62 for scheduling the performance of each subtransaction by an invocation of the subtransaction processing module 64. Note that it is an important aspect of the present invention that since the subtransactions can be processed independently of one another for a given transaction, instantiations of the subtransaction processing module 64 can be executed in substantially any desired order. In particular, such instantiations of the subtransaction processing module 64 can be performed concurrently, thus providing a substantial increase in transaction processing efficiency when such concurrency is provided on a computer having a plurality of processors.

Given that a subtransaction is performed successfully by the subtransaction processing module 64, various accounting tables within the transaction processing system 50 are updated. In general, each subtransaction conceptually

indicates a single operation of either plus or minus that is to be performed with two operands also indicated in the subtransaction. That is, the first operand indicates the data to be added or subtracted from a particular field or column of a table row identified by the second operand. Additionally, each subtransaction updates other tables within the transaction processing system 50 automatically in order to provide consistency among the data tables so that: (a) substantially on-line account balancing capabilities can be performed, and (b) full auditability of the records of the business enterprise providing the transaction can be facilitated by retaining history records of table updates, as will be discussed with reference to "master table transaction cluster processing" described hereinbelow. Accordingly, each subtransaction processed by an instantiation of the subtransaction processing module 64 may update a plurality of the data tables contained in the collectively labeled database 70. Note that for one skilled in the art of transaction data processing and accounting, the names provided to the tables are indicative of their information content and structure. However, for clarity, substantially all of the tables for the present invention will be discussed in detail and/or illustrated hereinbelow.

The subtransaction processing module 64 processes subtransactions derived from three general categories of transactions that may be input to the present invention. That is, there may be input transactions for each of the following types of financial transactions (1.1) through (1.3) hereinbelow.

(1.1) Transactions related to exchanges of funds such as cash debits and credits for accounts of a particular business enterprise are provided. At a high level, the tables related to this functionality include the account master table 84 (Fig. 2), the general ledger table 88, and the entity attribute master table 92.

(1.2) Transactions related to additional or customized accounting for clients having accounts in the account master table 84 are provided. For example, in addition to providing the functionality of the transactions described in (1.1) immediately above, a customer income statement (income/expense) table 96 may be provided with client account and transaction information related to income and expenses for tax purposes. Additionally, a customer cash flow (receipts/disbursements) table 100 is also provided for recording any account transaction information related to receipts and disbursements in client accounts. Further, a customer performance measurement table 104 is also provided for retaining client account performance information related to the performance of client portfolios in comparison to investment indexes such as the Dow Jones Industrial Average, the S&P 500, etc. Note that these tables will be discussed and/or illustrated hereinbelow.

(1.3) When transactions are additionally related to financial instruments other than cash, debits and credits, such as portfolio management wherein there is buying and selling of equities, income derived from equities, and trade settlements related thereto. Further, note that these additional capabilities also provide the same degree of flexibility, adaptability and simplicity as provided in relation to the transaction processing capabilities discussed in (1.1) and (1.2) immediately above. That is, financial equity transactions of various types and for various business enterprises may be easily modified and/or added or removed from the transaction processing system 50 of the present invention, since these transactions are also described

by transaction data descriptors consisting of a collection of subtransactions that are capable of being performed in substantially any order that is determined by the subtransaction scheduler 62.

Accordingly, in providing the functionality for the transactions related to portfolio management, the preprocessor and decomposer 54, upon being invoked by the transaction processing controller 52, also retrieves into working storage (as shown in Fig. 2) the necessary data for processing such portfolio maintenance transactions, this data including a subtransaction decomposition for the transaction. Subsequently, as discussed hereinabove, the subtransaction scheduler 62 invokes an instance of the subtransaction processing module 64. However, in addition to updating any appropriate rows of the tables 84, 88, 92, 96, 100 and 104, the subtransaction processing module 64 invokes a portfolio adjuster module 110 for capturing and/or updating detailed data of portfolio transactions that are not otherwise effectively captured for proper accounting and auditing. In particular, for a given subtransaction, the portfolio adjuster 110 invokes one of the following modules (2.1) through (2.4) hereinbelow.

(2.1) Original add module 114 for processing a subtransaction related to the addition of further financial instruments to a portfolio such as occurs when securities are bought and must be added to a given account.

(2.2) A reverse of add module 118 for reversing an addition of financial enterprises to a particular account portfolio. Note that this module is typically activated when financial enterprises are inadvertently added to an incorrect portfolio account.

(2.3) An original sell module 122 for processing subtransactions related to selling financial enterprises within a given account portfolio.

(2.4) A reversal of original sell module 126 for reversing the affects of an inadvertent sell of financial enterprises within an account portfolio.

These four modules 114-126 update the tables labeled collectively as 70B. In particular, the processing performed herein and the tables updated herein are described below.

Major Programs and Functionality

Major Programs

The N_gine transaction processing system contains four major programs. These are:

- (1) Transaction Processing controller 52
- (2) Transaction Preprocessor and Decomposer 54
- (3) Subtransaction Processing module 64
- (4) Subtransaction Scheduler 62

Program Functionality

The purpose of the Transaction Processing controller 52

- (a) test for incoming transactions and once detected
- (b) execute the Transaction Preprocessor and Decomposer 54 and then
- 5 (c) execute the Subtransaction Processing module 64 for each transaction.

The purpose of the Transaction Preprocessor and Decomposer 54 is to verify

- (a) that all information in the transaction is accurate
- (b) that all files and controls are available to properly process the transaction
- 10 (c) that the specific subtransaction processing instructions are loaded into working storage.

The purpose of the Subtransaction Processing module 64 is to

- (a) execute all of the subtransactions that have been previously defined for a transaction
- (b) create auditability for every transaction.

15 The purpose of the Subtransaction Scheduler 62 is to

- (a) allocate a specific task to a specific processor
- (b) return processing to the Transaction Processing controller 52.

The present invention may be described as "Table-Driven Transaction Processing". That is, the present invention permits the processing of virtually any type of user-definable transaction by defining the processing for such transactions as data descriptors that are interpreted in real time and dynamically as needed for processing corresponding transactions. Accordingly, the transaction data descriptors are denoted as "driving data" and are defined by the transaction processing master table and the transaction master table. That is, the transaction master table provides a first initial collection of data for identifying each transaction and the transaction processing table provides the remainder of the data including the subtransaction decompositions. Accordingly, each transaction processed updates an appropriate set of user-definable tables (known as the "driven" data) for completing the processing of the transaction. Since both the "driving" and the "driven" information is expressed as data rather than actual code, the entire functionality of the system can be changed in a straightforward manner.

25 In the description hereinbelow, the functional components of the present invention are also identified by other naming conventions from the description above. Accordingly, the following table shows the pairing of the functional component identifications above with those also used below:

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<u>ABOVE</u>	<u>BELOW</u>
TRANSACTION PROCESSING CONTROLLER 52	N_GINE COMMAND PROCESSOR
TRANSACTION PREPROCESSOR AND DECOMPOSER 54	N_GINE EDIT PROCESSOR
SUBTRANSACTION PROCESSING MODULE 64	N_GINE POSTING TO AM, EA AND GL
SUBTRANSACTION SCHEDULER 62	N_GINE SCHEDULER
PORTFOLIO ADJUSTER 110	AORS
ORIGINAL ADD MODULE 114	ORIGINATE ADD PROCESSING
REVERSER OF ADD MODULE 118	REVERSE ADD PROCESSING
ORIGINAL SELL MODULE 122	ORIGINATE SELL ROUTINE
REVERSE OF ORIGINAL SELL MODULE 126	REVERSER SUBTRACT PROCESS

10

N_gine System Design Rules

15

- A. The Magic Number in Software Design is 1. That is,
 - store data once,
 - program data once,
 - process data once.
- B. Design a total system with the fewest number of processing models. For example,
 - One model for processing all adds (inserts), changes (updates), and deletes (deletes) for all Master (or Reference) Files (or tables).
 - One model for processing all of simple transactions (such as debits and credits), including original and reversing entries.
 - One model for processing all complex transactions (such as buys and sells), including original and reversing entries.
 - One model for processing all adds (inserts), changes (updates), and deletes (deletes) for all Detail Record (or "driven") Files (or tables).
- C. Use the first and last models to process all files (or tables) in the entire system.
- D. Include audit controls for every table in the system from the very outset of design.
- E. For reasons of productivity assessment, include Production Statistics for every job.

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Namely,

- Begin Time
- Number of Transactions
- Number of Acceptances
- Number of Rejects
- End Time.

5

These variables represent the only true means of measuring actual productivity.

F. For reasons of auditability, never overwrite any original information. Move all original information from data entry (cradle) to data warehouse (grave) without any changes.

10

G. For reasons of reliability and profitability, system designs should focus on a “large number of small programs” rather than a “small number of large programs”. The result is not only ease of maintenance but also the ability to spread the small programs across a number of simultaneous processors.

H. For reasons of manageability, all system designs should embrace one integrated enterprise-wide standard naming convention for all files (tables), records (rows), and fields (columns).

15

I. For reasons of portability, use the fewest number of language commands to code the system. Avoid vendor and/or language extensions.

J. For reasons of flexibility, never hard code what can be table-driven.

Engine Design Concepts

20

A. Only 4 Processing Models for Financial Services and Telecommunications Applications

- 1. Schema
- 2. Units, Debit / Credit
- 3. Assets / Liabilities
- 4. File Maintenance Routine

25

B. Table-Driven Transaction Processing for maximum flexibility

- 1. Number of Transactions
- 2. Name of Each Transaction and Unique Details
- 3. Processing Algorithms (at least 1, up to 20 depending upon complexity)
- 4. Each algorithm has 3 components

30

- a. Plus (P) or Minus (M)
- b. Operand 1
- c. Operand 2

- C. 100% Auditability For Every Transaction by creating
1. a Detail Record containing all relevant data and
 2. hash totals of three relevant fields in at least 3 other tables.
- D. The 3 relevant fields for calculating all hash totals are:
1. Cash
 2. Units
 3. Cost Basis
- E. Basic Relational Database Management System Processing Concepts
1. Commit / Rollback
 2. Row Level Locking
 3. Indexing, ROWID
 4. Stored Procedures
 5. Shared Memory
- F. Some Financial Services Accounting Systems are not permitted to commingle funds. That is, separate accounting for both income and principal must be provided. Therefore, each account master must have a designated "income posting code" to define the proper processing. Such a code might be: (I) Income Only, (P) Principal Only, (B) Both Income and Principal.

Engine's Basic Tables

Licensee Profile (The Licensee "Reference" or "Master" Tables)

- LM** The License Master table contains the necessary information to process any type of licensee using either single or multiprocessing computers.
- LU** The Licensee User Master identifies different users for the disparate systems that may be processed simultaneously.
- LT** The Licensee Account Type table contains the necessary information to process any type of account be it for a pension trust account, a communications account, or a corporate subsidiary.
- LD** The Licensee Default Definition table the default definitions for cash, units, and cost basis controls for total system control.
- LL** The Licensee General Ledger Definition is a list of all of the acceptable entries for the General Ledger. That is, it provides a framework for processing any type of accounting controls for any set of account types.
- LS** The Licensee Diversification Scheme contains a three level classification scheme for reporting an decision-making purposes for any set of assets and liabilities.

- LP** The Performance Measurement Group Master contains a three level classification scheme for measuring the performance of different investment groups.
- LN** The Licensee Summary Name Master contains a list of the entries on any type of Income Statement and Cash Flow Statement.
- 5 **LW** The Licensee Wholesaler Master contains name, address, sales volumes, etc. wholesalers of communications services.
- LR** The Licensee Reseller Master contains name, address, sales volumes, etc. for resellers of communications services.

Account Profile (The Customer "Reference" Tables)

- 10 **AO** The Account Objectives Table contains the different types of account objectives, such as income, growth, capital preservation, etc.
- AL** The Account Jurisdiction contains the different types of legal relationships, such as broker, agent, trustee, advisor, etc.
- AJ** The Account Jurisdiction contains the different types of legal jurisdiction, such as federal law, state law, foreign law, etc.
- 15 **AR** The Account Representatives Table houses the different representatives, their names and communication addresses.
- AN** The Account Registration Names is a list of legal names used in security settlement.
- AM** The Account Master table provides all of the necessary information to process any type of account by linking the Account Objective, Account Jurisdiction, Legal Capacity, Profit Center, Account Representative, and Registration tables plus other relevant data for reporting content and reporting cycles.
- 20 **AC** The Account Communications Links links the Account Number for Financial Services to the account numbers for communications services so that all information can be contained in one reporting scheme.

Transaction Profile (The "Driving" Tables)

- 25 **TM** The Transaction Master table provides all of the information to process any type of transaction, excepting the specific processing algorithms.
- TP** The Transaction Processing table provides all of the specific processing algorithms for any type of transaction master. The Transaction Master and Transaction Processing tables provide all of the necessary information to process any type of transaction.
- 30 **TR** The Transactions - Recurring Table (TR) contains the necessary information for automatically processing any type of transaction on a recurring basis.

Entity Profile (The Entity "Reference" Tables)

- EM** The Entity Master table provides all of the necessary information to process any type of financial entity.
- EA** The Entity Attribute table joins all relevant diversification (known as type, group, and class), general ledger (known as accounting control numbers), and performance group (known as type, group, and class) data into one table for only one access seek.
- ET** The Entity Transaction table links specific transactions to specific entities, such as BG (Buy Government) for a US Treasury Note, BF (Buy Tax-Free) for a tax-free bond, BE (Buy Equity) for common stocks, etc. Note: It is the correct assignment of such transactions to such entities that permits the proper accumulation of data for income tax purposes.

10

Licensee Status

- SG** The System General Ledger contains all of the information to process any type of institutional accounting control.
- SJ** The System Transaction Journal Table contains all of the transactions and all of the details for each transaction for a specific accounting period.
- ST** The System Trade Settlement Table contains all of the automatically generated offset transactions for Buys and Sells
- SS** The System Summary Table contains a record for each execution of the system with the Begin Time, End Time, Number of Total Records Read, Number of Accepts, Number of Rejects, etc.
- SR** The System Reject Table contains a list of all transactions rejected for whatever reason.
- SC** The System Transaction Count Table contains the number of each type of transaction processed on any given transaction.

20

Customer Status (The "Driven" Tables)

- CS** The Customer Income Statement contains all revenues, expenses, and profits or losses for all customer accounts.
- CF** The Customer Cash Flow Statement contains all receipts and disbursements for all customer accounts.
- CB** The Customer Balance Sheet table contains all assets and liabilities for all customer accounts.
- CG** The Customer Capital Gains table contains all of the realized capital gain details for all customer accounts.
- CI** The Pending Income table contains all of the pending income, such as interest or dividends, for all accounts.
- CA** The Pending Capital Adjustments table contains all of the pending capital adjustments, such as stock splits, stock dividends, mergers, acquisitions, etc., for all accounts.
- CP** The Performance Measurement contains all of the periodic performance records for all customer accounts.

30

The Control Tables (The "System Balance" Tables)

Since every transaction is recorded in a detail record plus hashed to three other control tables, the control values of cash, units, and cost basis are added to like values in the following control tables:

Account Master, System General Ledger, and Entity Attribute tables.

5 For other reports such as the Income Statement and the Cash Flow Statements, the Performance Measurement table is used as a control table instead of the General Ledger.

The present invention includes four computational processing models (process models 1 through 4) for processing financial transactions and assuring full auditability and traceability.

10 The purpose of Process Model 1 (Fig. 5) is to create a single methodology for capturing, maintaining, and archiving the non-financial transaction data including a master table (reference table, or schema) data for 100% auditability within a single software system. This model provides:

- A current database 300 (Fig. 5)(for additions, negations and corrections) and an archive database 304(Read Only)
- Eight tables (i.e. tables 312, 316, 320, 324, 328, 332, 336 and 340, of Fig. 5)
- Number of Modifications
- 15 • 12 Control Fields per master table
- A sequence number generator
- A process flow methodology for add, change, and delete of data table rows.

The operation of Process Model 1 is as follows:

1) Normal Updating to current database 300

	<u>Write to Reject</u>	<u>Write to Accept</u>	<u>Move Master to History</u>	<u>Add to Master</u>	<u>Change Master</u>	<u>Delete Master</u>
Add						
IF Identifier Found	X					
IF Identifier Not Found		X		X		
Change						
IF Identifier Not Found	X					
IF Identifier Found		X	X		X	
Delete						
IF Identifier Not Found	X					
30 IF Identifier Found		X	X			X

2) Periodic updating to the archive database 304 at the end of a pre-determined time period. That is,

- (a) archive snapshots of the archive master 312 in the current database 300 to the master in archive database 304;
- (b) archive the archive history 332 in the current database 300 to the master history 340 in the archive database 304;
- (c) purge the history table 332 in the current database 304.

The purpose of Process Model 2 (Figs. 2A, 2B) is to create a single methodology for: capturing, maintaining, and archiving the financial transaction data including: units, and debit/credits for one or more disparate financial applications with 100% auditability, wherein the processing is performed by: (a) computing configurations containing any number of simultaneous processors, (b) decomposing each input financial transaction into separate and independent subcomponents,
5 (c) allocating the subcomponents across any number of multiple processors.

The methodology of process model 2 utilizes a data-driven transaction processing strategy, wherein the manner in which a transaction is processed is determined by retrieving appropriate control data for processing a given input transaction. Thus, the present model provides the ability: (a) to process like systems (such as financial services systems) with different transaction definitions and accounting requirements (such as commercial banking, broker/dealers, mutual funds, insurance
10 systems) and different debits and credits and/or (b) unlike systems (such as telecommunications systems) with disparate definitions (such as landline, wireless, satellite, cable systems) within the present invention at the same time.

The purpose of Process Model 3 (Figs. 2A, 2B) is to create a single methodology for: capturing, maintaining, and archiving the financial transaction data including: units, debits/credits, financial instruments for one or more disparate financial applications with 100% auditability within a single software system on computing configurations containing any
15 number of simultaneous processors, decomposing each disparate financial transaction into separate and independent subcomponents, allocating the subcomponents across any number of simultaneous processors, and processing the data with 100% auditability. The methodology of Model 3 provides:

- “Detail Record Maintenance”, that is, the ability to process transactions for similar business enterprises (such as portfolio management systems) relating to various financial instruments (such as disparate assets and liabilities) and/or
20 transactions for dissimilar business enterprises (such as portfolio management systems, paying agencies, stock transfer systems) with disparate languages (such as English, Spanish, French, or German) and disparate definitions (such as management philosophy, accounting, and operating nomenclature) and unlike financial instruments (such as assets and liabilities) within the same software at the same time.
- The ability to decompose, allocate, process, and audit each financial instrument transactions with 100% auditability.
- The current databases 300 (for additions, negations and corrections) and the archive databases 304(read only);
- Sixteen data tables (some of which are shown in Figs. 2A-2B) plus a sequence generator;
- 12 control fields appended to the master tables for tracing master table changes;
- One transaction three hash totals (mostly using AM, EA, and PM tables);
- 4 currency fields;
- Sequence number generation;
- Reversing/reversed by detail;
- Processing flow for additions, negations, and corrections.

The purpose of Process Model 4 is to create a single methodology for performing file maintenance including: creating a record (row) containing the initial data in a file (table) or modifying the initial data within an existing record (row) within a file (table) or deleting a current record (row) from a file (table) in any software application on computing configurations using simultaneous processors. Where the term, "Details", hereinbelow represents the identity of the specific financial transaction, the methodology of the process model 4 is provided by programs such as the following:

```

5 BEGIN
      IF Trxn is "ADD" then
          /*      Test for Duplicate Add          */
10      SELECT One or More Values from the Desired File (Table) into Working Storage
          IF Error then
              /*      Add New Record          */
              INSERT INTO Reject Report
15          IF Error then
                  Message "INSERT Reject ADD", Details
                  Goto Write Reject Table
              ENDIF
          ELSIF
              /*      Increment Existing Record          */
20      Increment One or More Data Values
              UPDATE SET, Details
              IF Error then
                  Message "UPDATE Error ADD", Details
                  Goto Write Reject Table
25          ENDIF
          ENDIF

      ELSIF Trxn is "SUBTRACT" then
          /*      Test for Valid Record          */
30      SELECT One or More Value(s) from Existing Record
          IF Error then
              Message "SELECT Error SUBTRACT", Details
              Goto Write Reject Table
          ENDIF
35      /*      Test for Valid Amounts          */
          IF One or More Amounts > One or More Values from Existing Record then
              INSERT INTO Reject Report
              IF Error then
40                  Message "INSERT Reject SUBTRACT", Details
                  Goto Write Reject Table
              ENDIF
          /*      Delete Existing Record          */
          ELSIF One or More Amounts = One or More Values from Existing Record
45      AND Special Deletion Criteria = TRUE then
              DELETE Record
              IF Error then
                  Message "DELETE Error", Details
                  Goto Write Reject Table
              ENDIF
50      ELSE
          /*      Decrement Existing Record          */
          Decrement One or More Values
          UPDATE SET, Details
    
```

```

        IF Error then
            Message "UPDATE Error SUBTRACT", Details
            Goto Write Reject Table
        ENDIF
5      ENDIF
      ELSE
        /*      Invalid ADD or SUBTRACT Code      */
        INSERT INTO Reject Report
        IF Error then
10       Message "INSERT Reject AORS", Details
            Goto Write Reject Table
        ENDIF
      ENDIF
      Goto EOJ
15     <<Write Reject Report>>
      ADD to Reject Table
      IF Error then
        Message "INSERT Reject Table Error", Details
        STOP
20     ENDIF
      <<EOJ>>
      Null
END

```

25 Accordingly, the methodology of process model 4 defines:

- (a) A current database (for additions, negations and corrections) and archive database (Read Only)
- (b) ADD or SUBTRACT;
- (c) Initial tests for values;
- (d) Special deletion criteria;
- 30 (e) Tests for action;
 - INSERT or UPDATE;
 - DELETE or UPDATE;
 - INSERT INTO Reject Tables;

Processing Model I:

35 Processing model I is a method for processing changes to files (or tables) denoted as master or reference tables (files) wherein these tables retain fundamental information that is not derivable from other tables. In particular, processing model I processes changes to master tables in an automated manner without losing historical financial information. Accordingly, 100% auditability of all data changes is able to be achieved.

40 The method of achieving this goal uses an architecture denoted as "Master Transaction Cluster Processing" (MTCP). MTCP is based on the premise of creating a logical flow of all original information from data capture (data entry) to permanent data repository (data warehouse) by replacing single master files (or tables) with a cluster of files (or tables). Therefore, MTCP addresses the complete life cycle of all information relevant to organizational decision-making. MTCP is targeted for use in the automatic generation of program code for multiple large-scale real-time transaction processing applications (such as securities trading,

telecommunications billing, and work management) on multi-processing computers (using 4, 8, 16, 32 processors), where control is not only an increasing complex issue but an absolute necessity for future competition.

The circumstances leading to the invention of Master Transaction Cluster Processing are:

- 5 a) Prior art financial transaction software architecture lacks the ability to identify transactions by table, transaction date, transaction number, and the person authorizing the transaction.
- b) Prior art financial transaction systems typically use only one table to contain all Master Information (i.e., non-derivable information) and the data in this table is overwritten, thereby losing historical information. Cases in point would be a record of all of the past mailing addresses or processing instructions for a specific customer.
- 10 c) Without 100% retention of an organization's vital information, management has no idea of the accuracy of the information being used for decision-making purposes.
- d) The Year 2000 problem, know as Y2K, is proving that past software applications designs have reached technological limits and current maintenance costs are inordinately expensive.
- e) Competitive pressures are mounting for higher quality software with lower software development and maintenance costs. Totally new architectures for applications software is in great demand.
- 15 f) The ComputerWorld article, "Information: America's Favorite Investment," by Paul Strassman, ComputerWorld Magazine, August 5, 1996, states that over 1100 companies are spending more on automation annually than the net worths of their respective companies.
- g) The Standish Report as described in Development Patterns, InfoWorld Magazine, Feb. 3, 1997, p. 56, states that the success rate of Business Process Reengineering has increased from 16% in 1994 to only 20 27% in 1996.

Note, in the book "Oracle Design", Ensor & Stevenson, O'Reilly Press, it is a recommended practice to compromise data retention rather than achieve 100% auditability. Today's hardware costs suggest otherwise.

The advantages of the present invention over the approaches discussed above are:

- 25 • to provide 100% auditability which offers business management the capability to exercise its fiduciary responsibility to its stockholders and Board of Directors,
- to capture, maintain, and ensure the integrity of all vital information for business enterprise decision-making purposes, and
- to preserve such information consistent with business enterprise-defined data retention cycles.

30 Additionally, the present invention allows accountants to certify in business enterprise annual reports that all vital corporate data is being properly preserved.

A detailed description of Master Transaction Cluster Processing corresponding to model I (the first computational model of the present invention) is as follows.

MTCP Overview

5

Master Transaction Clustering, or MTCP, performs the following tasks:

- a) assigns a unique identifier based on (i) master table identification, (ii) transaction date, (iii) transaction number, and (iv) authorized user, to each transaction that causes a change in the state of a particular record of a master table. That is, if one or more data elements in the record change, then the previous record is written to history, and a new status is assigned to an identifier field used for tracking such changes;
- 10 b) creates a logical flow of data as it is originally entered from its inception (data entry) to its repository (data warehouse). The unique architecture of MTCP replaces the Master File (or Table) within prior art systems with a cluster of Master Files (or Tables), known as a "Master Transaction Cluster". This cluster is suitable for multiprocessing (or the use of simultaneous processors within a single computer to complete a common job). Hence, MTCP addresses 100% auditability via maintaining the total life cycle of information. Aged information may be deleted from the appropriate tables consistent with user-defined data retention policies;
- 15 c) offers a standard for processing all Master Tables within a total application;
- d) provides a test bed for separately testing each Master Table Cluster under development and all Master Table Clusters in concert;
- 20 e) permits management to report that it is successfully capturing, maintaining, and preserving all critical information for decision-making purposes.

MTCP Scope

Master Transaction Cluster Processing utilizes the following (Fig. 5):

25

- a) two databases (i.e., the current data base 300 and the archive data base 304),
- b) sequencing generator 308 having: (i) two external sequence generators; (ii) two internal counters,
- c) eight tables (denoted master table 312, input table 316, summary table 320, reject table 324, accept table 328, history table 332, master archive table 336 and master history table 340), and
- d) twelve additional fields for every row in the master table 312.

30

MTCP Independence

Master Transaction Cluster Processing of Model I is independent of any:

- a) application - such as accounts receivable, customer billing, etc.
- b) industry - such as financial services, telecommunication, or work management,
- 5 c) hardware manufacturer - such as Compaq, Digital, HP, IBM, NCR, Unisys,
- d) operating system - such as MS-DOS, UNIX, OpenVMS, MVS, etc.
- e) network - such as Novell, Ethernet, etc.
- f) relational database management system - such as Oracle, Sybase, Microsoft SQL Server, Informix, etc.,
and
- 10 g) computer language - such as SQL, COBOL, FORTRAN, PL/I, Java, etc.

MTCP Architecture

The Master Transaction Cluster Processing (MTCP) architecture can be used for any application in any industry using any computer language. Within the typical structured processing scheme of input and process, the Master Transaction Cluster Processing focuses solely on the process function. Thus, the method permits users to define input screens and defined output reports.

MTCP Databases

Unlike prior art software systems which contain only one table for each set of primary records, Master Transaction Cluster Processing uses eight related tables, or a cluster of tables, to track all information on a cradle to grave basis. The cradle being its point in inception (or data entry), and the grave being its permanent repository (or data warehouse). Consequently, the "Master Transaction Cluster" spans two different databases: one denoted the Current database 300 containing all relevant data for the current processing period and a second denoted the Archive database 304 containing all relevant data for all previous processing periods. The Current database 300 represents the area of high inquiry, and the Archive database 304 represents the area of low inquiry. Consequently, the Current database 300 is normally placed on high-speed internal disk drive and the Archive database 304 is normally placed on less expensive lower-speed CD-ROMs. Note that trailing information in the Archive database 304 may be destroyed consistent with defined data retention policies, statute of limitations, etc.

MTCP Tables

The six tables in the Current database 300 are the

- a.) Master Table 312(M) that will contain all records to be maintained.
- b.) Input Table 316 (I) that will contain all records prior to updating.

- c.) Reject Table 324 (R) that will contain all records rejected during processing.
- d.) Accept Table 328 (A) that will contain all records accepted during processing.
- e.) History Table 332 (H) that contain a complete snapshot of all records prior to updating.
- f.) Summary Table 320 (S) that contains the results of a specific processing operation.

5 and the two tables in the Archive database 304 are the:

- g.) Master Archive Table 336 that contains snapshots of the master table 312 at the end of each processing period.
- h.) Master History Table 340 that contains a history of the master table 312 changes during a current processing period.

10 Note that the Master Table (M), Input Table (I), Reject Table (R), the Accept Table (A), the History Table (H) in the same "Master Transaction Cluster" share the same number and order of data elements consisting of alphabetic, numeric, and date items. Alternatively, the Summary Table (S) contains the start time, end time, number of accepts, and number of rejects for each time a series of master table 312 modifications are provided.

15 MTCP Generator and Counters

The Generators 308 include two different external counters and two internal counters used in effecting 100% auditability. The two external counters are the Accept Sequence Number Generator and the Reject Sequence Number Generator. The two internal counters are the Total Records Read Counter and the Number of Modifications Counter. All are used only in the Current database 300, as the Archive database 304 is read-only in nature.

20 Regarding the external counters, the Accept Sequence Number Generator included in the Current database 300 automatically generates sequential numbers for the processing period (daily, weekly, monthly, etc.) starting with the number 1, and increments by 1, so that every transaction processed against the preceding (old) master table 312 will receive a specific transaction number, and accordingly, each transaction processed will be uniquely identifiable based on master table identity, transaction date, transaction number, and authorized user. Note that the transaction date is read off the internal system clock. The Reject Sequence Number Generator counts the number of rejects for the specific processing period. Its function is similar to the Accept Sequence Number Generator. Both the Accept Sequence Number Counter and the Reject Sequence Number Counter are "processing period" specific. That is, both are cleared to zero at, e.g., midnight on the end of the processing period so that each processing period may be separately identified and audited.

30 Regarding the internal counters, the Total Records Read Counter counts the number of transactions read during a specific processing performance. Since the Total Records Read Counter is "job execution" dependent, this counter is cleared to zero at the outset of every processing program execution. The Number of Modifications Counter counts the number of times a specific record has been changed. As this counter is "record" dependent, this counter is never cleared to zero, This specific

counter should identify the number of individual records that may be retrieved, viewed, and verified from all of the tables in the specific Master Transaction Cluster to prove its auditability.

MTCP Archive Database 304

5 The Archive database 304 is read only. Within the Archive database 304, information contained in the Master Archive Table 336 represents a snapshot of information in the Master Table in the Current database 300 at a particular point in time such as the end of a month, quarter, or year. And, information in the History Archive Table 336 contains all of the transactions that have occurred from the beginning of the most recent processing period until the particular point in time, be it month, quarter, or year. For example, the Master Archive Table 336 contains the status of the Master Table 312 at the
10 end of the first quarter, and the History Archive 340 contains all of the transaction modifications occurring since the end of the last quarter. In this fashion, any status of any Master Table 312 can be recreated for any point in time (say, month ends) by simply processing all transactions in the History Archive 340 for the desired period against the previous Master Archive Table 336, or the beginning of the period.

15 MTCP SQL Script Library Implications

 To achieve 100% auditability of a complete system, every master file (or table in relational database management systems has a Master Transaction Cluster. Therefore, a total system containing 15 tables would require 15 x 8 or 120 tables to achieve full 100% auditability. Since each table will require at least 4 SQL scripts to (1) Create Table, (2) Select data from the table, (3) Delete data from the table, and (4) Drop the Table in the event of redefinition, the number of SQL scripts is 15
20 x 8 x 4, or 960 SQL Scripts. Then, each Master Transaction Cluster will require at least a Processing Program plus a Review, Reset, and Retest, or at least four more programs for each cluster, or 4 x 15, or 60, more SQL Scripts. All of the SQL scripts would be stored in one SQL Script Library on the computer for future reference and ease of maintenance.

MTCP Multi-processing

25 The multi-processing of the Master Transaction Cluster occurs in the following manner:

 For additions (or Insertions in SQL) of data

 The Insertions to the Master Table 312 and Insertions to the Accept Table 328 may be processed simultaneously.

 For changes (or Updates in SQL) of data

30 The Update of the Master Table 312 and the Insert to the Accept Table 328 may be processed simultaneously after the original record from the Master Table 312 has been copied to the History Table 332.

For deletes (or Deletes in SQL) of data

The Deletion from the Master Table 312 and the Insertion to the Accept Table 328 may be processed simultaneously after the current record in the Master Table 312 has been updated for the transaction identifier and then copied to the History Table 332.

5

MTCP Creation

Before processing any Master Transaction Cluster, the necessary databases and files (or tables) must be created. For each business enterprise utilizing the present invention, these databases and files are created only once in the following manner:

10

(Begin Program)

Create "Current" database

Create "Archive" database

in the "Current" database

Create Master Table

15

Create Input Table

Create Reject Table

Create Accept Table

Create Second Accept Table (on separate disk unit, if desired)

Create History Table

20

Create Summary Table

Create Sequence Number for Accepts

Create Sequence Number for Rejects

in the "Archive" database

Create Master Archive

25

Create History Archive

(End of Program)

MTCP Processing

Processing of the "Master Transaction Cluster" then occurs in the following manner.

30

Step 1: All required information for processing a transaction is first captured on an Input Form.

Step 2: Once this information is edited by, e.g., an operator, an Enter Key can be pressed by an operator to write this information to the Input Table 316 for particular master transaction clusters.

Step 3: For each input table 316, a polling program notes that the Input Table is not empty and has a transaction action to be processed whereupon the action is processed by a process (denoted "process I" in Fig. MI).

Step 4: The transaction processing program determines the type of file maintenance to perform; basically,

- (1) add a record (entitled Insert a Row in SQL),
- 5 (2) change a record (entitled Update a Row in SQL), and
- (3) delete a record (entitled Delete a Row in SQL),

which in turn determines the multi-processing potential as described above in the MTCP Multi-processing.

The normal daily processing flow to achieve 100% auditability in either real-time or batch mode is as follows:

```

(Begin Program)
10 Read System Clock to Store Begin Time
   (Read Next Transaction)
   If Last Transaction
     Read System Clock to Store End Time
     Write End Time, Begin Time, Number of Accepts, Number of Rejects,
15     and Total Records Read to Summary Table
     Goto End of Program
   Increment Total Records Read by 1
   (Add a New Record)
   If transaction is "Add" then
20     If record exists then
       Process Addition Error
       Goto Write Reject Table
*****
   * Select System Clock Date           into Insert - Transaction Date *
25   * Increment Sequence Number         into Insert - Transaction Number *
   * Select User Name                   into Insert - Transaction User *
   * Select Zero                         into Update - Transaction Number *
   * Select Zero                         into Delete - Transaction Number *
*****
30   Insert to Master Table
   Goto Write Accept Table
   (Change an Existing Record)
   If transaction is "Change" then
35     If record does not exist then
       Process Change Error
       Goto Write Reject Table
*****
   * (Master Snapshot) *
40   * Move Master Table Record to History Table *
*****
   * Select System Clock Date           into Update - Transaction Date *
   * Increment Sequence Number         into Update - Transaction Number *
   * Select User Name                   into Update - Transaction User *
45   * Select Zero                         into Delete - Transaction Number *
   * Increment Master Table Number of Modifications by 1 *
*****

```

Update Master Table with New Data
 Goto Write Accept Table

```

5      (Delete an Existing Record)
      If transaction is "Delete" then
          If record does not exist then
              Process Drop Error
              Goto Write Reject Table
          *****
10         * Select System Clock Date      into Delete - Transaction Date      *
          * Increment Sequence Number      into Delete - Transaction Number *
          * Select User Name                into Delete - Transaction User      *
          *****
          * Update Master Table Record for Tran Date/Tran Num/User      *
15         *****
          * (Master Snapshot)                                                    *
          * Move Master Table Record to History Table                          *
          *****
          Delete Master Table Record From Master Table
          (Write MULTI-PROCESSED Accept Table)
          *****
          * Move "Current"                  into Archive - Status *
          * Move "System Date"              into Archive - Date   *
          *****
25         Increment Accept Counter
          Insert to Accept Table
          Insert Second Accept Table (on a separate disk drive, if desired)
          Goto Loop to Next Transaction
          (Write Reject Table)
30         Increment Reject Counter
          Insert to Reject Table
          (Loop to Next Transaction)
          Goto Read Next Transaction
          (End of Program)
35         End
    
```

Note: The specific multiprocessing of "Write Multiprocessed Accept Table" may be relocated to the specific routine (Add, Change, or Delete) depending upon the computer language being used.

40 Step 5: At the end of the "proofing period" ,such as daily or weekly, when proof tallies are matched to computer tallies, the Accept Table can be deleted as follows:

```

      (Begin Program)

          Delete All Records from the Accept Table

      (End Program)
    
```

Step 6: Backup all databases and tables before any information is purged as follows:

(Begin Program)

Write All Tables in the "Current" database to backup

Write All Tables in the "Archive" database to backup

(End of Program)

5 Step 7: At the end of a user-defined period, an archive and purge process occurs that

(Begin Program)

* Move "Archive" to Archive Status

10 * Move "System Date" to Archive Date

Move All Records in the Master Table to Master Archive.

Move All Records in the History Table to the History Archive.

(End Program)

15

Step 8: In the event that current records are wrongfully moved to the History Archive,

they may be retrieved by

(Begin Program)

Move Specific Records from the Master Archive to the Master Table

20 Move Specific Records from the History Archive to the History Table

(End Program)

This program should be executed only after Records have been moved from the Current database 300 to the Archive database 304. It should never be run after new transactions have been processed to the Current database 300.

25

MTCP Backup/Recovery

If necessary, a recovery program can be utilized at any time in the event of hardware failure. Upon complete recovery, Step 7 and Step 8 will have to be re-executed to insure the correct status before the next day's processing is begun. The Accept Table can then be used to as a substitute Input Table to return the system to its previous processing point. Once this table is exhausted, data from the Input

5 Table would supply the remaining data for the processing job.

MTCP Management

Once test data are defined and processed, a business enterprise may

- 10
- (a) Review lists of the contents of all Master Tables 312 for determining correctness.
 - (b) Reset the contents of all Master Tables for performing the next test.
 - (c) Retest.

MTCP Auditability

Once auditability is achieved, the business enterprise may query:

- 15
- (a) When a Master Table Cluster was created.
 - (b) When each record was added (or inserted) to the Master Table 312,
 - (c) How many authorized changes (or updates) have been made to a record of the Master Table 312.
 - (d) Prove the integrity of the master transaction cluster by producing a sequential list of all record changes, and if the record was deleted, where the record is stored.

Accordingly, 100% auditability of every change, every day, for every application is possible.

20

Multiprocessing Defined

Unlike serial processing which processes all jobs in sequential fashion, multiprocessing processes some of the same jobs simultaneously, or in parallel. While multiprocessing is not new, major computer manufacturers such as Compaq, Digital, Hewlett-Packard, IBM, NCR, Unisys, etc. have announced offerings of low-cost multiprocessing machines based on 2, 4, 8, and sixteen processors. These

25 machines will rapidly increase the demand for multiprocessing software, which is known as "multithreaded" software. Multithreaded software permits the simultaneous execution of more than one jobs or job sequences.

Multiprocessing takes two forms, Symmetrical Multiprocessing (SMP) and Massively Parallel Processing (MPP), the difference being that symmetrical multiprocessing machines collectively have only one bus between the processors and the peripheral storage. For example, a symmetrical multiprocessing machine may have eight processors, one bus, and sixteen disk drives. In contrast, massive parallel processing machines has one bus for each processor. For example, a massively parallel machine may have eight processor, eight busses, and sixteen disk drives. Therefore, symmetrical multiprocessing machines are best suited for applications with a high processing content and a low input/output content. In contrast, massively parallel processing machines are best suited for applications that can be parallelized and have a high input/output requirement, as is the case with many commercial systems.

In either event, multiprocessing machines are best utilized when carefully tuned to avoid bottlenecks. This is likely to mean that all of the layers constituting a computing environment are multiprocessing-enabled. That is, the hardware, operating system, relational database management system, and the specific application are capable of multiprocessing. Some multiprocessing mainframes have been available for several years as well as some versions of the UNIX operating system. Only a few multiprocessing relational databases exist and even fewer multiprocessing applications. It is believed by some that the success of multiprocessing is solely dependent upon the "knowledge of the application" rather than "knowledge of the underlying tools," the tools being the hardware, operating system, and relational database system.

Accordingly, it is believed that the limiting factors for the success of multiprocessing for financial systems depends on:

- (1) the lack of financial transaction application knowledge,
- (2) a lack of understanding of how multiprocessing can be used to effect 100% auditability, and
- (3) the lack of understanding as to how to decompose a financial transaction system into a series of small independent processes that may be performed simultaneously.

MTPC Uniqueness

Approaching multiprocessing from the business enterprise perspective, there are several levels by which processing could be sub-divided. These are by:

- (1) application, wherein certain applications are capable of being performed in parallel, such as , e.g., Accounts Receivable, Accounts Payable, etc.
- (2) function, wherein certain functions within an application are capable of being performed in parallel, such as, e.g., updating customer profiles, customer status, or performance.

- (3) process, wherein certain large tasks are capable of being decomposed into smaller tasks that can be performed in parallel, such as, e.g., by splitting a large Accounts Receivable process, such as billing, into subcomponents.
- (4) transaction, wherein transactions are decomposed into subtransactions that are capable of being performed in parallel.

5 The value of MTCP is that it addresses the last form of multiprocessing which is believed to be the most critical to delivering rapid response times for real-time financial transaction processing systems. That is, by dividing a transaction into subtransactions that can be spread across several multiprocessors, processing throughput may be faster. Plus, the large number of small programs make maintenance much easier and less expensive.

A first embodiment of the transaction processing controller 52 is provided in the flowchart of Fig. 6. Note that for simplicity, error handling and related validity checking steps have been omitted. However, the performance of such steps is within the scope of the present invention, as one skilled in the art will appreciate. A second pseudo-code embodiment of the transaction processing controller 52 follows.

Pseudo-Code for the Command Processor
(Transaction Processing Controller 52)

15 BEGIN

/* The following switches are global. They control both the activity of the system. */

/* The Processor Switches monitors the availability of an eight processor computer. */

20 /* The Process Switches monitors all of the jobs that are to be executed. */

/* These switches initialize the system, and then change throughout processing */

/* as the subcomponents of the system and the processors finish. */

/* The Processor Switches are turned ON as jobs are sent to specific processors. */

25 /* The Processor Switches are turned OFF after the jobs are completed. */

Set Processor 1 Switch = 0

Set Processor 2 Switch = 0

Set Processor 3 Switch = 0

30 Set Processor 4 Switch = 0

Set Processor 5 Switch = 0

Set Processor 6 Switch = 0

Set Processor 7 Switch = 0

Set Processor 8 Switch = 0

35 Read Begin Time from Systems Clock into Working Storage

Set Total Records Read = 0

Set Number Accepts = 0

Set Number Rejects = 0

40 /* The Command Programs reads the transaction input from the operator, then */

/* edits the transaction for validity and loads the transaction processing algorithms */

/* from the Transaction Processing table (or cache file) to a temporary table. It then */

/* walks down all of algorithms in the temporary table to process the total transaction */

```

/* with 100% auditability. Each algorithm may be passed to a separate processor.

/* Read operator instructions for starting and ending item in input stream          */
/* For the purposes of restart in the event of mid-stream job failure                */
5  /* For the purpose of omissions in processing.                                  */
/* Operator may enter Begin ..... End for all items                               */
/* Operator may enter Begin ..... End for a beginning list                       */
/* Operator may enter Begin ..... End for an intermediate list                   */
10 /* Operator may enter Begin ..... End for an ending list                       */

Read Beginning Item in Input Stream from Master Control Terminal
Read Ending Item in Input Stream from Master Control Terminal

15 Set Beginning Item to Next Transaction
Set Ending Item to End of List

Read System Clock for Begin Time
Add Record with Begin Time
20 IF Error then
    Message "No System Table Record for Begin Time", Details
ENDIF

<<Read Next Transaction>>

25 /* The Process Switches are turned ON as each transaction subcomponent is completed. */
/* The Process Switches are turned OFF after the total transaction is completed.      */
Set Process 1 Switch = 0
Set Process 2 Switch = 0
30 Set Process 3 Switch = 0
Set Process 4 Switch = 0
Set Process 5 Switch = 0
Set Process 6 Switch = 0
Set Process 7 Switch = 0
35 Set Process 8 Switch = 0
Set Process 9 Switch = 0
Set Process 10 Switch = 0
Set Process 11 Switch = 0
40 Set Process 12 Switch = 0
Set Process 13 Switch = 0
Set Process 14 Switch = 0
Set Process 15 Switch = 0
Set Process 16 Switch = 0
45 Set Process 17 Switch = 0
Set Process 18 Switch = 0
Set Process 19 Switch = 0
Set Process 20 Switch = 0
Set Process 21 Switch = 0
50 Set Process 22 Switch = 0
Set Process 23 Switch = 0
Set Process 24 Switch = 0

Read Next Transaction into Working Storage
IF EOF then
55 Set End Time from Systems Clock into Working Storage
INSERT End-time, Begin Time
Total Records Read, Number Accepts, Number Rejects

```

```

        into Summary Table
    IF Error then
        Message "INSERT ST Table", Details
        STOP
5      ENDIF
      Goto EOJ
    ENDIF

    IF Next Transaction = End of List
10     Goto EOJ
    ENDIF

    Increment Total Records Read

15     <<Test Transaction Type>>
    IF Transaction Type != ' ' then
        /* Set Switches for Trade Offset and Settle Offset Processing */
        Set Process 1 Switch = 0
        Set Process 2 Switch = 1
20     Set Process 3 Switch = 1
        Set Process 4 Switch = 1
        Set Process 5 Switch = 1
        Set Process 6 Switch = 0
        Set Process 7 Switch = 1
25     Set Process 8 Switch = 1
        Set Process 9 Switch = 1
        Set Process 10 Switch = 1
        Set Process 11 Switch = 0
        Set Process 12 Switch = 1
30     Set Process 13 Switch = 1
        Set Process 14 Switch = 1
        Set Process 15 Switch = 1
        Set Process 16 Switch = 1
        Set Process 17 Switch = 0
35     Set Process 18 Switch = 0
        Set Process 19 Switch = 1
        Set Process 20 Switch = 1
        Set Process 21 Switch = 1
        Set Process 22 Switch = 1
40     Set Process 23 Switch = 1
        Set Process 24 Switch = 0
    ENDIF

    <<Test OORR>>
45     IF OORR = 'O' then
        *****
        CALL N_gine EDIT
        *****
        IF Edit Error
50         Message "Edit Error", Details
            Goto Write Reject Table
        ENDIF

        IF Tran-Type != 'Sell'
55         OR Tran-Type != 'Withdraw' then
            INSERT into Transaction Journal Table
            IF Error

```

35

```

    Message "Insert TJ Error", Details
    Goto Write Reject Table
  ENDIF
  IF Correction Data then
5      DELETE from Reject Table
      IF Error
          Message "Delete Reject Error", Details
          Goto Write Reject Table
      ENDIF
10  ENDIF
  ENDIF
  *****
  CALL TT          i.e., execute the algorithms in the temporary table
  *****
15  IF Temporary Table Error then
      Message "Temporary Table Error", Details
      Goto Write Reject Table
  ENDIF

20  Generate Sequence Number

  ELSIF OORR = 'R'
      *****
      CALL N_gine EDIT
      *****
25  IF Edit Error
          Message "Edit Error", Details
          Goto Write Reject Table
      ENDIF
30  Assign Transaction Number = '000000'
      Assign LOT Number      = 1

      <<Read Next Reversal>>
      Read Transaction Journal Table for reversal number
35  IF "No Transaction Exists" where LOT = 1 then
          Message "No Transaction Exists", Details
          Goto Write Reject Table
      ENDIF
      IF "No Transaction Exists" and LOT > 1 then
40  Goto Transaction Wrap-up
      ENDIF
      IF Previously Reversed
          Message "Previously Reversed", Details
          Goto Write Reject Table
45  ENDIF

      INSERT Reversing Transaction" to Transaction Journal Table
      IF Error
          Message "INSERT TJ Reversing Error", Details
50  Goto Write Reject Table
      ENDIF
      UPDATE "Reversed" Transaction
      IF Error
          Message ""UPDATE TJ Reversed Error", Details
55  Goto Write Reject Table
      ENDIF

```

```

Increment the LOT Number
*****
CALL TT           i.e., execute the algorithms in the temporary table
*****
5   IF Temporary Table Error then
      Message "Temporary Table Error", Details
      Goto Write Reject Table
    ENDIF
    Goto Read Next Reversal
10
    Generate Sequence Number

    UPDATE "Reversed" Transaction, ALL ROWS with Reversing Data
    IF Error then
15      Message "UPDATE TL Table Reversed", Details
      Goto Write Reject Report
    ENDIF
    UPDATE "Reversing" Transaction, ALL ROWS with Reversed Data
    IF Error then
20      Message "UPDATE TL Table Reversing", Details
      Goto Write Reject Report
    ENDIF
    ELSE
25      INSERT into Reject Table "No Originate or Reverse Code"
      IF Error then
        Message "Insert Reject Table", Details
        Goto Write Reject Table
      ENDIF
    ENDIF
30
    <<Transaction Wrap-up>>
    INSERT INTO Transaction Count Table
    Select Original-Count and Reversal Count from TC Table into Working Storage
    IF Error then
35      INSERT INTO TC Table, Details
      IF Error then
        Goto Write Reject Table
      ENDIF
    ELSE
40      IF AORS = 'O' then
        Increment Original-Count
      ELSIF AORS = 'R'
        Increment Reversal-Count
      ELSE
45      Message "Invalid AORS Code", Details
      STOP
    ENDIF
    ENDIF
50
    <<Test Trade Settlement>>
    IF Transaction Switch = 2
      Goto Loop Next Transaction
    ENDIF
55
    IF Transaction Switch = 1
    OR AORS = ' ' then
      Goto Loop Next Transaction

```

```

ENDIF

/* COMMIT Work to Database          */
5 COMMIT Original Transaction Before Offset Transaction

IF      AORS = 'A' then
      Insert Licensee Trade Offset Buy in Transaction Identifier
ELSIF   AORS = 'S'
      Insert Licensee Trade Offset Sell in Transaction Identifier
10 ELSE
      Message "Invalid AORS", Details
ENDIF

/* Swap Account Numbers for Automatic Transaction          */
15 Move Account Number to Working Storage Account Number
   Move Buyer/Seller Number to Account Number
   Move Working Storage Account Number to Account Number
   Multiply the Net Amount by -1
   Multiply the Amount Units by -1
20 Add Number of Settlement Days from Entity Master to Trade Date to determine Settlement Date

   Add to Total Number of Accepts
   UPDATE Row in System Table for Number of Accepts
   IF Error then
25       Message "Update Error for Accepts", Details
       Goto Write Reject Record
   ENDIF

   Go to Test Transaction Type
30
   <<Loop Next Transaction>>

/* COMMIT Work to Database          */
35 COMMIT Original Transaction or Offset Transaction, if any
   Goto Read Next Transaction

   <<Write Reject Record>>
   Add to Total Number of Rejects
   UPDATE Row in System Table for Number of Rejects
40   IF Error then
       Message "Update Error for Rejects", Details
   ENDIF

   INSERT Into Reject Table, Details
45   IF Error
       Message "Insert Command Reject Table", Details
       STOP
   ENDIF

50   Move Incoming Licensee Identifier to Stored Licensee Identifier
   Move Incoming Account Identifier to Stored Account Identifier
   Move Incoming Transaction Identifier to Stored Transaction Identifier
   Move Incoming Entity Identifier to Stored Entity Identifier
55   Goto Read Next Transaction

   <<EOJ>>
   Read System Clock for End Time

```

```

Add Record with End Time
IF Error then
    Message "No System Table Record for End Time", Details
ENDIF
5
END

```

10 A first embodiment of the transaction preprocessor and decomposer 54 is provided in the flowcharts of Figs. 7-A through 7-D and Figs. 8-A and 8-B. Note that for simplicity, error handling and related validity check steps have been omitted. However, the performance of such steps is within the scope of the present invention, as one skilled in the art will appreciate.

A second pseudo-code embodiment of the transaction preprocessor and decomposer 54 follows.

```

15
Pseudo-Code for the Edit Processor for
all Incoming Transactions
    (Transaction Preprocessor and Decomposer 54)

BEGIN

20
    Housekeeping

        Set Working Storage Alphas to Blanks
        Set Working Storage Numbers to Zeroes

25
    IF Incoming Licensee Identifier = Stored Licensee Identifier then
        Using Licensee Identifier from Input String, retrieve
            Licensee Name
            Trade Settlement Switch
            Trade Offset Buy
            Trade Offset Sell
30
        from Licensee Master into Working Storage
        IF Error then
            Message "No Licensee Master", Detail
            Goto EOJ
        ENDIF
35
    ENDIF

    /*****/
40
    IF the Default Definition Table has not been loaded to memory then
        LOAD all records from the Default Definition Table consisting of
            Licensee
            DD Class
            DD Identification
            DD Sub-Class
45
            DD Accounting Control Number
            DD Name
            from the Default Definition Table
            into the Temporary Table (TA)
50
        IF Error then
            Message "NO TA Table", Details
            Goto EOJ

```



```

                ENDIF

ENDIF

5      /*****
      IF the Incoming Account Identifier = Stored Account Identifier
        Goto Access Transaction Master (TM)

10     ELSE

        /*** This is the first table containing control totals for cash, units, and cost basis ***/
        <<Access Account Master>>

15     From the Account Master Table (TM)
        using the Licensee Identifier from the Input String
        and the Account Identifier from the Input String, retrieve

                Account Type
                Income Posting Code
20     Income/Expense Switch
                Receipt/Disbursement Switch
                Performance Measurement Switch

                Fiscal Year - Month
25     Fiscal Year - Day
                Fiscal Year - Number Periods

                Income Cash Balance
                Principal Cash Balance
30     Invested Income
                Invested Principal
                Total Units - Assets
                Liabilities
                Total Units - Liabilities
35

        and the Row Identification of the Account Master Record
        from the Account Master Table (AM) into Working Storage
      IF Error then
        Report "Invalid Account Identifier", Details
40     Goto Write Reject Report
      ENDIF

ENDIF

ENDIF

45     <<Access Transaction Master>>
      IF the Incoming Transaction Identifier = Stored Transaction Identifier
        Goto Test Cash Entry in Entity Attribute Table

50     ELSE
        Using the Licensee Identifier from the Input String
        and the Transaction Identifier from the Input String
                Transaction Name
                Add or Subtract Switch
55     Settlement Switch
        and the Row Identification
        from the Transaction Master Table (TM) into Working Storage

```

```

IF Error then
    Message "Invalid Transaction Identifier", Details
    Goto Write Reject Report
ENDIF
5
IF AORS = 'A' then
    Using the Licensee Identifier from the Input String
    and the Trade Offset Buy from Working Storage, verify
    the existence of a Trade Offset Buy in the TM Table
10
    IF Error then
        Message "No Trade Offset Buy", Details
        Goto Write Reject Table
    ENDIF
15
ELSE AORS = 'S' then
    Using the License Identifier from the Input String
    and the Trade Offset Sell from Working Storage, verify
    the existence of a Trade Offset Sell in the TM Table.
20
    IF Error then
        Message "No Trade Offset Sell", Details
        Goto Write Reject Table
    ENDIF
25
ELSE
    Message "Invalid AORS Code", Details
    Goto Write Reject Report
30
ENDIF

<<Access Transaction Processing Table (TP)>>
Using the Licensee Identifier from the Input String
and the Transaction Identifier from the Input String, retrieve
35
    ALL of the Transaction Processing algorithms
    from the Transaction Processing Table (TP)
    into a Temporary Table (TT) in Working Storage
IF Error then
    Message "No Transaction Processing Algorithms", Details
40
    Goto Write Reject Report
ENDIF

/**** This is the second control table containing cash, units, cost basis, liabilities, etc. ****/

45
<<Test Income Cash Posting Controls>>
IF the Working Storage Income Posting Code = 'I'
OR the Working Storage Income Posting Code = 'B' then
    Count the number of IC entries in the TA table

50
    <<Test Income Cash>>
    IF count = 1 then
        Using Licensee Identifier from the Input String
        and the Class = 'IC'
        and the Sub-Class = ' ' retrieve
55
        Accounting Control Number from TA into Working Storage
    IF Error then
        Message "Invalid Income Cash ACN", Details

```

41

```

    Goto Write Reject Record
ENDIF

5      Using the Licensee Identifier from the Input String
        and the Accounting Control Number in Working Storage, retrieve
        Accounting Control Number
        and the Row Identification from General Ledger Table (SG)
10     IF Error then
        Message "Invalid Income Cash on SG", Details
        Goto Write Reject Report
    ENDIF

    ELSIF count = 2 then

15     Using the Licensee Identifier from the Input String
        and the Class = 'IC'
        and the Sub-class = 'D', retrieve
        Accounting Control Number from TA into Working Storage

20     IF Error then
        Message "Invalid Income Cash Demand ACN in TA", Details

        Goto Write Reject Report
    ENDIF

25     Using the Licensee Identifier from the Input String
        and the Accounting Control Number in Working Storage, retrieve
        Accounting Control Number
        and the Row Identification from the General Ledger

30     IF Error then
        Message "Invalid Income Cash Demand in GL", Details
        Goto Write Reject Report
    ENDIF

35     Using the Licensee Identifier from the Input String
        and the Class = 'IC'
        and the Sub-class = 'O', retrieve
        Accounting Control Number from TA table into Working Storage

40     IF Error then
        Message "Invalid Income Cash Overdraft ACN in TA",
            Details
        Goto Write Reject Report
    ENDIF

45     Using the Licensee Identifier from the Input String
        and the Accounting Control Number in Working Storage, retrieve
        Accounting Control Number
        and the Row Identification from the General Ledger

50     IF Error then
        Message "Invalid Income Cash Overdraft in GL", Details
        Goto Write Reject Report
    ENDIF

55     ELSE
```

Message "Invalid Income Cash Count on DD", Details
Goto Write Reject Record

ENDIF

5

<<Test Principal Cash Posting Controls>>

ELSIF the Working Storage Income Posting Code = 'P'
Count the number of PC entries in the TA table

10

<<Test Principal Cash>>

IF count = 1 then

Using the Licensee Identifier from the Input String

and the Class = 'PC'

and the Sub-Class = ' ' retrieve

15

Accounting Control Number from TA into Working Storage

IF Error then

Message "Invalid Principal Cash ACN", Details

Goto Write Reject Record

ENDIF

20

Using the Licensee Identifier from the Input String

and the Accounting Control Number in Working Storage, retrieve

Accounting Control Number

and the Row Identification from General Ledger Table (SG)

25

IF Error then

Message "Invalid Principal Cash on SG", Details

Goto Write Reject Report

ENDIF

30

ELSIF count = 2 then

Using the Licensee Identifier from the Input String

and the Class = 'PC'

and the Sub-class = 'D', retrieve

35

Accounting Control Number from TA into Working Storage

IF Error then

Message "Invalid Principal Cash Demand ACN in TA",
Details

40

Goto Write Reject Report

ENDIF

Using the Licensee Identifier from the Input String

and the Accounting Control Number in Working Storage, retrieve

Accounting Control Number

and the Row Identification from the General Ledger

45

IF Error then

Message "Invalid Principal Cash Demand in GL", Details

Goto Write Reject Report

50

ENDIF

Using the Licensee Identifier from the Input String

and the Class = 'PC'

and the Sub-class = 'O', retrieve

55

Accounting Control Number from TA table into Working Storage

```

IF Error then
    Message "Invalid Principal Cash Overdraft ACN in TA",
        Details
    Goto Write Reject Report
5   ENDIF

    Using the Licensee Identifier from the Input String
    and the Accounting Control Number in Working Storage, retrieve
10   Accounting Control Number
    and the Row Identification from the General Ledger

    IF Error then
        Message "Invalid Principal Cash Overdraft in GL", Details
        Goto Write Reject Report
15   ENDIF

    ELSE
        Message "Invalid Principal Cash Count on DD", Details
        Goto Write Reject Record
20   ENDIF

    ELSE
        Message "Invalid Posting Code", Details
        Goto Write Reject Report
25   ENDIF

    ENDIF
30

    <<Test Cash Entry in Entity Attribute Table>>
    Using the Licensee Identifier from the Input String
    and the Account Control Number from the TU Record in Working Storage, retrieve
35   The Total Units - Assets
    and the Row Identifier from the Entity Attribute Table (EA)
    IF Error then
        Message "Invalid Total Units", Details
        Goto Write Reject Table
40   ENDIF

    <<Test Asset / Liability Processing>>
    IF Working Storage Add or Subtract Switch (AORS) is OFF then
45   Goto EOJ
    ENDIF

    IF Incoming Entity Identifier = Stored Entity Identifier then
50   Goto EOJ
    ENDIF

    /** This is the third table containing control table for cash, units, cost basis, liabilities, etc. ***/
    <<Access Entity Attribute Table (EA)>>
55   Using the Licensee Identifier from the Input String
    and the Entity Identifier from the Input String, retrieve

```

```

Accounting Control Number (Asset)
Accounting Control Number (Liability)

Diversification Type
Diversification Group
Diversification Class

Invested Income Balance
Invested Principal Balance
Total Units - Assets
Total Units - Liabilities

and the Row Identification of the Entity Attribute Record
from the Entity Attribute Table (EA) into Working Storage
IF Error then
Message "Invalid Entity Identifier in EA", Details
Goto Write Reject Table
ENDIF

<<Access the Entity Transaction Table (ET)>>
Using the Licensee Identifier from the Input String
and the Entity Identifier from the Input String, verify
the existence of an acceptable transaction
in the Entity Transaction Table (ET) for the Entity Identifier.
IF Error then
Message "Invalid Transaction for this Entity", Details
Goto Write Reject Table
ENDIF

<<Access the Entity Master Table (EM)>>
Using the Entity Identifier from the Input String, retrieve
Income Rate
Income Ex-Date
Income Record Date
Income Payment Date
Cap-Adj Rate
Cap-Adj Ex-Date
Cap-Adj Record Date
Cap-Adj Payment Date
Settlement Days
Current Price
from the Entity Master Table (EM) into Working Storage
IF Error then
Message "No Entity Master", Details
Goto Write Reject Report
ENDIF

<<Test Other Assets>>
Using the Licensee Identifier from the Input String
and the Account Type from Working Storage
and the Accounting Control Number - Asset from Working Storage, retrieve
the Accounting Control Number - Asset
and Row Identifier from the General Ledger (SG)
IF Error then
Message "Invalid ACN - Asset", Details
Goto Write Reject Report
ENDIF

```

```

5  <<Test Other Liabilities>>
    Using the Licensee Identifier from the Input String
    and the Account Type from Working Storage
    and the Accounting Control Number - Liability from Working Storage, retrieve
    the Accounting Control Number - Liability
    and Row Identifier from the General Ledger (SG)
    IF Error then
    Message "Invalid ACN - Liabilities", Details
    Goto Write Reject Report
10  ENDIF

    <<Test Invested Income>>
    Using the Licensee Identifier from the Input String
    and the Account Type Code from Working Storage
15  and the Invested Income Identifier from Working Storage, retrieve
    the Invested Income Balance
    and the Row Identifier from the General Ledger Table (SG)
    IF Error then
    Message "Invalid Invested Income"
20  Goto Write Reject Table
    ENDIF

    <<Test Invested Principal>>
    Using the Licensee Identifier from the Input String
25  and the Account Type Code from Working Storage
    and the Invested Principal Identifier from Working Storage, retrieve
    the Invested Principal Balance
    and the Row Identifier from the General Ledger Table (SG)
    IF Error then
30  Message "Invalid Invested Principal"
    Goto Write Reject Table
    ENDIF

    Goto EOJ
35

    <<Write Reject Table>>
    Add to Reject Table
    IF Error then
    Message "Invalid Insert to Reject Table", Details
40  STOP
    ENDIF

    <<EOJ>>
    Null
45

END

```

50 **Pseudo-Code for the SCHEDULER**
 (Subtransaction Scheduler 62)

```

BEGIN
55  <<Read Next Process>>
    Read Next Transaction in Temporary Table (TT)
    IF EOJ then

```

```

    <<Test All Switches - AORL>>
    IF      All 18 Process Switches = 0
        Goto EOJ
    ENDIF
5         Wait 10 milliseconds
        Goto Test All Switches - AORL
    ENDIF
<<Test Processor Availability>>
10        IF Processor 1 Switch = 0 then
        Set Processor 1 Switch = 1
        Initiate Process on Processor 1          @ end, Set Processor 1 Switch = 0
        Goto Next Process Loop
    ENDIF
15        IF License Master (LM) Number of Processors = 1 then
        <<Test 1 Processor>>
        IF Processor 1 Switch = 1 then
            Wait 10 Milliseconds
            Goto Test 1 Processor
        ENDIF
20        Goto Test Processor Availability
    ENDIF

25        IF Processor 2 Switch = 0 then
        Set Processor 2 Switch = 1
        Initiate Process on Processor 2          @ end, Set Processor 2 Switch = 0
        Goto Next Process Loop
    ENDIF
30        IF License Master (LM) Number of Processors = 2 then
        <<Test 2 Processors Busy>>
        IF      Processor 1 Switch = 1
        AND     Processor 2 Switch = 1 then
            Wait 10 milliseconds
            Goto Test 2 Processors Busy
        ENDIF
35        Goto Test Processor Availability
    ENDIF

40        IF Processor 3 Switch = 0 then
        Set Processor 3 Switch = 1
        Initiate Process on Processor 3          @ end, Set Processor 3 Switch = 0
        Goto Next Process Loop
    ENDIF
45        IF Processor 4 Switch = 0 then
        Set Processor 4 Switch = 1
        Initiate Process on Processor 4          @ end, Set Processor 4 Switch = 0
        Goto Next Process Loop
    ENDIF
50        IF License Master (LM) Number of Processors = 4 then
        <<Test 4 Processors Busy>>
        IF      Processor 1 Switch = 1
        AND     Processor 2 Switch = 1
        AND     Processor 3 Switch = 1
        AND     Processor 4 Switch = 1 then
            Wait 10 milliseconds
55        Goto Test 4 Processors Busy
        ENDIF
        Goto Test Processor Availability
    
```



```

ENDIF
IF Processor 5 Switch = 0 then
    Set Processor 5 Switch = 1
5      Initiate Process on Processor 5      @ end, Set Processor 5 Switch = 0
      Goto Next Process Loop
ENDIF
IF Processor 6 Switch = 0 then
    Set Processor 6 Switch = 1
10     Initiate Process on Processor 6      @ end, Set Processor 6 Switch = 0
      Goto Next Process Loop
ENDIF
IF Processor 7 Switch = 0 then
    Set Processor 7 Switch = 1
15     Initiate Process on Processor 7      @ end, Set Processor Switch 7 = 0
      Goto Next Process Loop
ENDIF
IF Processor 8 Switch = 0 then
    Set Processor 8 Switch = 1
20     Initiate Process on Processor 8      @ end, Set Processor 8 Switch = 0
      Goto Next Process Loop
ENDIF
IF Licensee Master (LM) Number of Processors = 8 then
    <<Test 8 Processors Busy>>
25     IF Processor 1 Switch = 1
        AND Processor 2 Switch = 1
        AND Processor 3 Switch = 1
        AND Processor 4 Switch = 1
        AND Processor 5 Switch = 1
30     AND Processor 6 Switch = 1
        AND Processor 7 Switch = 1
        AND Processor 8 Switch = 1 then
            Wait 10 milliseconds
            Goto Test 8 Processors Busy
35     ENDIF
        Goto Test Processor Availability
    ENDIF
    <<Next Process Loop>>
    Goto Read Next Process
40
    <<EOJ>>
    Null
END

```

45

**Process the Controls Process Routine
in the Temporary Table (TT)**

```

50 BEGIN
    IF OORR = "O" then
        Set Factor = + 1
    ELSIF OORR = 'R' then
        Set Factor = - 1
55 ENDIF

```

```

5  <<Total Units>>
    IF      Operand 2 = 'TU' then
          (AMU) Process AM          Units
          (EAU) Process EA          Units
          (PMU) Process PM          Units

10  <<Cash Balances>>
    ELSIF  Operand 2 = 'IC'
    OR      Operand 2 = 'PC' then
          (AMC) Process AM          Income Cash Demand
                                          Income Cash Overdraft
                                          Principal Cash Demand
                                          Principal Cash Overdraft
          (EAC) Process EA          Income Cash
15                                          Principal Cash

          (GLC) Process GL          Assets - Income Cash Demand
                                          Assets - Income Cash Overdraft
20                                          Assets - Principal Cash Demand
                                          Assets - Principal Cash Overdraft
                                          Liab - Income Net Worth
                                          Liab - Principal Net Worth

25  <<Investment Balances>>
    ELSIF  Operand 2 = 'II'
    OR      Operand 2 = 'IP' then
          (AMI) Process AM          Invested Income
                                          Invested Principal
          (EAI) Process EA          Cost
30          (GLI) Process GL          Assets - Actg Control Number
                                          Liab - Income Net Worth
                                          Liab - Principal Net Worth

35  <<Other Customized Investment Reporting>>
    ELSIF  Operand 2 = 'I' and Report Request = 'Y'
    OR      Operand 2 = 'E' and Report Request = 'Y' then
          (IEE) Process IE
          (PME) Process PM

40  <<Receipts/Disbursements>>
    ELSIF  Operand 2 = 'R' and Report Request = 'Y'
    OR      Operand 2 = 'D' and Report Request = 'Y' then
          (IEC) Process RD
45          (PMC) Process PM

          <<Performance Measurement>>
    ELSIF  Operand 2 = 'PM' and Report Request = 'Y' then
          (PMP) Process PM

50  <<Contributions/Distributions>>
    ELSIF  Operand 2 = 'CN' and Report Request = 'Y'
    OR      Operand 2 = 'DN' and Report Request = 'Y' then
          (CDC) Process PM

55  <<Management Fees>>
    ELSIF  Operand 2 = 'MF' and Report Request = 'F' then

```

```

(PMM) Process PM

<<Commissions>>
5  ELSIF Operand 2 = 'CM' then
    (PCM) Process PM

<<Federal Taxes>>
10 ELSIF Operand 2 = 'FT' then
    (PMF) Process PM

<<State Taxes>>
    ELSIF Operand 2 = 'ST' then
    (PMS) Process PM

15 ELSE
    Message "Invalid Operand 2"
    STOP
    ENDIF

20 END

```

Process the Detail Records Maintenance Routine (AORS)

25 **Note:** Leave all switches = 1 until the last routine is completed. This forces the processing to loop through each succeeding routine until completed. Then turn set all switches = 0 so that the Scheduler will revert back to the Command Program to read another transaction.

```

<<Originate ADD>>
30 IF OORR = 'O' and
    AORS = 'A' then
    IF Process 1 Switch = 0 then
        Set Process 1 Switch = 1
        Initiate Process BS
35 ELSIF Process 2 Switch = 0 then
        Set Process 2 Switch = 1
        Initiate Process PI/PA
    ELSIF Process 3 Switch = 0 then
        Set Process 3 Switch = 1
40 Initiate Process TS
    ELSIF Process 4 Switch = 0 then
        Set Process 4 Switch = 1
        Initiate Process PM
45 ELSE
        Set Process 1 Switch = 0
        Set Process 2 Switch = 0
        Set Process 3 Switch = 0
        Set Process 4 Switch = 0
    ENDIF
50

<<Reverse ADD>>
    ELSIF OORR = 'R' and
    AORS = 'A' then
55 IF Process 5 Switch = 0 then
        Set Process 5 Switch = 1
        Initiate Process BS

```

50

```

5      ELSIF Process 6 Switch = 0 then
        Set Process 6 Switch = 1
        Initiate Process PI/PA
      ELSIF Process 7 Switch = 0 then
        Set Process 7 Switch = 1
        Initiate Process TS
      ELSIF Process 8 Switch = 0 then
        Set Process 8 Switch = 1
        Initiate Process PM
10     ELSE
        Set Process 5 Switch = 0
        Set Process 6 Switch = 0
        Set Process 7 Switch = 0
        Set Process 8 Switch = 0
15     ENDIF

```

<<Originate SUB>>

```

20     ELSIF OORR = 'O' and
        AORS = 'S' then
        IF Process 9 Switch = 0 then
          Set Process 9 Switch = 1
          Initiate Process BS
        ELSIF Process 10 Switch = 0 then
          Set Process 10 Switch = 1
          Initiate Process PI/PA
25     ELSIF Process 11 Switch = 0 then
          Set Process 11 Switch = 1
          Initiate Process TS
        ELSIF Process 12 Switch = 0 then
          Set Process 12 Switch = 1
          Initiate Process CG
30     ELSIF Process 13 Switch = 0 then
          Set Process 13 Switch = 1
          Initiate Process PM
35     ELSE
        Set Process 9 Switch = 0
        Set Process 10 Switch = 0
        Set Process 11 Switch = 0
        Set Process 12 Switch = 0
40     Set Process 13 Switch = 0
        ENDIF

```

<<Reverse SUB>>

```

45     ELSIF OORR = 'R' and
        AORS = 'S' then
        IF Process 14 Switch = 0 then
          Set Process 14 Switch = 1
          Initiate Process BS
        ELSIF Process 15 Switch = 0 then
          Set Process 15 Switch = 1
          Initiate Process PI/PA
50     ELSIF Process 16 Switch = 0 then
          Set Process 16 Switch = 1
          Initiate Process TS
        ELSIF Process 17 Switch = 0 then
          Set Process 17 Switch = 1
          Initiate Process CG
55

```

51

```

    ELSIF Process 18 Switch = 0 then
      Set Process 18 Switch = 1
      Initiate Process PM
5    ELSE
      Set Process 14 Switch = 0
      Set Process 15 Switch = 0
      Set Process 16 Switch = 0
      Set Process 17 Switch = 0
      Set Process 18 Switch = 0
10   ENDIF
  ENDIF

```

A first embodiment of the processing for the subtransaction processing module 64 is provided in the flowcharts of
 15 Figs. 9-A through 9-B, Figs. 10, 11, 12, 13 and 14. Note that for simplicity, error handling and related validity checking steps
 have been omitted. However, the performance of such steps is within the scope of the present invention, as one skilled in the
 art will appreciate.

A second pseudo-code embodiment of the transaction processing controller 52 follows.

20 **Pseudo-Code for Processing for the
 Subtransaction Processing Module 64**

```

BEGIN
25   DO WHILE List of Subtransactions in the TT Table is Valid

      Select Next Row of Operator, Operand 1, and Operand 2 from TT into Working Storage

      /*      To choose the specific input field (or column) */
30     IF      Operand 1 = 'N'
          Set Value = Net Amount           from Input String
      ELSIF   Operand 1 = 'I'
          Set Value = Interest             from Input String
      ELSIF   Operand 1 = 'P'
35     Set Value = Principal               from Input String
      ELSIF   Operand 1 = 'H'
          Set Value = Amount Units         from Input String
      ELSIF   Operand 1 = 'U'
          Set Value = Amount Units         from Input String
40     ELSIF   Operand 1 = 'C'
          Set Value = Cost Basis           from Input String
      ELSIF   Operand 1 = 'V'
          Set Value = Amount Units * Curr Price from Input String
      ELSIF   Operand 1 = 'F'
45     Set Value = Federal Taxes           from Input String
      ELSIF   Operand 1 = 'S'
          Set Value = State Taxes          from Input String
      ELSIF   Operand 1 = 'L'

```

```

Set Value = Local Taxes                from Input String
ELSIF Operand 1 = 'M'
Set Value = Management Fees           from Input String
ELSE
5   Message "Invalid Operand 1", Details
ENDIF

/* To Adjust for Plus or Minus          */
10  IF Operator = 'P' then
Set Multiplier = +1
ELSIF Operator = 'M' then
Set Multiplier = -1
ENDIF

15

/* To Adjust for Originate or Reversal  */
IF OORR = 'O' then
Set Multiplier = Multiplier * +1
20  ELSIF OORR = 'R'
Set Multiplier = Multiplier * -1
ENDIF

25

/* Test for Total Unit Changes          */
IF Operand 2 = 'TU' then
Add Value to AM - Total Units
Add Value to EA - Total Units

30

/* Test for Income Cash Changes        */
IF Operand 2 = 'IC' then
/* Add to First Controls - Account Master */
Add Value to AM - Income Cash
Add Value to AM - Units

35

/* Add to Second Controls - Entity Attribute */
Add Value to EA - Invested Income
Add Value to EA - Units

40

/* Add to Third Controls - General Ledger */
IF Number of Entries = 1 then
Add Value to GL - Income Cash
ELSIF Number of Entries = 2 then
45   IF Value > 0 then
IF ICD >= 0 then
Add Value to GL - Income Cash Demand
ELSE ICD < 0
Add (Value - ICO) to GL - Income Cash Demand
Set Zero to GL - Income Cash Overdraft
50   ENDIF
ELSIF Value <= 0 then
IF ICD < 0 then
Add Value to GL - Income Cash Overdraft
ELSE ICD >= 0 then
55   Add (Value - ICD) to GL - Income Cash Overdraft
Set Zero to GL - Income Cash Demand
ENDIF
ENDIF

```

```

ELSE
    Message "Invalid Value", Details
ENDIF

5      Add Value to Uninvested Income
ELSE
    Message "Invalid Number Entries", Details
ENDIF

10     /* Test for Principal Cash Changes */
ELSIF Operand 2 = 'PC' then

    /* Add to First Controls - Account Master */
    Add Value to AM - Principal Cash
15     Add Value to AM - Units

    /* Add to Second Controls - Entity Attribute */
    Add Value to EA - Invested Principal
20     Add Value to EA - Units

    /* Add to Third Controls - General Ledger */
    IF Number of Entries = 1 then
        Add Value to GL - Principal Cash
25     ELSIF Number of Entries = 2 then
        IF Value > 0 then
            IF PCD >= 0 then
                Add Value to GL - Principal Cash Demand
            ELSE PCD < 0
                Add Value to GL - Principal Cash Demand
30                 Set Zero to GL - Principal Cash Overdraft
            ENDIF
        ELSIF Value <= 0 then
            IF PCD < 0 then
                Add Value to GL - Principal Cash Overdraft
35                 ELSE PCD >= 0 then
                Add (Value - PCD) to GL - Principal Cash Overdraft
                Set Zero to GL - Principal Cash Demand
            ENDIF
        ELSE
40         Message "Invalid Value", Details
        ENDIF
    ELSE
        Message "Invalid Number Entries", Details
45     ENDIF

    Add Value to Uninvested Principal

    /* Test for Invested Income Changes */
    ELSIF Operand 2 = 'II' then

50     /* Add to First Controls - Account Master */
        Add Value to AM - Invested Income

        /* Add to Second Controls - Entity Attribute */
55     Add Value to EA - Invested Income

        /* Add to Third Controls - General Ledger */

```

```

/*      Update Assets      */
Add Value to ACN- Assets
/*      Update Liabilities      */
5      IF      ACN-Liab = ' ' then
          Add Value to Invested Income
      ELSE
          Add Value to ACN_Liabilities
      ENDIF

10     /*      Test for Invested Principal Changes      */
      ELSIF Operand 2 = 'IP' then

          /* Add to First Controls - Account Master      */
          Add Value to AM - Principal Cash

15     /* Add to Second Controls - Entity Attribute */
          Add Value to EA - Invested Principal

          /* Add to Third Controls - General Ledger      */
20     /*      Update Assets      */
          Add Value to ACN - Assets
          /*      Update Liabilities      */
          IF      ACN_Liab = ' ' then
          Add Value to Invested Principal
25     ELSE
          Add Value to ACN_Liabilities
      ENDIF

          /* Test for Other Customized Reporting Changes      */
30     ELSIF Operand 2 = 'I' and Report Request = 'Y'
      OR      Operand 2 = 'E' and Report Request = 'Y' then
          (IEE) Process IE
          (PME) Process PM

35     ELSIF Operand 2 = 'R' and Report Request = 'Y'
      OR      Operand 2 = 'D' and Report Request = 'Y' then
          (IEC) Process RD
          (PMC) Process PM

40     /* Test for other Performance Measurement Data      */
      ELSIF Operand 2 = 'PM' and Report Request = 'Y' then
          (PMP) Process PM

45     ELSIF Operand 2 = 'CN'
      OR      Operand 2 = 'DN' then
          (CDC) Process PM

          ELSIF Operand 2 = 'MF' then
          (PMM) Process PM

50     ELSIF Operand 2 = 'CM' then
          (PCM) Process PM

          ELSIF Operand 2 = 'FT' then
55     (PMF) Process PM

          ELSIF Operand 2 = 'ST' then

```



```

(PMS) Process PM

ELSE
  Message "Invalid Operand 2", Details
5
ENDIF

/* Test for Detail Record Maintenance of Financial Instruments */
10 IF AORS != ' ' then
    *****
    CALL PORTFOLIO ADJUSTER 110
    *****
ENDIF

15 ENDDO

END

20
Pseudo-Code for Performance Measurement (PM)
Processing related to the Licensee
Performance Measurement Table 104

25 BEGIN

IF Trxn = 'A' and Type = 'O' OR Trxn = 'S' and Type = 'R' (which means ADD)

30 SELECT Data into Working Storage from PM Record
IF Error then
    INSERT INTO PM Record, Details
    IF Error then
        Message "INSERT PM Error", Details
        Goto Write Reject Report
35    ENDIF
ELSE
    Increment Units by amount to be increased
    UPDATE Data to Table / Row
    IF Error
40        Message "UPDATE PM Error 1", Details
        Goto Write Report Error
    ENDIF
ENDIF
ELSIF Trxn = 'A' and Type = 'R' OR Trxn = 'S' and Type = 'O' (which means
45 SUBTRACT)
SELECT Data into Working Storage from PM Record
IF Error then
    Message "SELECT PM Error 2", Details
    Goto Write Report Error
50 ENDIF
IF Units = 'ALL'
and All Other Balances in the Row are Zero then
    DELETE from Table / Row
    IF Error
55        Message "DELETE PM Error", Details
        Goto Write Report Error

```

```

                ENDIF
            ELSE
                Decrement Units by Amount to be reduced
                UPDATE PI SET Details
5              IF Error then
                    Message "UPDATE PM Error 2", Details
                    Goto Write Report Writer
                ENDIF
            ENDIF
10          ELSE
                Null
            ENDIF
            Goto EOJ
15          <<Write Reject Report>>
            INSERT into Reject Table, Details
                IF Error
                    STOP
            ENDIF
20          <<EOJ>>
            Null
        END
    
```

Pseudo-Code for Income / Expense Processing (IE)

Processing related to the Customer Income Statement
(Income/Expense) Table 96

```

25          BEGIN
30          IF Trxn = 'Debit' and Type = 'O'                                (which means ADD)
            OR Trxn = 'Credit' and Type = 'O' then
                SELECT Data into Working Storage from IE Record
                IF Error then
                    INSERT INTO IE Table, Details
                    IF Error then
35                      Message "INSERT IE Error 1", Details
                      Goto Write Report Error
                    ENDIF
                ELSE
                    Increment Units by amount to be increased
                    UPDATE Data to Table / Row
                    IF Error then
40                      Message "UPDATE IE Error 1", Details
                      Goto Write Report Error
                    ENDIF
                ENDIF
45          ELSIF Trxn = 'Debit' and Type = 'R'                                (which means SUBTRACT)
            OR Trxn = 'Credit' and Type = 'R' then
                SELECT Data into Working Storage from IE Record
                IF Error then
50                      Message "SELECT IE Error 2", Details
                      Goto Write Report Error
                ENDIF
                IF Units = 'ALL' then
                    DELETE from Table / Row
                    IF Error then
55                      Message "DELETE IE Error", Details
                    
```

```

                    Goto Write Report Error
                ENDIF
            ELSE
                Decrement Units by Amount to be reduced
                UPDATE IE SET Details
                IF Error then
                    Message "UPDATE IE Error 2", Details
                    Goto Write Report Writer
                ENDIF
            ENDIF
        ELSE
            Null
        ENDIF
        Goto EOJ
    << Write Reject Report >>
    INSERT into Reject Table, Details
        IF Error then
            STOP
        ENDIF
    <<EOJ>>
    Null
END
    
```

Pseudo-Code for AORS Processing
(Portfolio Adjuster 110 Processing)

```

BEGIN
    /* The End AORS Switch is a global switch that signals the end of all AORS processing */
    /* otherwise known as the Detail Record (or Row) Maintenance Processing. */
    /* The switch is originally set = 0. Each called routine ends by setting the switch = 1. */

    Set End AORL Switch = 0

    DO WHILE End AORS Switch = 0

        IF Trxn = "ADD" then
            IF Type = 'O' then
                *****
                CALL Original Add Module 114 (Originate Add)
                *****
                IF Error
                    Message "No OADD Routine"
                    Goto Write Reject Report
                ENDIF
            ELSIF Type = 'R' then
                *****
                CALL Reverse Add Module 118 (Reverse Add)
                *****
                IF Error
                    Message "NO RADD Routine"
                    Goto Write Reject Routine
                ENDIF
            ELSE
    
```

```

                    Message "Invalid O OR R Code for ADD", Details
                    Goto Write Reject Report
                ENDIF

5          ELSIF Trxn = 'SUBTRACT' then
            IF Type = 'O' then
                *****
                CALL Original Sell Module 122          (Originate Subtract)
                *****
10         IF Error then
                    Message "No OSUB Routine", Details
                    Goto Write Reject Report
                ENDIF
            ELSIF Type = 'R' then
15         *****
                CALL Reverse Sell Module 126          (Reverse Subtract)
                *****
                IF Error then
                    Message "No RSUB Routine, Details
20         Goto Write Reject Report
                ENDIF
            ELSE
                Message "Invalid O OR R for SUBTRACT", Details
25         Goto Write Reject Report
            ENDIF

        ELSE
            Message "Invalid Transaction", Details
30         Goto Write Reject Report
        ENDIF

        Goto EOJ

35         << Write Reject Report >>
        INSERT into Reject Table
            IF Error then
                STOP
            ENDIF
        Set End AORL Switch = 1
40

        <<EOJ>>
        Null

45     ENDDO
END

```

50 A first embodiment of the processing for the balance sheet table 130 is provided in the flowchart of Fig. BAL-SHT. Note that for simplicity, error handling and related validity checking steps have been omitted. However, the performance of such steps is within the scope of the present invention, as one skilled in the art will appreciate.

A second pseudo-code embodiment of the processing for the balance sheet table 130 follows.

Balance Sheet Processing (BS)

```

BEGIN
5       IF      AORL = 'A' and OORR = 'O'                (which means ADD)
      AND      AORL = 'S' and OORR = 'R' then
      SELECT Data into Working Storage from BS Record
      IF Error then
10          INSERT INTO BS Table, Details
          IF Error then
              Message "INSERT BS Error", Details
              Goto Write Reject Table
          ENDIF
      ELSE
15          Increment Units by amount to be increased
          UPDATE Data to Table / Row
          IF Error
              Message "UPDATE BS Error 1", Details
              Goto Write Report Error
20          ENDIF
      ENDIF
      ELSIF AORL = 'A' and OORR = 'R'                (which means SUBTRACT)
      OR      AORL = 'S' and OORR = 'O' then
      SELECT Data into Working Storage from BS Record
25      IF Error then
          Message " SELECT BS Error 2", Details
          Goto Write Report Error
      ENDIF
      IF Units = 'ALL' then
30          DELETE from Table / Row
          IF Error
              Message "DELETE BS Error", Details
              Goto Write Report Error
          ENDIF
35      ELSE
          Decrement Units by Amount to be reduced
          UPDATE IE SET Details
          IF Error then
40              Message "UPDATE BS Error 2", Details
              Goto Write Report Writer
          ENDIF
      ENDIF
      ELSE
          Null
45      ENDIF
      Goto EOJ
      << Write Reject Report >>
      INSERT into Reject Table, Details
      IF Error
50          STOP
      ENDIF
      <<EOJ>>
      Null
55      END

```

Pseudo-Code For Processing The Capital Gains Table I40

```

BEGIN
5       IF AORL = 'S' and Type = 'O'                (which means ADD)
          SELECT Data into Working Storage from    CG Record
          IF Error then
              INSERT INTO CG Table, Details
          IF Error then
10              Message "INSERT CG Table", Details
              Goto Write Report Error
          ENDIF
          ELSE
              Increment Units by amount to be increased
15          UPDATE Data to Table / Row
          IF Error
              Message "UPDATE CG Error 1", Details
              Goto Write Report Error
          ENDIF
20      ENDIF
      ELSIF AORL = 'S' and Type = 'R'                (which means SUBTRACT)
          SELECT Data into Working Storage from CG Record
          IF Error then
              Message " SELECT CG Error 2", Details
25          Goto Write Report Error
          ENDIF
          IF Units = 'ALL' then
              DELETE from Table / Row
          IF Error
30          Message "DELETE CG Error", Details
              Goto Write Report Error
          ENDIF
          ELSE
              Decrement Units by Amount to be reduced
35          UPDATE IE SET Details
          IF Error then
              Message "UPDATE CG Error 2", Details
              Goto Write Report Writer
          ENDIF
40      ENDIF
      ELSE
          Null
      ENDIF
      Goto EOJ
45      <<Write Reject Report>>
      INSERT into Reject Table, Details
          IF Error
              STOP
          ENDIF
50      <<EOJ>>
      Null
END

```

Pseudo-Code for Original Add Module II4 Processing

Note: Do not turn switch OFF or back to 0 as these switches indicate which processes remain.

5

BEGIN

IF Process 1 Switch = 0 then
Set Process 1 Switch = 1

10

CALL BS

15

ELSIF Process 2 Switch = 0 then
Set Process 2 Switch = 1

CALL PI

20

ELSIF Process 3 Switch = 0 then
Set Process 3 Switch = 1

CALL PA

25

ELSIF Process 4 Switch = 0 then
Set Process 4 Switch = 1

CALL TS

30

ELSIF Process 5 Switch = 0 then
Set Process 5 Switch = 1

CALL PM

35

Set End AORS Switch = 1

Notes End of AORS Processing

ELSE

NULL

ENDIF

40

CALL Subtransaction Scheduler 62

45

END

Pseudo-Code for Reverse of Add Module II8 Processing

Note: Do not turn switch OFF or back to 0 as these switches indicate which processes remain.

50

BEGIN

55

IF Process 6 Switch = 0 then
Set Process 6 Switch = 1

```

          CALL BS
          *****
5      ELSIF Process 7 Switch = 0 then
          Set Process 7 Switch = 1
          *****
          CALL PI
          *****
10     ELSIF Process 8 Switch = 0 then
          Set Process 8 Switch = 1
          *****
          CALL PA
          *****
15     ELSIF Process 9 Switch = 0 then
          Set Process 9 Switch = 1
          *****
          CALL TS
          *****
20     ELSIF Process 10 Switch = 0 then
          Set Process 10 Switch = 1
          *****
          CALL PM
          *****

          Set End AORS Switch = 1           Notes End of AORS Processing
25
      ELSE
          NULL
      ENDIF
30
      *****
      CALL Subtransaction Scheduler 62
      *****

35  END

```

PSEUDO-CODE FOR ORIGINAL SELL MODULE I22 PROCESSING

```

40  BEGIN
      IF Sell-Method = 'LOT' then
          Select LOT Amount into Working Storage from BS record
          IF Amount Sold > Lot Amount in Working Storage then
              Message "Lot Amount > Amount Available"
              Goto Write Reject Report
45          ENDIF

          IF Process 11 Switch = 0 then
              Set Process 11 Switch = 0
50
              *****
              CALL BS
              *****

          ELSIF Process 12 Switch = 0 then
55          Set Process 12 Switch = 0

```



```

*****
CALL PI
*****
5   ELSIF Process 13 Switch = 0 then
      Set Process 13 Switch = 0

*****
CALL PA
*****
10  ELSIF Process 14 Switch = 0 then
      Set Process 14 Switch = 0

*****
CALL CG
*****
15  ELSIF Process 15 Switch = 0 then
      Set Process 15 Switch = 1

*****
CALL TS
*****
20  ELSIF Process 16 Switch = 0 then
      Set Process 16 Switch = 0

*****
CALL PM
*****
25  ELSIF Process 17 Switch = 0 then
      Set Process 17 Switch = 0

30  *****
      CALL TL
      *****

35  Set End AORS Switch = 1           Notes End of AORS Processing
      ELSE
          NULL
      ENDIF
*****
40  CALL SUBTRACTION SCHEDULER 62
      *****

ELSE

45  Select all LOTS into Temporary Working Storage Table
      Licn/Acct/Asset/Purch/Amt/Cost/Unit-Cost/ROWID)
      Set Total Amount Sold = Data Entry Amount Sold
      IF Total Amount Sold > Total Amount Available then
          Message "Total Amount Sold > Total Amount Available", Details
          Goto Write Reject Report

50  ENDIF

      Avg-Factor = 1
      IF Sell-Method = "AVG" then
          Avg-Factor = (Total Amount Sold / Total Amount Available)

55  ENDIF

```

<<Sell Multiple Lot Routine>>

DO While Total Amount Sold = 0

```

5          IF Total Amount Sold > 0 then
            IF Sell-Method = 'FIF' or ' ' then
                Select LOT Amount Available into WS Lot Amount
                Where Purch = MIN (Purch)
            ENDIF
        ELSIF
10         IF Sell-Method = 'LIF'
            Select LOT Amount Available into WS Lot Amount
            Where Purch = MAX(Purch)
        ENDIF
        ELSIF
15         IF Sell-Method = 'LCF'
            Select LOT Amount Available into WS Lot Amount
            Where Unit-Cost = MIN(Unit-Cost)
        ENDIF
        ELSIF
20         IF Sell-Method = 'HCF'
            Select LOT Amount Available into WS Lot Amount
            Where Unit-Cost = MAX(Unit-Cost)
        ENDIF
        ELSE
25         <<for Sell-Method = 'AVG' or 'ALL'>>
            IF Amount Sold * Avg Factor < WS Lot Amount then
                UPDATE Temporary Table Lot Amount for Amount Sold
            ELSE
30             DELETE Total Row Temporary Table
            ENDIF
            *****

35         IF Process 11 Switch = 0 then
            Set Process 11 Switch = 0
            *****
            CALL BS
            *****

        ELSIF Process 12 Switch = 0 then
40         Set Process 12 Switch = 0
            *****
            CALL PI
            *****

        ELSIF Process 13 Switch = 0 then
45         Set Process 13 Switch = 0
            *****
            CALL PA
            *****

        ELSIF Process 14 Switch = 0 then
50         Set Process 14 Switch = 0
            *****
            CALL CG
            *****

        ELSIF Process 15 Switch = 0 then
55         Set Process 15 Switch = 1
            *****
            CALL TS
            *****

```

```

5      ELSIF Process 16 Switch = 0 then
        Set Process 16 Switch = 0
        *****
        CALL PM
        *****
10     ELSIF Process 17 Switch = 0 then
        Set Process 17 Switch = 0
        *****
        CALL TL
        *****

        Set End AORS Switch = 1           Notes End of AORS Processing
ELSE
  NULL
15  ENDIF

  Decrement Total Amount Sold by Cap Gain Lot Amount
  Increment the e LOT Number

20  *****
    CALL SUBTRANSACTION SCHEDULE 62
    *****
    ENDIF
    ENDDO
25  ENDIF
    <<EOJ>>
    NULL
END

```

Originate Sell Routine

```

30  BEGIN

35  IF Sell-Method = 'LOT' then
    Select LOT Amount into Working Storage from BS record
    IF Amount Sold > Lot Amount in Working Storage then
      Message "Lot Amount > Amount Available"
      Goto Write Reject Report
    ELSE
40  *****
      CALL BS Routine
      *****
    ENDIF
    *****
45  CALL PIPA
    *****
    *****
    CALL CG
    *****
50  *****
    CALL TS
    *****
    *****
    CALL PM
55  *****

```

```

*****
CALL CG
*****
5 *****
CALL TL
*****
ELSE
10 Select All LOTS into Temporary Working Storage Table
Licn/Acct/Asset/Purch/Amt/Cost/Unit-Cost/ROWID)
Set Total Amount Sold = Data Entry Amount Sold
IF Total Amount Sold > Total Amount Available then
    Message "Total Amount Sold > Total Amount Available", Details
    Goto Write Reject Report
15 ENDIF

Avg-Factor = 1
IF Sell-Method = 'AVG' then
    Avg-Factor = (Total Amount Sold / Total Amount Available)
20 ENDIF
DO While Total Amount Sold = 0
    IF Total Amount Sold > 0 then
        IF Sell-Method = 'FIF' or ' ' then
            Select LOT Amount Available into WS Lot Amount
            Where Purch = MIN (Purch)
25 ENDIF
        ELSIF
            IF Sell-Method = 'LIF"
                Select LOT Amount Available into WS Lot Amount
                Where Purch = MAX(Purch)
30 ENDIF
            ELSIF
                IF Sell-Method = 'LCF"
                    Select LOT Amount Available into WS Lot Amount
                    Where Unit-Cost = MIN(Unit-Cost)
35 ENDIF
                ELSIF
                    IF Sell-Method = 'HCF"
                        Select LOT Amount Available into WS Lot Amount
                        Where Unit-Cost = MAX(Unit-Cost)
40 ENDIF
                ELSE
                    <<for Sell-Method = 'AVG' or 'ALL'>>
                    IF Amount Sold * Avg Factor < WS Lot Amount then
                    UPDATE Temporary Table Lot Amount for Amount Sold
45 ELSE
                        DELETE Total Row Temporary Table
                    ENDIF
                    *****
                    CALL BS with the amount of LOT sold
                    *****
                    ENDIF
                    *****
                    CALL PIPA
55 *****

```

```

5          *****
          CALL TS
          *****
          *****
          CALL PM
          *****
          *****
          CALL CG          with the amount of LOT sold
          *****
          *****
10         CALL TL
          *****
          Decrement Total Amount Sold by Cap Gain Lot Amount
          Increment the LOT Number
15         ENDIF
          ENDDO
          ENDIF
          Goto EOJ
20         <<Write Reject Report>>
          INSERT into Reject Table
          IF Error then
          STOP
          ENDIF
25         <<EOJ>>

```

END

**Pseudo-Code for Reverse of
Original Sell Module I26 Processing**

```

30
35     BEGIN
          IF      Process 18 Switch = 0 then
          Set Process 18 Switch = 1
          *****
          CALL BS          with the amount of LOT sold
          *****
40     ELSIF    Process 19 Switch = 0 then
          Set Processor 19 Switch = 1
          *****
          CALL PI
          *****
45     ELSIF    Process 20 Switch = 0 then
          Set Process 20 Switch = 1
          *****
          CALL PA
          *****
50     ELSIF    Process 21 Switch = 0 then
          Set Process 21 Switch = 1
          *****
          CALL TS
          *****
55     ELSIF    Process 22 Switch = 0 then
          Set Process 22 Switch = 1

```

```

*****
CALL PM
*****
5   ELSIF Process 23 Switch = 0 then
    Set Process 23 Switch = 1
    *****
    CALL CG          with the amount of LOT sold
    *****
10  ELSIF Process 24 Switch = 0 then
    Set Process 24 Switch = 1
    *****
    CALL TL
    *****
    Set End AORL Switch = 1
15  Processing
    ELSE
        NULL
    ENDIF
20  *****
    CALL Subtransaction Scheduler 62
    *****
25  END

```

Notes End of AORS

Pseudo-Code for Processing Model #4

```

30  For All INSERTS, UPDATES, and DELETES to all Tables
    BEGIN
        IF Trxn is 'ADD' then
            SELECT Data in Working Storage
35         IF Error then
            INSERT INTO Table, Details
            IF Error then
                Message "INSERT Error", Details
                Goto Write Reject Report
40         ENDIF
        ELSE
            Increment the Details
            UPDATE Set Table, Details
            IF Error then
45         Message "UPDATE Error ADD", Details
            Goto Write Reject Report
            ENDIF
        ENDIF
        ELSIF Trxn is 'SUBTRACT' then
50         SELECT Data into Working Storage
            IF Error then
                Message "SELECT Error Subtract", Details
                Goto Write Reject Report
            ENDIF
55         If One or More Amounts > One or More Values from Existing Record then
            ADD to Reject Report

```

```

IF Error then
    Message "INSERT Reject SUBTRACT", Details
    Goto Write Reject Report
ENDIF
5 IF Details = 'ALL' then
    DELETE From Table, Details
    IF Error then
        Message "DELETE Error", Details
        Goto Write Reject Report
10 ENDIF
    ELSE
        Decrement the Details
        UPDATE SET, Details
        IF Error then
15 Message "UPDATE Error SUBTRACT", Details
        Goto Write Reject Report
    ENDIF
    ENDIF
20 ENDIF
    Goto EOJ

<<Write Reject Report>>
INSERT INTO Reject Table, Details
IF Error then
25 Message "INSERT Reject Table Error", Details
    STOP
ENDIF

<<EOJ>>
30 NULL
END

```

35 **Pseudo-Code for Processing the Trade Settlement Table 142**

```

BEGIN
40 IF Trxn = 'A' and Type = 'O' OR Trxn = 'S' and Type = 'O' (which means ADD)
    INSERT into TS table, Details
    IF Error then
        Message "INSERT TS Error 1", Details
        Goto Write Report Error
45 END
    ELSIF Trxn = 'A' and Type = 'R' OR Trxn = 'S' and Type = 'R' (which means SUBTRACT)
        SELECT Data into Working Storage from TS Record
        IF Error then
50 Message " SELECT TS Error 2", Details
        Goto Write Report Error
        ENDIF
        DELETE from Table / Row
        IF Error
55 Message "DELETE TS Error", Details
        Goto Write Report Error
        ENDIF

```

```

ELSE
    Null
ENDIF
5      Goto EOJ

<<Write Reject Report>>
INSERT into Reject Table, Details
10     IF Error
        STOP
        ENDIF

<<EOJ>>
15     Null
END

```

Pseudo-Code for Processing the Customer Cash Flow (Receipts/Disbursements)

20 **Table 100**

```

BEGIN
25     IF Trxn = 'Receipt' and Type = 'O' (which means ADD)
        OR Trxn = 'Disbursement' and Type = 'O' then
            SELECT Data into Working Storage from RD Record
            IF Error then
                INSERT INTO RD Table, Details
                IF Error then
30                 Message "INSERT RD Error", Details
                    Goto Write Report Error
                ENDIF
            ELSE
                Increment Units by amount to be increased
                UPDATE Data to Table / Row
                IF Error then
35                 Message "UPDATE RD Error 1", Details
                    Goto Write Report Error
                ENDIF
            ENDIF
40     ELSIF Trxn = 'Receipt' and Type = 'R' (which means SUBTRACT)
        OR Trxn = 'Disbursement' and Type = 'R'
            SELECT Data into Working Storage from RD Record
            IF Error then
45                 Message "SELECT RD Error 2", Details
                    Goto Write Report Error
            ENDIF
            IF Units = 'ALL' then
                DELETE from Table / Row
                IF Error
50                 Message "DELETE RD Error", Details
                    Goto Write Report Error
                ENDIF
            ELSE
55                 Decrement Units by Amount to be reduced
                    UPDATE IE SET Details
            ENDIF

```



```

                IF Error then
                    Message "UPDATE RD Error 2", Details
                    Goto Write Report Writer
                ENDIF
5           ENDIF
        ELSE
            Null
        ENDIF
        Goto EOJ
10      <<Write Reject Report>>
        INSERT into Reject Table, Details
            IF Error then
                STOP
            ENDIF
15      <<EOJ>>
        Null
    END

```

20 **Pseudo-Code for Processing**
 the Pending Adjustment Table I38

```

BEGIN
25      IF Trxn = 'A' and Type = 'O' OR Trxn = 'S' and Type = 'R'    (which means ADD)
        AND Trade Date < Income Ex-Date then
            SELECT Data into Working Storage from PA Record
            IF Error then
30                INSERT INTO PA Table, Details
                    IF Error then
                        Message "INSERT PA Error", Details
                        Goto Write Report Error
                    ENDIF
            ELSE
35                Increment Units by amount to be increased
                UPDATE Data to Table / Row
                IF Error
                    Message "UPDATE PA Error 1", Details
                    Goto Write Report Error
40                ENDIF
            ENDIF
        ELSIF Trxn = 'A' and Type = 'R' OR Trxn = 'S' and Type = 'O' (which means SUBTRACT)
        AND Trade Date > Income Ex-date + 1 then
            SELECT Data into Working Storage from PA Record
45            IF Error then
                Message " SELECT PA Error 2", Details
                Goto Write Report Error
            ENDIF
            IF Units = 'ALL' then
50                DELETE from Table / Row
                IF Error
                    Message "DELETE PA Error", Details
                    Goto Write Report Error
                ENDIF
            ELSE
55                Decrement Units by Amount to be reduced

```

```

UPDATE PA SET Details
IF Error then
    Message "UPDATE PA Error 2", Details
    Goto Write Report Writer
5      ENDIF
      ENDIF
ELSE
    Null
ENDIF
10    Goto PA-EOJ
    <<Write Reject Report>>
    INSERT into Reject Table, Details
        IF Error
            STOP
15      ENDIF
    <<PA-EOJ>>
    Null
END

```

20

**Pseudo-Code for Processing
the Pending Income Table I34**

```

25    BEGIN
    IF   Trxn = 'A' and Type = 'O' OR Trxn = 'S' and Type = 'R'   (which means ADD)
    AND Trade Date < Income Ex-Date then
        SELECT Data into Working Storage from PI Record
        IF Error then
30      INSERT INTO PI Table, Details
        IF Error then
            Message "INSERT PI Error", Details
            Goto Write Reject Report
        ENDIF
    ELSE
35      Increment Units by amount to be increased
        UPDATE Data to Table / Row
        IF Error
            Message "UPDATE PI Error 1", Details
            Goto Write Report Error
40      ENDIF
    ENDIF
    ELSIF Trxn = 'A' and Type = 'R' OR Trxn = 'S' and Type = 'O' (which means SUBTRACT)
    AND Trade Date > Income Ex-date + 1 then
        SELECT Data into Working Storage from PI Record
45      IF Error then
            Message "SELECT PI Error 2", Details
            Goto Write Report Error
        ENDIF
        IF Units = 'ALL' then
50      DELETE from Table / Row
        IF Error
            Message "DELETE PI Error", Details
            Goto Write Report Error
        ENDIF
55      ELSE
        Decrement Units by Amount to be reduced
    
```

```

UPDATE PI SET Details
IF Error then
    Message "UPDATE PI Error 2", Details
    Goto Write Report Writer
5   ENDF
    ENDF
ELSE
    Null
ENDIF
10  Goto PI-EOJ

<<Write Reject Report>>
INSERT into Reject Table, Details
    IF Error
15  STOP
    ENDF
<<PI-EOJ>>
    Null
20  END
    
```

**N_gine File (or Table) Structure and
Likely Order of Creation**
corresponding with Figs. 4-A through 4-E

25	<u>Institutional Profile</u>	<u>Data Source</u>
	LM Licensee Master	User-Definable
	LU Licensee Users	User-Definable
	LT Licensee Account Type	User-Definable
	LD Licensee Default Definitions	User-Definable
30	LL Licensee General Ledger Definitions	User-Definable
	LS Licensee Diversification Scheme	User-Definable
	LP Licensee Performance Group	User-Definable
	LN Licensee Summary Names	User-Definable
	LW Licensee Service Wholesalers	User-Definable
35	LR Licensee Service Resellers	User-Definable

	<u>Customer Profile</u>	
	AO Account Objective	User-Definable
	AL Account Legal Capacity	User-Definable
40	AJ Account Jurisdiction	User-Definable
	AR Account Representatives	User-Definable
	AN Account Registration Names	User-Definable
	AM* Account Master	User-Definable
	AC Account Communication Links	User-Definable

	<u>Transaction Profile</u>	
	TM** Transaction Master	User-Definable "Driving" File
	TP** Transaction Processor	User-Definable "Driving" File
	TR Transactions - Recurring	User-Definable "Driving" File

50 Entity Profile

	EM	Entity Master	Public Market Data
	EA*	Entity Attribute	User-Definable
	ET	Entity Transaction	User-Definable
5	<u>Licensee Status</u>		
	SG*	System General Ledger	User-Definable
	SJ*	System Transaction Journal	System Defined "Driven" File
	ST	System Trade Settlement	System Defined "Driven" File
	SS	System Summary Table	System Defined
10	SR	System Reject Table	System Defined
	SC	System Transaction Count	System Defined
	<u>Customer Status</u>		
	CS	Customer Income Statement (Income / Expense)	System Defined "Driven" File
15	CF	Customer Cash Flow (Receipts / Disbursements)	System Defined "Driven" File
	CB*	Customer Balance Sheet	System Defined "Driven" File
	CG	Customer Capital Gain	System Defined "Driven" File
	CI	Customer Pending Income	System Defined "Driven" File
	CA	Customer Pending Capital Adjustments	System Defined "Driven" File
20	CP*	Customer Performance Measurement	System Defined "Driven" File

Notes: * denotes Primary Control Tables
 ** denotes "Driving Tables"

25

TABLE DATA DESCRIPTIONS WITH EXAMPLES

(LM) Licensee Master

30 Primary Data consisting of
 Licensee Identifier
 Licensee Description
 Trade Settlement Data consisting of
 Licensee Trade Settlement Switch
 35 Trade Offset Buy Identifier
 Trade Offset Sell Identifier
 Settle Offset Buy Identifier
 Settle Offset Sell Identifier
 +
 40 Other Details
 +
 Audit Fields consisting of Processing Model I
 Add Date
 Add Sequence Number
 45 Add User Identifier
 Change Date
 Change Sequence Number
 Change User Identifier

5 Delete Date
Delete Sequence Number
Delete User Identifier
Number of Modifications
Archive Status
Archive Date

Example:

10	<u>Licensee Identifier</u>	<u>Licensee Description</u>	<u>Other Licensee Address</u>	<u>Licensee City/State/ZIP</u>
	LICN1	First Licensee Name	Main Street	Denver, CO
	LICN2	Second Licensee Name	Broadway	New York, NY
	LICN3	Third Licensee Name	Michigan Ave.	Chicago, IL

15

(LU) Licensee Users

20 Primary Data consisting of
Licensee Identifier
User Identifier
User Description
+
Other Details
25 +
Audit Fields consisting of Processing Model I
Add Date
Add Sequence Number
Add User Identifier
30 Change Date
Change Sequence Number
Change User Identifier
Delete Date
Delete Sequence Number
Delete User Identifier
35 Number of Modifications
Archive Status
Archive Date

40 **Example:**

	<u>Licensee Identifier</u>	<u>User Identifier</u>	<u>User Description</u>	<u>Other User Address</u>	<u>User City/State/ZIP</u>
45	LICN1	FUN	First User Name	Lincoln Ave	Denver, CO
	LICN2	SUN	Second User Name	Park Ave	New York, NY
	LICN3	TUN	Third User Name	Montgomery	San Francisco, CA

(LT) Licensee Account Type

- 5 Primary Data consisting of
 - Licensee Identifier
 - Account Type Identifier
 - Account Type Description
 - +
- Other Details
 - +
- 10 Audit Fields consisting of Processing Model I
 - Add Date
 - Add Sequence Number
 - Add User Identifier
 - Change Date
 - 15 Change Sequence Number
 - Change User Identifier
 - Delete Date
 - Delete Sequence Number
 - Delete User Identifier
 - 20 Number of Modifications
 - Archive Status
 - Archive Date

Example:

25	<u>Licensee Identifier</u>	<u>Account Type Number</u>	<u>Account Type Name</u>
	LICN1	100	Pension Trust
30	LICN1	200	Investment Advisory
	LICN1	300	Estates
	LICN1	400	Settlements - Buy
	LICN1	500	Settlements - Sell
35	LICN2	1000	Wireless Communications
	LICN2	2000	Landline Communications
	LICN2	3000	Satellite Broadcast
	LICN3	9000	Domestic Subsidiary
	LICN3	10000	Foreign Subsidiary

(LD) Licensee Default Definitions

- 45 Primary Data consisting of
 - Licensee Identifier
 - Default Class
 - Demand or Overdraft
 - Accounting Control Number
 - Accounting Control Number Description
 - Cash Record Pointer in EA Table

- +
Other Details
- +
Audit Fields consisting of Processing Model I
- 5 Add Date
- Add Sequence Number
- Add User Identifier
- Change Date
- 10 Change Sequence Number
- Change User Identifier
- Delete Date
- Delete Sequence Number
- Delete User Identifier
- Number of Modifications
- 15 Archive Status
- Archive Date

Example:

20	<u>Licensee Identifier</u>	<u>Class Iden</u>	<u>Sub-Class Iden</u>	<u>Accounting Control Number</u>	<u>Accounting Control Name</u>
	LICNI	IC	D	A01	Income Cash Demand
	LICNI	IC	O	A02	Income Cash Overdraft
25	LICNI	IC	D	A03	Principal Cash Demand
	LICNI	IC	O	A04	Principal Cash Overdraft
	LICNI	UI		L05	Uninvested Income
	LICNI	UP		L10	Uninvested Principal
	LICNI	II		L15	Invested Income
30	LICNI	IP		L20	Invested Principal

(LL) Licensee General Ledger Definition

- 35 Primary Data consisting of
- Licensee Identifier
- Asset or Liability
- Account Type Identifier
- Account Type Description
- 40 +
- Other Details
- +
- Audit Fields consisting of Processing Model I
- 45 Add Date
- Add Sequence Number
- Add User Identifier
- Change Date
- Change Sequence Number

5 Change User Identifier
 Delete Date
 Delete Sequence Number
 Delete User Identifier
 Number of Modifications
 Archive Status
 Archive Date

(See Details Provided)

10

(LS) Licensee Diversification Scheme

Primary Data consisting of
 15 Licensee Identifier
 Diversification Type Identifier
 Diversification Group Identifier
 Diversification Class Identifier
 Diversification Description
 +
 20 Other Details
 +
 Audit Fields consisting of Processing Model I
 Add Date
 Add Sequence Number
 25 Add User Identifier
 Change Date
 Change Sequence Number
 Change User Identifier
 Delete Date
 30 Delete Sequence Number
 Delete User Identifier
 Number of Modifications
 Archive Status
 Archive Date

35 Example:

	<u>Licensee Identifier</u>	<u>Diversification Type</u>	<u>Diversification Group</u>	<u>Diversification Class</u>	<u>Diversification Name</u>
40	LICNI	100	000	000	Money Market Instruments
	LICNI	100	100	000	US Govt Bills
	LICNI	100	200	000	US Govt Notes
	LICNI	100	300	000	Par Notes
	LICNI	100	400	000	Discount Notes
45	LICNI	200	000	000	Fixed Income Securities
	LICNI	200	100	000	US Govt Bonds
	LICNI	200	200	000	Municipal Bonds
	LICNI	200	300	000	Corporate Bonds

	LICN1	200	400	000	Bond Funds
	LICN1	300	000	000	Equities
	LICN1	300	100	000	Preferred Stock
	LICN1	300	200	000	Convertible Preferred
5	LICN1	300	300	000	Common Stock
	LICN1	300	300	100	Automotive
	LICN1	300	300	200	Building
	LICN1	300	300	300	Chemical
	LICN1	300	300	400	Drug
10	LICN1	300	400	000	Oil Partnerships
	LICN1	300	500	000	Real Estate Partnerships
	LICN2	100	000	000	Communication Services
	LICN2	100	100	000	Wireless Communication
	LICN2	100	200	000	Landline Communication
15	LICN2	100	300	000	Direct Satellite
	LICN3	100	100	000	Cash
	LICN3	100	200	000	Other Current Assets
	LICN3	100	300	000	Fixed Assets
	LICN3	100	400	000	Depreciation
20	LICN3	100	500	000	Other Tangible Assets
	LICN3	100	600	000	Other Intangible Assets
	LICN3	100	700	000	Current Liabilities
	LICN3	100	800	000	Deferred Taxes
	LICN3	100	900	000	Long-Term Debt
25	LICN3	100	1000	000	Net Worth

(LP) Licensee Performance Group

30	Primary Data consisting of
	Licensee Identifier
	Performance Type Identifier
	Performance Group Identifier
	Performance Class Identifier
35	Performance Description
	+
	Other Details
	+
	Audit Fields consisting of Processing Model I
40	Add Date
	Add Sequence Number
	Add User Identifier
	Change Date
	Change Sequence Number
45	Change User Identifier
	Delete Date
	Delete Sequence Number
	Delete User Identifier

Number of Modifications
 Archive Status
 Archive Date

5

Example:

	<u>Licensee Identifier</u>	<u>Perf Meas Type</u>	<u>Perf Meas Group</u>	<u>Perf Meas Class</u>	<u>Perf Meas Name</u>
10	LICNI	100	000	000	Money Market
	LICNI	100	100	000	US Notes
	LICNI	100	100	9710	Maturing 10/97
	LICNI	100	100	9711	Maturing 11/97
15	LICNI	100	200	000	Par Notes
	LICNI	100	200	9711	Maturing 11/97
	LICNI	100	200	9712	Maturing 12/97
	LICNI	200	000	000	Municipal Bonds
	LICNI	200	AAA	000	Rated AAA
20	LICNI	200	AAA	9803	Maturing 03/98
	LICNI	200	AAA	9806	Maturing 06/98
	LICNI	300	000	000	Common Stock
	LICNI	300	100	000	Durables
	LICNI	300	100	100	Autos
25	LICNI	300	100	200	Appl
	LICNI	300	200	000	Consumer Goods
	LICNI	300	200	100	Food
	LICNI	300	200	200	Beverage

30 **(LN) Licensee Summary Names**

Primary Data consisting of
 Licensee Identifier
 Summary Type Identifier
 Summary Number
 Summary Description

35

+

Other Details

+

40

Audit Fields consisting of Processing Model 1

Add Date
 Add Sequence Number
 Add User Identifier
 Change Date
 Change Sequence Number
 Change User Identifier
 Delete Date
 Delete Sequence Number

45

Delete User Identifier
 Number of Modifications
 Archive Status
 Archive Date

5

Example:

Licensee Identifier	Type Code	Group Code	Class Code	Summary Item Name
LICNI	I	0001		Dividends - Ordinary
LICNI	I	0002		Dividends - Partially Tax-Exempt
LICNI	I	0003		Dividends - Tax-Free
LICNI	E	0001		Management Fees
LICNI	E	0004		Legal Expenses
LICNI	R	0001	I	Dividends
LICNI	R	0002	I	Interest - Net
LICNI	R	0007	P	Principal Contributions
LICNI	R	0008	P	Principal Sale Proceeds
LICNI	D	0001	I	Management Fees
LICNI	D	0009	P	Principal Disbursements

(LW) Licensee Service Wholesalers

25 Primary Data consisting of
 Licensee Identifier
 Wholesaler Identifier
 Wholesaler Address
 Number of Calls
 30 Value of Call
 +
 Other Details
 +
 Audit Fields consisting of Processing Model I
 35 Add Date
 Add Sequence Number
 Add User Identifier
 Change Date
 Change Sequence Number
 40 Change User Identifier
 Delete Date
 Delete Sequence Number
 Delete User Identifier
 Number of Modifications
 45 Archive Status
 Archive Date

Example:

<u>Licensee Identifier</u>	<u>Wholesaler Identifier</u>	<u>Wholesaler Name</u>	<u>Wholesaler Address</u>	<u>City/State/ZIP Codes</u>
LICNI	ABCD	AB Cellular Dealer	100 Main Street	Denver, CO
LICNI	RSTU	RS Telephone Utility	200 Broadway	NY, NY

(LR) Licensee Resellers

- Licensee Identifier
- Wholesaler Identifier
- Reseller Identifier
- Reseller Address
- +
- Other Details
- +
- Audit Fields consisting of Processing Model I
 - Add Date
 - Add Sequence Number
 - Add User Identifier
 - Change Date
 - Change Sequence Number
 - Change User Identifier
 - Delete Date
 - Delete Sequence Number
 - Delete User Identifier
 - Number of Modifications
 - Archive Status
 - Archive Date

Example:

<u>Licensee Identifier</u>	<u>Wholesaler Identifier</u>	<u>Reseller Identifier</u>	<u>Reseller Name</u>	<u>Reseller Address</u>	<u>City/State/ZIP Codes</u>
LICNI	ABCD	123	123 Reseller	200 Oak	Tulsa, OK
LICNI	ABCD	234	234 Reseller	500 Elm	Okla City, OK
LICNI	RSTU	678	678 Reseller	300 Pine	Fresno, CA
LICNI	STUV	789	789 Reseller	700 Cedar	Pittsburgh, PA

(AO) Account Objective

- Primary Data consisting of
 - Licensee Identifier
 - Objective Identifier
 - Objective Description
 - +

Other Details

+

Audit Fields consisting of Processing Model I

- 5 Add Date
- Add Sequence Number
- Add User Identifier
- Change Date
- Change Sequence Number
- Change User Identifier
- 10 Delete Date
- Delete Sequence Number
- Delete User Identifier
- Number of Modifications
- Archive Status
- 15 Archive Date

Example:

20	<u>Licensee Identifier</u>	<u>Objective Identifier</u>	<u>Objective Name</u>
	LICNI	0100	Growth
	LICNI	0200	Income
	LICNI	0300	Growth with Income
25	LICNI	0400	Capital Preservation
	LICNI	0500	High-Risk

(AL) Account Legal Capacity

30

Primary Data consisting of

- Licensee Identifier
- Legal Capacity Identifier
- Legal Capacity Description

35

+

Other Details

+

Audit Fields consisting of Processing Model I

- 40 Add Date
- Add Sequence Number
- Add User Identifier
- Change Date
- Change Sequence Number
- Change User Identifier
- 45 Delete Date
- Delete Sequence Number
- Delete User Identifier
- Number of Modifications

Archive Status
Archive Date

5 Example:

	<u>Licensee Identifier</u>	<u>Legal Capacity Number</u>	<u>Legal Capacity Name</u>
	LICNI	010	Trustee
10	LICNI	020	Broker
	LICNI	030	Advisor
	LICNI	040	Agent
	LICNI	050	Escrow
	LICNI	060	Executor
15	LICNI	070	Administrator

(A) Account Jurisdiction

20 Primary Data consisting of
Licensee Identifier
Jurisdiction Identifier
Jurisdiction Description
+
25 Other Details
+
Audit Fields consisting of Processing Model I
Add Date
Add Sequence Number
Add User Identifier
30 Change Date
Change Sequence Number
Change User Identifier
Delete Date
Delete Sequence Number
35 Delete User Identifier
Number of Modifications
Archive Status
Archive Date

40 Example:

	<u>Licensee Identifier</u>	<u>Jurisdiction Identifier</u>	<u>Jurisdiction Name</u>
45	LICNI	CA	California
	LICNI	PA	Pennsylvania
	LICNI	VI	Virgin Islands
	LICNI	NA	Netherlands Antilles

(AR) Account Representative

- 5 Primary Data consisting of
 - Licensee Identifier
 - Account Representative Identifier
 - Account Representative Name
 - +
- 10 Other Details
 - +
- Audit Fields consisting of Processing Model I
 - Add Date
 - Add Sequence Number
 - Add User Identifier
 - 15 Change Date
 - Change Sequence Number
 - Change User Identifier
 - Delete Date
 - Delete Sequence Number
 - 20 Delete User Identifier
 - Number of Modifications
 - Archive Status
 - Archive Date

25 Example:

	<u>Licensee Identifier</u>	<u>Representative Identifier</u>	<u>Representative Name</u>
30	LICNI	RR	Rhonda Red
	LICNI	WW	Wanda White
	LICNI	BB	Bill Brown
	LICN	GG	Glenn Green

(AN) Account Registration Name

- 40 Primary Data consisting of
 - Licensee Identifier
 - Registration Identifier
 - Registration Description
 - +
- Other Details
 - +
- 45 Audit Fields consisting of Processing Model I
 - Add Date
 - Add Sequence Number
 - Add User Identifier
 - Change Date

5 Change Sequence Number
 Change User Identifier
 Delete Date
 Delete Sequence Number
 Delete User Identifier
 Number of Modifications
 Archive Status
 Archive Date

10 Example:

	<u>Licensee Identifier</u>	<u>Registration Identifier</u>	<u>Registration Name</u>
15	LICNI	AA	Able & Company
	LICNI	BB	Baker & Company
	LICNI	CC	Charlie & Company

20 **(AM) Account Master**

25 Primary Data consisting of
 Licensee Identifier
 Account Identifier
 Account Description
 Account Address
 Account Fiscal Year - MM
 Account Fiscal Year - DD
 Account Fiscal Year - Number of Periods
 30 Income Posting Code
 Account Type
 Account Objective
 Account Legal Capacity
 Account Jurisdiction
 35 Account Representative
 Account Registration Name
 Income / Expense Switch
 Receipts / Disbursement Switch
 Performance Measurement Switch
 40 Licensee Wholesaler
 Licensee Reseller
 Account Settlement Switch
 +
 Other Details
 45 +
 System Control Data consisting of
 Income Cash
 Principal Cash

Invested Income
 Invested Principal
 Total Units - Assets
 Liabilities
 5 Total Units - Liabilities
 +
 Capital Gain Control Fields consisting of
 Total Units
 Total Cost Basis
 10 System Control Fields consisting of
 Total Income
 Total Expense
 Total Receipts
 Total Disbursements
 15 +
 Pending Income consisting of
 Total Units
 Total Cost Basis
 Total Pending Income
 20 +
 Pending Cap Adj Out consisting of
 Cap Adj Out - Units
 Cap Adj Out - Cost Basis
 Cap Adj In - Units
 25 Cap Adj In - Cost Basis
 +
 Audit Fields consisting of Processing Model I
 Add Date
 Add Sequence Number
 Add User Identifier
 30 Change Date
 Change Sequence Number
 Change User Identifier
 Delete Date
 35 Delete Sequence Number
 Delete User Identifier
 Number of Modifications
 Archive Status
 40 Archive Date

(AC) Account Communication Links

45 Primary Data consisting of
 Account Identifier
 Communications Number
 +

Other Details

+

Audit Fields consisting of Processing Model I

- 5 Add Date
- Add Sequence Number
- Add User Identifier
- Change Date
- Change Sequence Number
- Change User Identifier
- 10 Delete Date
- Delete Sequence Number
- Delete User Identifier
- Number of Modifications
- Archive Status
- 15 Archive Date

Example:

	<u>Licensee Identifier</u>	<u>Account Identifier</u>	<u>Communications Identifier</u>
	LICNI	123456	ATT-001
	LICNI	123456	TCI-345
	LICNI	234567	US-West
25	LICNI	234567	ATT-002
	LICNI	234567	MCI
	LICNI	456789	Sprint

30 **(TM) Transaction Master**

Primary Data consisting of

- Licensee Identifier
- Transaction Identifier
- 35 Income Posting Code
- Transaction Description
- Add or Subtract Switch
- Settlement Transaction Identifier
- 40 Terminate Settlement Switch

+

Other Details

+

Audit Fields consisting of Processing Model I

- 45 Add Date
- Add Sequence Number
- Add User Identifier
- Change Date
- Change Sequence Number

5
 Change User Identifier
 Delete Date
 Delete Sequence Number
 Delete User Identifier
 Number of Modifications
 Archive Status
 Archive Date

Example:

10

<u>Licensee Identifier</u>	<u>Transaction Identifier</u>	<u>Income Posting Code</u>	<u>Transaction Name</u>
LICN1	D01	I	Paid Management Fee
15 LICN1	D01	I	Paid Management Fee
LICN1	D01	I	Paid Management Fee
LICN1	SE	I	Sell Equity
LICN1	SE	P	Sell Equity
20 LICN1	SE	B	Sell Equity
LICN2	D01	P	Cellular Charge
LICN2	D02	P	Landline Charge
LICN2	D03	P	Direct Satellite Charge
25 LICN2	D04	P	America On-Line Charge

(TP) Transaction Processor

30 Primary Data consisting of
 Licensee Identifier
 Transaction Identifier
 Transaction Income Posting Code
 Transaction Process Description
 35 +
 Other Details
 +
 Audit Fields consisting of Processing Model I
 40 Add Date
 Add Sequence Number
 Add User Identifier
 Change Date
 Change Sequence Number
 Change User Identifier
 45 Delete Date
 Delete Sequence Number
 Delete User Identifier
 Number of Modifications

Archive Status
Archive Date

Example:

5

<u>Licensee Identifier</u>	<u>Transaction Identifier</u>	<u>Income Posting Code</u>	<u>Operator</u>	<u>Operand 1</u>	<u>Operand 2</u>	<u>Suffix</u>
----------------------------	-------------------------------	----------------------------	-----------------	------------------	------------------	---------------

10

(TR) Transactions - Recurring

Primary Data consisting of

15

Licensee Identifier
 Account Identifier
 Transaction Identifier
 Transaction Amount
 Begin Paying
 End Paying
 User Identifier

20

+

Other Details

+

Audit Fields consisting of Processing Model I

25

Add Date
 Add Sequence Number
 Add User Identifier
 Change Date
 Change Sequence Number
 Change User Identifier
 Delete Date
 Delete Sequence Number
 Delete User Identifier
 Number of Modifications

30

35

Archive Status
Archive Date

Example:

40

<u>Licensee Identifier</u>	<u>Account Identifier</u>	<u>Transaction Identifier</u>	<u>Transaction Amount</u>	<u>Begin Date</u>	<u>End Date</u>	<u>User Identifier</u>
----------------------------	---------------------------	-------------------------------	---------------------------	-------------------	-----------------	------------------------

45

(EM) Entity Master

Primary Data consisting of

Entity Identifier
Entity Description

Asset or Liability Code
 Settlement Days
 +
 5 Income Collection Data consisting of
 Income Rate
 Income Ex-Date
 Income Record Date
 Income Payment Date
 +
 10 Capital Adjustment Data consisting of
 Capital Adjustment Rate
 Capital Adjustment Ex-Date
 Capital Adjustment Record Date
 Capital Adjustment Payment Date
 15 Capital Adjustment New Entity
 +
 Other Details
 +
 20 Audit Fields consisting of Processing Model I
 Add Date
 Add Sequence Number
 Add User Identifier
 Change Date
 Change Sequence Number
 25 Change User Identifier
 Delete Date
 Delete Sequence Number
 Delete User Identifier
 Number of Modifications
 30 Archive Status
 Archive Date

(EA) Entity Attribute

35 Primary Data consisting of
 Licensee Identifier
 Entity Identifier
 +
 40 Management Decision-Making Data consisting of
 Diversification Type
 Diversification Group
 Diversification Class
 +
 45 Performance Measurement Data consisting of
 Performance Type
 Performance Group

Performance Class
 +
 Accounting Data consisting of
 Accounting Control Number - Asset
 Accounting Control Number - Liability
 +
 System Control Data consisting of
 Invested Income
 Invested Principal
 Total Units - Assets
 Liabilities
 Total Units - Liabilities
 +
 Settlement Data consisting of
 Buy - In Units
 Buy - Out Cost Basis
 Sell - In Proceeds
 Sell - Out Units
 +
 Other Details
 +
 Audit Fields consisting of Processing Model I
 Add Date
 Add Sequence Number
 Add User Identifier
 Change Date
 Change Sequence Number
 Change User Identifier
 Delete Date
 Delete Sequence Number
 Delete User Identifier
 Number of Modifications
 Archive Status
 Archive Date

5

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(ET) Entity Transaction

Primary Data consisting of
 Licensee Identifier
 Entity Identifier
 Transaction Identifier
 +
 Other Details
 +
 Audit Fields consisting of Processing Model I
 Add Date
 Add Sequence Number

40

45

5 Add User Identifier
 Change Date
 Change Sequence Number
 Change User Identifier
 Delete Date
 Delete Sequence Number
 Delete User Identifier
 Number of Modifications
 10 Archive Status
 Archive Date

Example:

15	<u>Licensee Identifier</u>	<u>Entity Identifier</u>	<u>Transaction Identifier</u>
	LICNI	GM	BE
	LICNI	GM	XO
20	LICNI	GM	XI

(SG) System General Ledger

25 Primary Data consisting of
 Licensee Identifier
 +
 Control Fields consisting of
 Asset or Liability
 30 Account Type Identifier
 Accounting Control Number
 Account Balance
 +
 Other Details
 +
 35 Audit Fields consisting of Processing Model I
 Add Date
 Add Sequence Number
 Add User Identifier
 Change Date
 40 Change Sequence Number
 Change User Identifier
 Delete Date
 Delete Sequence Number
 Delete User Identifier
 45 Number of Modifications
 Archive Status
 Archive Date

Example:

(See Details provided)

5

(S1) System Transaction Journal

Primary Data consisting of
Licensee Identifier
Account Identifier
Transaction Identifier and either

10

Buys / Sells
Entity Identifier
Purchase Date
Amount Units
Net Amount
Cost Basis (if Sell)

or

Debits / Credits
Entity Identifier (if any)
Principal
Income
Net Amount

15

+

20

Other Details

+

Currency Fields consisting of
Currency Rate
Currency From
Currency To
Currency Date

25

+

Sell Data consisting of
Sell Date
Sell Price
Sell Proceeds
Sell Transaction Date
Sell Transaction Sequence Number
Sell Transaction Lot
Sell To
Capital Gain Amount
Capital Gain Period

30

+

Sell Currency Data consisting of
Sell Currency Rate
Sell Currency From
Sell Currency To
Sell Currency Date

40

+

Audit Fields consisting of Processing Model 2
Transaction Date
Transaction Sequence Number
Transaction Lot

45

5 Reversing Transaction Date
 Reversing Sequence Number
 Reversing Transaction Lot
 Reversed By Transaction Date
 Reversed By Transaction Sequence Number
 Reversed By Transaction Lot
 Trade Date
 Archive Status
 Archive Date

10

(ST) System Trade Settlement

Primary Data consisting of
 15 Licensee Identifier
 Account Identifier
 Entity Identifier
 Purchase Date
 Amount Units
 Cost Basis
 20 Buyer / Seller
 Trade Settlement Date

+
 Currency Fields consisting of
 25 Currency Ratio
 Currency From
 Currency To
 Currency Date

+
 Other Details
 30 +
 Transaction Date
 Transaction Sequence Number
 Transaction Lot

+
 35 Audit Data consisting of
 Add Date
 Add User Identifier
 Archive Status
 Archive Date

40

(SS) System Summary Table

Primary Data consisting of
 45 Licensee Identifier
 Job Number
 Job Name
 Begin Time
 End Time

5 Number of Accepts
 Number of Rejects
 Total Items
 +
 10 Audit Data consisting of
 Add Date
 Add User Identifier
 Archive Status
 Archive Date

Example:

15

<u>Licensee Identifier</u>	<u>Job Number</u>	<u>Job Name</u>	<u>Begin Time</u>	<u>End Time</u>	<u>Total Transactions</u>	<u>Number Accepts</u>	<u>Number Rejects</u>
----------------------------	-------------------	-----------------	-------------------	-----------------	---------------------------	-----------------------	-----------------------

(SR) System Reject Table

20 Primary Data consisting of
 Licensee Identifier
 Licensee Record
 +
 25 Audit Data consisting of
 Add Date
 Add User Identifier
 Archive Status
 Archive Date

30 Example:

<u>License Identifier</u>	<u>Transaction Record</u>
---------------------------	---------------------------

35 **(SC) System Transaction Count**

40 Primary Data consisting of
 Licensee Identifier
 Today's Date
 Transaction Identifier
 Transaction Count - Originate
 Transaction Count - Reversal
 +
 45 Audit Data consisting of
 Add Date
 Add User Identifier
 Archive Status

Archive Date

Example:

5	<u>License Identifier</u>	<u>Transaction Date</u>	<u>Transaction Identifier</u>	<u>Transaction Count - Orig</u>	<u>Transaction Count - Rev</u>
---	---------------------------	-------------------------	-------------------------------	---------------------------------	--------------------------------

(CS) Customer Income Statement (Income / Expense)

10 Primary Data consisting of
 Licensee Identifier
 Account Identifier
 Fiscal Year - YYYY
 Fiscal Year - Period
 15 Income / Expense
 Income / Expense Number
 Income / Expense Balance
 +

20 Audit Fields consisting of
 Add Date
 Add User Identifier
 Archive Status
 Archive Date

25 Example:

<u>Licensee Identifier</u>	<u>Account Identifier</u>	<u>Fiscal Year</u>	<u>Fiscal Period</u>	<u>Inc / Exp Identifier</u>	<u>Inc / Exp Number</u>	<u>Inc / Exp Balance</u>
----------------------------	---------------------------	--------------------	----------------------	-----------------------------	-------------------------	--------------------------

30 LICNI

(CF) Customer Cash Flow (Receipts / Disbursements)

35 Primary Data consisting of
 Licensee Identifier
 Account Identifier
 Fiscal Year - YYYY
 Fiscal Year - Period
 40 Receipt / Disbursement
 Receipt / Disbursement Number
 Receipt / Disbursement Balance
 +

45 Audit Fields consisting of
 Add Date
 Add User Identifier
 Archive Status
 Archive Date

Example:

	<u>Licensee Identifier</u>	<u>Account Identifier</u>	<u>Fiscal Year</u>	<u>Fiscal Period</u>	<u>Rec / Dis Identifier</u>	<u>Rec / Dis Number</u>	<u>Rec / Dis Balance</u>
5	LICNI						

(CB) Customer Balance Sheet

- 10 Primary Data consisting of
 - Licensee Identifier
 - Account Identifier
 - Entity Identifier
 - Purchase Date
 - 15 Amount Units
 - Cost Basis
 - +
- 20 Currency Data consisting of
 - Currency Rate
 - Currency From
 - Currency To
 - Currency Date
 - +
- 25 Other Details
 - +
- 30 Transaction Identification consisting of
 - Transaction Date
 - Transaction Sequence Number
 - Transaction Lot
 - +
- 35 Audit Fields consisting of
 - Add Date
 - Add User Identifier
 - Archive Status
 - Archive Date

(CG) Customer Capital Gains

- 40 Primary Data consisting of
 - Licensee Identifier
 - Account Identifier
 - Entity Identifier
 - Purchase Date
 - 45 Amount Units
 - Cost Basis
 - Purchase Price
 - Buy From

- 5 +
Transaction Identification consisting of
Transaction Date
Transaction Sequence Number
Transaction Lot
- 10 +
Buy Currency Fields consisting of
Current Rate
Currency From
Currency To
Currency Date
- 15 +
Sell Data consisting of
Sell Date
Sell Price
Sell Proceeds
Sell Transaction Date
Sell Transaction Sequence Number
Sell Transaction Lot
- 20 +
Sell To
Capital Gain Amount
Capital Gain Period
- 25 +
Sell Currency Data consisting of
Sell Currency Rate
Sell Currency From
Sell Currency To
Sell Currency Date
- 30 +
Audit Fields consisting of
Add Date
Add User Identifier
Archive Status
Archive Date

35 **(CI) Customer Pending Income**

- 40 Primary Data consisting of
Licensee Identifier
Account Identifier
Entity Identifier
Purchase Date
Amount Units
Cost Basis
- 45 Purchase Price
+
Transaction Identification consisting of
Transaction Date

Transaction Sequence Number
 Transaction Lot
 +
 5 Payment Date Data consisting of
 Income - Ex-Date
 Income - Record Date
 Income - Payment Date
 +
 10 Audit Fields consisting of
 Add Date
 Add User Identifier
 Archive Status
 Archive Date

15 **(CA) Pending Capital Adjustment**

Primary Data consisting of
 Licensee Identifier
 Account Identifier
 20 +
 Pending Out Data consisting of
 Entity Identifier (Old Entity)
 Purchase Date
 25 Transaction Identifier (Exchange Out)
 Amount Units (Old Amount)
 Cost Basis
 Purchase Price
 +
 30 Transaction Identification consisting of
 Transaction Date
 Transaction Sequence Number
 Transaction Lot
 +
 35 Pending In Data consisting of
 Transaction Identifier (Exchange In)
 Entity Identifier (New Entity)
 Amount Units (New Amount)
 +
 40 Payment Date Data consisting of
 Capital Adjustment - Ex-Date
 Capital Adjustment - Record Date
 Capital Adjustment - Payment Date
 +
 45 Audit Fields consisting of
 Add Date
 Add User Identifier
 Archive Status
 Archive Date

(CP) Customer Performance Measurement

5 Primary Data consisting of
 Licensee Identifier
 Account Identifier
 Fiscal Year - YYYY
 Fiscal Year - Period
 Performance Measurement - Type
 10 Performance Measurement - Group
 Performance Measurement - Class
 Beginning Value
 Beginning Units
 Contributions
 15 Distributions
 Income
 Expenses
 Management Fees
 Commissions
 20 Federal Taxes
 State Taxes
 Local Taxes
 Ending Value
 Ending Units
 25 Ending Net Asset Value
 +
 Capital Gain Control Fields consisting of
 Total Units
 Total Cost Basis
 30 System Control Fields consisting of
 Total Income
 Total Expense
 Total Receipts
 Total Disbursements
 35 +
 Pending Income consisting of
 Total Units
 Total Cost Basis
 Total Pending Income
 40 +
 Pending Cap Adj Out consisting of
 Cap Adj Out - Units
 Cap Adj Out - Cost Basis
 Cap Adj In - Units
 45 Cap Adj In - Cost Basis
 +
 Audit Fields consisting of
 Add Date

Add User Identifier
 Archive Status
 Archive Date

5

**SAMPLE DATA FOR LICENSE GENERAL LEDGER
 DEFINITION TABLE (LL)**

	<u>Licensee Identifier</u>	<u>Asset or Liab</u>	<u>Accounting Control Number</u>	<u>Accounting Name</u>
10	LICN1	A	A05	Municipal Bonds
	LICN1	A	A07	Corporate Bonds
	LICN1	A	A10	Common Stocks
	LICN1	A	A12	Mutual Funds
	LICN1	A	A13	International Currencies
15	LICN1	A	A15	Oil Partnerships
	LICN1	A	A20	Real Estate Partnerships
	LICN1	A	A30	Foreign Equities
	LICN1	A	A35	Objects of Art
	LICN1	A	A40	Jewelry
20	LICN1	A	A45	Homes
	LICN	A	A50	Automobiles
	LICN	A	A90	Derivatives
	LICN2	A	W10	MSA/RSA -North
	LICN2	A	W20	MSA/RSA -East
25	LICN2	A	W30	MSA/RSA -South
	LICN2	A	W40	MSA/RSA -West
	LICN2	A	L10	Alabama
	LICN2	A	L20	Alaska
	.		.	.
30	.		.	.
	.		.	.
	LICN2	A	L500	Wyoming

	<u>Licensee Identifier</u>	<u>Asset or Liab</u>	<u>Accounting Control Number</u>	<u>Accounting Name</u>
	LICN2	A	S10	Major Market 1
	LICN2	A	S20	Major Market 2
	LICN2	A	S30	Major Market 3
	•		•	•
5	•		•	•
	•		•	•
	LICN2	A	S1000	Major Market N
	LICN3	A	C10	Cash
	LICN3	A	C20	Other Current Assets
10	LICN3	A	C30	Fixed Assets
	LICN3	A	C40	Depreciation
	LICN3	A	C50	Intangible Assets
<hr/>				
	LICN1	L	L05	Uninvested Income
15	LICN1	L	L10	Invested Income
	LICN1	L	L15	Uninvested Principal
	LICN1	L	L20	Invested Principal
	LICN1	L	L30	Personal Notes
	LICN1	L	L40	Mortgages
20	LICN1	L	L90	Income
	LICN1	L	L60	Short-Term Liabilities
	LICN1	L	L65	Deferred Taxes
	LICN1	L	L70	Long-Term Liabilities
	LICN1	L	L75	Net Worth
25				

SAMPLE DATA FOR SYSTEM GENERAL LEDGER TABLE

	<u>Licensee Master</u>	<u>Asset or Liab</u>	<u>Account Type</u>	<u>Accounting Control Number</u>	<u>Accounting Name</u>
5	LICNI	A	000	000	Financial Services Assets
	LICNI	A	100	000	Pension Trust
	LICNI	A	100	A01	Income Cash Demand
	LICNI	A	100	A02	Income Cash Overdraft
	LICNI	A	100	A03	Principal Cash Demand
10	LICNI	A	100	A04	Principal Cash Overdraft
	LICNI	A	100	A07	Corporate Bonds
	LICNI	A	100	A10	Common Stocks
	LICNI	A	100	A15	Oil Partnerships
	LICNI	A	100	A20	Real Estate Partnerships
15	LICNI	A	100	A30	Foreign Equities
	LICNI	A	200	000	Investment Advisory
	LICNI	A	200	A01	Income Cash Demand
	LICNI	A	200	A02	Income Cash Overdraft
	LICNI	A	200	A03	Principal Cash Demand
20	LICNI	A	200	A04	Principal Cash Overdraft
	LICNI	A	200	A05	Municipal Bonds
	LICNI	A	200	A07	Municipal Bonds
	LICNI	A	200	A10	Common Stocks
	LICNI	A	200	A12	Mutual Funds
25	LICNI	A	200	A13	International Currencies
	LICNI	A	200	A15	Oil Partnerships
	LICNI	A	200	A20	Real Estate Partnerships
	LICNI	A	100	A30	Foreign Equities
	LICNI	A	100	A90	Financial Derivatives

	<u>Licensee Master</u>	<u>Asset or Liab</u>	<u>Account Type</u>	<u>Accounting Control Number</u>	<u>Accounting Name</u>
	LICNI	A	300	000	Estates
	LICNI	A	300	A01	Income Cash Demand
	LICNI	A	300	A02	Income Cash Overdraft
	LICNI	A	300	A03	Principal Cash Demand
5	LICNI	A	300	A04	Principal Cash Overdraft
	LICNI	A	300	A05	Municipal Bonds
	LICNI	A	300	A07	Corporate Bonds
	LICNI	A	300	A10	Common Stocks
	LICNI	A	300	A12	Mutual Funds
10	LICNI	A	300	A15	Oil Partnerships
	LICNI	A	300	A20	Real Estate Partnerships
	LICNI	A	300	A30	Foreign Equities
	LICNI	A	300	A35	Objects of Art
	LICNI	A	300	A40	Jewelry
15	LICNI	A	300	A40	Homes
	LICNI	A	300	A50	Automobiles
	LICNI	A	400	000	Settlement Accounts - Buy
	LICNI	A	400	A01	Income Cash Demand
	LICNI	A	400	A02	Income Cash Overdraft
20	LICNI	A	400	A03	Principal Cash Demand
	LICNI	A	400	A04	Principal Cash Overdraft
	LICNI	A	400	A05	Corporate Bonds
	LICNI	A	400	A07	Municipal Bonds
	LICNI	A	400	A10	Common Stocks
25	LICNI	A	400	A15	Oil Partnerships
	LICNI	A	400	A20	Real Estate Partnerships
	LICNI	A	400	A30	Foreign Equities

	<u>Licensee Master</u>	<u>Asset or Liab</u>	<u>Account Type</u>	<u>Accounting Control Number</u>	<u>Accounting Name</u>
	LICN1	A	500	000	Settlement Accounts - Sell
	LICN1	A	500	A01	Income Cash Demand
	LICN1	A	500	A02	Income Cash Overdraft
	LICN1	A	500	A03	Principal Cash Demand
5	LICN1	A	500	A04	Principal Cash Overdraft
	LICN1	A	500	A05	Corporate Bonds
	LICN1	A	500	A07	Municipal Bonds
	LICN1	A	500	A10	Common Stocks
	LICN1	A	500	A15	Oil Partnerships
10	LICN1	A	500	A20	Real Estate Partnerships
	LICN1	A	500	A30	Foreign Equities
				(AND/OR)	
	LICN2	A	1000	000	Communication Assets
	LICN2	A	1000	W00	Wireless Communications
15	LICN2	A	1000	W10	MSA/RSA - North
	LICN2	A	1000	W20	MSA/RSA - East
	LICN2	A	1000	W30	MSA/RSA - South
	LICN2	A	1000	W40	MSA/RSA - West
	LICN2	A	2000	L00	Landline Communications
20	LICN2	A	2000	L10	Alabama
	LICN2	A	2000	L20	Alaska
	.				.
	.				.
	.				.
25	LICN2	A	2000	L500	Wyoming
	LICN2	A	3000	S00	Satellite Broadcast
	LICN2	A	3000	S10	Major Market I

	<u>Licensee Master</u>	<u>Asset or Liab</u>	<u>Account Type</u>	<u>Accounting Control Number</u>	<u>Accounting Name</u>
	LICN2	A	3000	S20	Major Market 2
	LICN2	A	3000	S30	Major Market 3
	.				.
	.				.
5	.				.
	LICN2	A	3000	S1000	Major Market 4
				(AND/OR)	
	LICN3	A	0000	000	Corporate Assets
	LICN3	A	9000	000	Domestic Subsidiary
10	LICN3	A	9000	C10	Cash
	LICN3	A	9000	C20	Other Current Assets
	LICN3	A	9000	C30	Fixed Assets
	LICN3	A	9000	C40	Depreciation
	LICN3	A	9000	C50	Intangible Assets
15	LICN3	A	9000	000	Foreign Subsidiary
	LICN3	A	9000	C10	Cash
	LICN3	A	9000	C20	Other Current Assets
	LICN3	A	9000	C30	Fixed Assets
	LICN3	A	9000	C40	Depreciation
20	LICN3	A	9000	C50	Intangible Assets
<hr/>					
	LICN1	L	000	000	Financial Services Liabilities
	LICN1	L	100	000	Pension Trust
	LICN1	L	100	L15	Uninvested Principal
25	LICN1	L	100	L20	Invested Principal
	LICN1	L	200	000	Investment Advisory
	LICN1	L	200	L05	Uninvested Income

	<u>Licensee Master</u>	<u>Asset or Liab</u>	<u>Account Type</u>	<u>Accounting Control Number</u>	<u>Accounting Name</u>
	LICN1	L	200	L10	Invested Income
	LICN1	L	200	L15	Uninvested Principal
	LICN1	L	200	L20	Invested Principal
	LICN1	L	300	000	Estates
5	LICN1	L	300	L05	Uninvested Income
	LICN1	L	300	L10	Invested Income
	LICN1	L	300	L15	Uninvested Principal
	LICN1	L	300	L20	Invested Principal
	LICN1	L	300	L30	Personal Notes
10	LICN1	L	300	L40	Mortgages
	LICN1	L	400	000	Settlement - Buy
	LICN1	L	400	L15	Uninvested Principal
	LICN1	L	400	L20	Invested Principal
	LICN1	L	500	000	Settlement - Buy
15	LICN1	L	500	L15	Uninvested Principal
	LICN1	L	500	L20	Invested Principal
				(AND/OR)	
	LICN2	L	1000	000	Communications
	LICN2	L	1000	000	Wireless
20	LICN2	L	1000	L90	Income
	LICN2	L	2000	000	Landline
	LICN2	L	2000	L90	Income
	LICN2	L	3000	000	Satellite Broadcast
	LICN2	L	3000	L90	Income
25				(AND/OR)	
	LICN3	L	9000	000	Domestic Subsidiary
	LICN3	L	9000	L60	Short-Term Liabilities

	<u>Licensee Master</u>	<u>Asset or Liab</u>	<u>Account Type</u>	<u>Accounting Control Number</u>	<u>Accounting Name</u>
	LICN3	L	9000	L65	Deferred Taxes
	LICN3	L	9000	L70	Long-Term Liabilities
	LICN3	L	9000	L75	Net Worth
	LICN3	L	9000	000	Foreign Subsidiary
5	LICN3	L	9000	L60	Short-Term Liabilities
	LICN3	L	9000	L65	Deferred Taxes
	LICN3	L	9000	L70	Long-Term Liabilities
	LICN3	L	9000	L75	Net Worth

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A Standardized Method for Naming the Programs
(or SQL Scripts) and Data Elements of Real-time Multiprocessed Automated Applications

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The specific invention is a standardized file naming convention to be used in the automatic generation of program code for multiple large-scale transaction processing applications (such as securities trading, telecommunications billing, and work management) on multi-processing computers (using 4, 8, 16, 32 processors) with 100% auditability of user-defined controls. The standardized file naming convention is totally independent of any specific

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- a.) application such as accounts receivable, customer billing, etc.,
- b.) industry such as financial services, telecommunications, or work management,
- c.) hardware manufacturer such as Compaq, Digital, HP, IBM, NCR, Unisys,
- d.) operating system such as MS-DOS, UNIX, OpenVMS, MVS, etc.,
- e.) relational database management system such as Oracle, Sybase, MS-SQL Server,
- f.) computer language such as SQL, COBOL, Fortran, PL/I, etc.

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The standard naming convention contains the fewest number of characters in any naming conventions; namely, eleven characters used by MS-DOS. The naming convention of MS-DOS uses eight characters as a file name and three characters as a file extension wherein the user may define a file name using the alphabet and selected other characters. While this flexibility is suitable for home use are a small number of files and users, it is not acceptable for large-scale enterprise-wide applications with large number of files and large number of supporting technicians. Hence, the need for enterprise-wide standards.

The standard file naming convention contains six elements that permit the technician to readily identify the functionality of the specific script (or program) without looking at its contents. Using ANSI Standard structured Query Language as an example language, the six elements are:

a.) a 2-character mnemonic for the SQL commands such as:

5	<u>Mnemonic</u>	<u>ANSI Standard SQL Commands</u>
	CT	Create Table
	SF	Select From Table
	DF	Delete From
	DT	Drop Table
10	II	Insert Into
	SI	Select Into
	CS	Create Sequence
	DS	Drop Sequence
	CI	Create Index
15	DI	Drop Index
	RV	Review
	RT	Retest
	RS	Reset, etc.

20 b.) a 2-character mnemonic for the application name such as

	<u>Mnemonic</u>	<u>User Defined Application Name Examples</u>
	ST	Securities Trading
	TC	Telecommunications Billing
	WM	Work Management, etc.

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c.) a 2-character mnemonic for the table (or file name) such as

	<u>Mnemonic</u>	<u>User-Defined Table Name Examples</u>
	AM	Account Master Name/Address/Etc.
	SM	Securities Master
30	DC	Detail Calls
	XB	External Billing, etc.

III

d.) a 1-character mnemonic for the table cluster role such as

Mnemonic Standard Table Roles

	M	Master
	I	Input
5	A	Accepts
	R	Rejects
	H	History
	S	Summary
	1	Master History
10	2	Accepts History
	0	Output

e.) a 1-character mnemonic for the table cluster type such as

Mnemonic Standard Table Types

15	M	Master
	J	Journal
	T	Temporary
	1-9	Index Numbers

20 f.) a 3-character extension is then added to the file name depending upon the type of operating system being used such as MS-DOS, UNIX, OpenVMS, etc. and whether or not the file is a source file for programmer use or a compiled file (or stored procedure) for machine use.

Hence, script name examples are:

25 CTXBMDMM.SQL - Create Table for the External Billing System, Master Definition Table Cluster, Master Table, and Master Role for SQL use.

DTXBDCOJ.SQL - Drop Table for the External Billing System, Detail Call Cluster, Output Table, and Journal Role for SQL use.

Circumstances Leading to the Invention

30 The circumstances leading to the invention of a standard SQL script naming convention are:

a.) one programmer will rarely adhere to the same naming conventions over time and unless an acceptable standard is defined each succeeding programmer added to the job will only complicate the issue by bringing

their own standards. Hence, software maintenance becomes a matter of knowing which programmer wrote which program at what time.

b.) without a naming standard any programmer has no idea of what functions the programming is performing without opening the program and examining the program code. This process produces create inefficient maintenance by existing programmers and inefficient training for new programmers.

c.) Competitive pressures are mounting for the efficient of software maintenance.

Advantage of the Invention

Because no duplicate script names are permitted the name of each SQL Script should

a.) convey to the user the precise use of each SQL Script and

b.) permit the storage of all SQL scripts in a one SQL Script Library, or directory.

A standard naming convention also permits the user to determine what scripts may be automatically executed in sequence by use of a SQL command script, which is a single SQL script containing a list of SQL scripts to be executed in sequence. Hence, any single SQL scripts contained in the SQL Library can be reused in many different SQL command scripts.

Although any standard naming convention represents a unique entity separate and apart from the other technologies described immediately above, this particular naming convention is unique in that it embraces all of the logical information necessary to readily identify the role of the script in the total system.

Detailed Description of Invention:

std_name is a standard naming convention that constructs names for programs (or SQL Scripts), system tables, table clusters, and data elements. The seven basic elements are:

- | | | | |
|-----|----------|-------------------|---|
| 1.) | org_name | Organization | 2 |
| 2.) | com_name | SQL Command | 2 |
| 3.) | app_name | Application | 2 |
| 4.) | tab_name | Table | 2 |
| 5.) | rol_name | Table Role | 1 |
| 6.) | typ_name | Table Type | 1 |
| 7.) | col_name | Column (or Field) | 4 |

std_name defines both "external" names used by the operating system and "internal" names used by the specific program.

The "external" resulting names are:

- 1.) clu_name Cluster Name 4
- 2.) sys_name System Table Name 6
- 3.) ext_name Extension Name 3
- 4.) sql_name SQL Script Name 11 (8 name plus 3 extension)

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where the SQL Script Names are used by the operating systems.

The "internal" resulting names are:

- 1.) tab_iden Table Iden Name 4
- 2.) col_name Column (or Field) Name 4
- 3.) dat_name Data Element Name 8 or more, in increments of 4

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where the Data Element Names are used by the programs (or SQL Scripts).

External Names used by the operating system in identifying programs (or SQL Scripts) are created by employing the following naming components:

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com_name SQL Command Mnemonic

app_name Application Name Mnemonic

tab_name Table Name Mnemonic

rol_name Table Role Name Mnemonic

20

tab_name Table Type Name Mnemonic

ext_name Extension Mnemonic

1 2 3 4 5 6 7 8 . 9 10 11

Examples: C T X B M D M M . S Q L

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S F X B M D M M . S Q L

clu_name

tab_iden

sys_name ext_name

sql_name

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Internal Names used by the program (or SQL Script) in processing the data elements are created by employing the following naming components:

5 6 7 8

	tab_name	Table Name Mnemonic		
			rol_name	Role Name Mnemonic
			typ_name	Type Name Mnemonic
5			col_name	Column Name
Examples:	M D M M	LNAM	...	for last name
	M D M M	FNAM	...	for first name
	M D M M	MNAM	...	for middle name
	M D M M	ADRI	...	address - 1st line
10	M D M M	ADR2	...	address - 2cd line
	M D M M	CITY	...	city
	M D M M	STAT	...	state
	M D M M	ZIPC	...	zip code
	dat_name			

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Data Tracing

By addressing both the external names for the operating system and the internal names for a specific program, the naming convention is global in nature. In the event that one data element derives its source of input from another table rather than its own specific input screen, then the data name is extended by placing the table identifier of the table supplying the data between the first four and second four characters of the intended data name. Should the data be derived from another table that also derived its data from another table, then eight characters are placed between the first four characters and the last four characters of the intended data name. In the fashion, the data name points backwards through all of the preceding tables to the original source of data and its input form. This process is called "data tracing", and it provides benefits to programmers in the testing and debugging stages of software development by identifying the original source of data. Thus, "data tracing" provides the programmer with thorough documentation of the data flow throughout an entire system.

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Standard naming conventions do not apply to certain language extensions such as the script footings that, for example, specify the size of the table to be created in a "Create Table" script.

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The foregoing discussion of the invention has been presented for purposes of illustration and description. Further, comments and description is not intended to limit the invention to the form disclosed herein. Consequently, variation and modification commensurate with the above teachings, and within the skill and knowledge of the relevant art, are within the scope of the present invention. The embodiment described herein above is further intended to explain

the best mode presently known of practicing the invention and to enable others skilled in the art to utilize the invention as such, or in other embodiments, and with the various modifications required by their particular application or uses of the invention. It is intended that the appended claims be construed to include alternative embodiments to the extent permitted by the prior art.

What is claimed is:

1. A system for processing accounting operations that facilitates auditability for each of one or more business enterprises, comprising:
 - means for generating financial data records, wherein each said data record provides access to one or more status data fields for values indicative of when one of : a creation, a modification and deletion of said data record has occurred;
 - a plurality of master collections for a first of the enterprises, said master collections having said data records, wherein for each said master collection, said data records in said master collection have an identical data format;
 - a processing means for modifying said data records of one or more of said master collections according to each operation of a series of input accounting operations, wherein said processing means modifies said one or more of said status fields;
 - a history data storage area for each of said master collections, for storing history data for the master collection, wherein when performance of one of said accounting operations generates a modified version of a corresponding previous version of one of said data records of said master collection, a corresponding history record is provided to said history data storage area, said corresponding history record having information indicative of said previous version of said data record prior to its modification;
 - a reversal means for reversing a performance of at least a first of said accounting operations, wherein for each of the one or more of said modified data records provided by said first accounting operation, said modified data record is replaced with said corresponding previous version using said corresponding history record, wherein said corresponding history record is determined using values of said status fields of said modified data record.
2. A system as claimed in Claim 1, wherein said accounting operations include a financial transaction wherein one of: all processing for the financial transaction must be accepted, and no processing for the financial transaction must be accepted.
3. A system as claimed in Claim 1, wherein said accounting operations include any operation for changing one of: an identifier and a location, wherein the changing is for one of: the first enterprise, an account held by the first enterprise, an entity for which the first enterprise is capable of being held accountable.
4. A system as claimed in Claim 1, wherein said plurality of master collections includes a corresponding master collection for each of some of the following data record types:
 - (a) a description identifying the first enterprise;
 - (b) a description of account types desired by the first enterprise;
 - (c) default account subtypes;

- (d) a description identifying categories for balances of a general ledger for the first enterprise;
- (e) a description identifying financial categories to which financial postings can occur in accounts with the first enterprise;
- (f) a description of groupings of financial enterprises traded in the accounts for the first enterprise;
- 5 (g) a description of one or more performance measurements by which a performance of financial enterprises for which the first enterprise is accountable are capable of being measured;
- (h) a description of objectives for accounts held by the first enterprise;
- (i) a description of jurisdictions for accounts held by the first enterprise;
- (j) a description of legal capacities that the first enterprise can hold with respect to its accounts;
- 10 (k) a description of one or more account representatives for the first enterprise;
- (l) a description of accounts for clients of the first enterprise, including at least one balance;
- (m) a description identifying transactions capable of being performed on accounts held by the first enterprise;
- (n) a description identifying characteristics of enterprises traded in accounts held by the first enterprise;
- 15 (o) a description, for each of one or more financial enterprises capable of being traded in accounts held by the first enterprise, of an identity of each financial transaction that can be applied to the financial entity;
- (p) a description, for each entity traded in accounts held by the first enterprise, identifying one or more classifications of the entity, said classifications indicative of how the first enterprise classifies the entity for account purposes;
- 20 (q) a description of identification for income expenses receipts and disbursements generated by financial accounting classifications used by the first enterprise;
- (r) a description for identifications for collections of enterprises held by the first enterprise for accounts of the first enterprise, wherein each collection is an aggregation of the enterprises for a plurality of the accounts.
5. A system as claimed in Claim 1, wherein said means for generating includes means for creating at least some of the following data fields as status data fields:
- 25 (a) at least one of a date and time the record was inserted in the master collection;
- (b) a sequence number indicating an order of when the record was inserted into the master collection;
- (c) an identification of a user requesting that the record be inserted into the master collection;
- (d) at least one of: a date and a time the record was updated in the master collection;
- 30 (e) a sequence number indicating an order of when the record was updated in the master collection;
- (f) an identification of a user requesting an update of the record in the master collection;
- (g) at least one of: a date and time when the record was deleted from the master collection;

- (h) a sequence number indicating an order of when the record was deleted from the master collection;
- (i) an identification of a user requesting a deletion of the record from the master collection;
- (j) a number indicating a number of modifications to the row since it was inserted.

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6. A system as claimed in Claim 1 further including, for at least some of said master collections, an accept data storage area for storing, for each successful performance of one of the accounting operations, an accept record having information indicative of successful performance of the accounting operation.

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7. A system as claimed in Claim 1 further including, for at least some of said master collections, a reject data storage area for storing, for each unsuccessful performance of one of the accounting operations, a reject record having information indicative of unsuccessful performance of the accounting operation.

8. A system for processing accounting operations that facilitates auditability for each of one or more enterprises, comprising:

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means for generating financial data records wherein each said data record provides access to one or more status data fields for values indicative of when one of : a creation, a modification and deletion of said data record has occurred;

a plurality of master collections for a first of the enterprises, said master collections having said data records, wherein for each said master collection, said data records in said master collection have a same data format;

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a processing means for modifying said data records of one or more of said master collections according to each operation of a series of input accounting operations, wherein said processing means modifies said one or more status fields;

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for each of said master collections, a history data storage area for accumulating data for changes to the master collection, wherein when performance of said series of input accounting operations generates modified versions of corresponding previous versions of the data records of said master collection, corresponding history records are added to said history data storage area, said corresponding history records having information indicative of said previous versions of each data record of said master collection so that an audit tracing of changes by versions of the data records of said master collection is capable of being performed using said one or more status fields.

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9. A system as claimed in Claim 8, wherein for a plurality of the descriptions (a) through (r) below, there is one of said master collections whose data records include data for said description:

- (a) a description identifying the first enterprise;
- (b) a description of account types desired by the first enterprise;
- (c) default account subtypes;

- (d) a description identifying categories for balances of a general ledger for the first enterprise;
- (e) a description identifying financial categories to which financial postings can occur in accounts with the first enterprise;
- (f) a description of groupings of financial enterprises traded in the accounts for the first enterprise;
- 5 (g) a description of one or more performance measurements by which a performance of financial enterprises for which the first enterprise is accountable are capable of being measured;
- (h) a description of objectives for accounts held by the first enterprise;
- (i) a description of jurisdictions for accounts held by the first enterprise;
- (j) a description of legal capacities that the first enterprise can hold with respect to its accounts;
- 10 (k) a description of one or more account representatives for the first enterprise;
- (l) a description of accounts for clients of the first enterprise, including at least one balance;
- (m) a description identifying transactions capable of being performed on accounts held by the first enterprise;
- (n) a description identifying characteristics of enterprises traded in accounts held by the first enterprise;
- 15 (o) a description, for each of one or more financial enterprises capable of being traded in accounts held by the first enterprise, of an identity of each financial transaction that can be applied to the financial entity;
- (p) a description, for each entity traded in accounts held by the first enterprise, identifying one or more classifications of the entity, said classifications indicative of how the first enterprise classifies the entity for account purposes;
- 20 (q) a description of identification for income expenses receipts and disbursements generated by financial accounting classifications used by the first enterprise;
- (r) a description for identifications for collections of enterprises held by the first enterprise for accounts of the first enterprise, wherein each collection is an aggregation of the enterprises for a plurality of the accounts.
10. A system as claimed in Claim 8, wherein said means for generating includes means for creating at least some of the following data fields as status data fields:
- 25 (a) at least one of a date and time the record was inserted in the master collection;
- (b) a sequence number indicating an order of when the record was inserted into the master collection;
- (c) an identification of a user requesting that the record be inserted into the master collection;
- (d) at least one of: a date and a time the record was updated in the master collection;
- 30 (e) a sequence number indicating an order of when the record was updated in the master collection;
- (f) an identification of a user requesting an update of the record in the master collection;
- (g) at least one of: a date and time when the record was deleted from the master collection;

- 5 (h) a sequence number indicating an order of when the record was deleted from the master collection;
(i) an identification of a user requesting a deletion of the record from the master collection;
(j) a number indicating a number of modifications to the row since it was inserted;
(k) a value indicative of whether the record is archived on a read only storage device;
(l) a date indicative of when archiving of the record to the read only storage device is performed.

10 11. A system as claimed in Claim 8, wherein said history data storage area includes a first and second data storage areas, wherein said history records are initially accumulated in said first data storage area and periodically transferred to said second storage area, wherein at least some of said history records remain in said first storage area for greater than approximately 1 day prior to being transferred to said second storage area where said history records cannot be modified.

12. A system for processing financial transactions with auditability for each of one or more business enterprises comprising:

15 a first collection of account records for clients having a corresponding account at a first of the business enterprises, wherein for each said account records there is associated information for determining:

(A1) a value indicative of a number of financial items in an account for the account record,
and

(A2) one or more amounts related to the financial items in the corresponding account for the account record;

20 (A3) one or more values indicative of an amount of cash held in the corresponding account;

a second collection of financial item records representing financial items for which the first enterprise is accountable, each said item record having data for identifying a corresponding one of the financial items, and for each said item record there is associated information for determining:

(B1) a value indicative of a number of units of the corresponding financial item, and

25 (B2) a value indicative of an amount related to the units of the corresponding financial item;

a third collection of one or more general ledger financial records, wherein each of said general ledger records provides a value indicative of cash held by the first enterprise;

means for balancing accounts of the first financial institution, including (C1) and (C2) below:

30 (C1) means for comparing: a sum of the values of (A1) for said account records, and a sum of the values of (B1) for said item records;

(C2) means for comparing: (a) a sum of the values of (A2) for said account records with a sum of the values of (B2) for said item records; and (b) a sum of at least one value of the one or more values

of (A3) for said account records with a total of the values indicative of cash of said one or more general ledger financial records.

13. A method for processing financial transactions, comprising:

receiving one or more financial transaction data records, wherein for each said transaction data record one of: all processing for the transaction data record must be accepted, and no processing for the transaction data record must be accepted;

identifying, for at least a first of said financial transaction data records, at least first and second subtransactions, each of said first and second subtransactions being for accessing a corresponding data store and performing a predetermined operation;

retrieving said first and second subtransactions from a storage area having encodings of said subtransactions; performing, after said step of retrieving, said first and second subtransactions, wherein said first subtransaction is capable of being performed independently of a performance of said second subtransaction, and, said second subtransaction is capable of being performed independently of said first subtransaction.

14. A method as claimed in Claim 13, wherein said first financial transaction data record includes data related to one of: a cash transaction, an asset related transaction, a liability related transaction, a transaction related to a disbursement of funds, and a reversal of a previously processed one of said financial transaction data records.

15. A method as claimed in Claim 13, wherein said cash transaction includes data for one of a credit and debit.

16. A method as claimed in Claim 13, wherein said step of receiving includes receiving a second one of said financial transaction data records, wherein said first financial transaction data record is supplied by a business enterprise different from a business enterprise supplying said second financial transaction data record.

17. A method as claimed in Claim 13, wherein said step of identifying includes selecting a transaction processing descriptor having data for describing at least one of said first subtransaction and said second subtransaction, wherein said descriptor is substantially text.

18. A method as claimed in Claim 17, wherein for said data describing said first subtransaction, said first subtransaction consists essentially of an identification of a single operation and a plurality of operands.

19. A method as claimed in Claim 18, wherein said operand represents one of: an addition and a subtraction operation.

20. A method as claimed in Claim 13, wherein for said first and second subtransactions, said corresponding data stores are different.
21. A method as claimed in Claim 13, wherein each of said corresponding data stores includes information identifying one of: the first business enterprise, an account for a client of the first business enterprise, and a financial instrument for which the first business enterprise is capable of being held accountable.
22. A method as claimed in Claim 13, wherein during a processing of said first financial transaction data record, said step of performing includes determining an order to commence performing each of said first and second subtransactions.
23. A method as claimed in Claim 13, wherein step of performing includes overlapping, in said step of performing, the performing of said first and second subtransactions.
24. A method as claimed in Claim 13, wherein said step of performing includes performing said first subtransaction on a first processor and performing said second subtransaction on a different second processor.
25. A single system for simultaneously processing one or more totally disparate and user-definable automated financial applications on computing configurations containing one or more simultaneous processors with the ability to prove the processing accuracy of all transaction changes and the existence of all data records on a periodic basis:
- a. for non-financial transactions
- A single system for processing all original non-financial data from original entry to permanent archive without ever overwriting any of the original data:
- Process Model 1 with 12 fields on all Reference Tables
- Add Date
 - Add Sequence Number
 - Add User Authorization
 - Change Date
 - Change Sequence Number
 - Change User Authorization
 - Delete Date
 - Delete Sequence Number
 - Delete User Authorization
 - Number of Modifications

Archive Status

Archive Date

- 1. Processing Methodology - add, Change, Delete
- 2. Reverse Processing Methodology - None Required

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b. for financial transactions

A single system for processing all original financial data from original entry to permanent archive without ever overwriting any of the original data:

Process Model 2 with 12 fields on all Reference Tables

Add Date

10

Add Sequence Number

Add User Authorization

Trade Date

Archive Status

Archive Date

15

Reversed by Date

Reversed by Sequence Number

Reversed by Lot Number

Reversing Date

Reversing Sequence Number

20

Reversing Lot

- 1. For specific units, debits, and credit transactions, a single method for utilizing data rather than actual program code to define the unit, debit, and credit transaction processing content of all applications to be processed by the system
- 2. A single method for reversing the above transaction

25

Process Model 3

1. For specific buy (or deposit) and sell (or withdraw) transactions, a single method of utilizing data rather than actual program code to define the buy (or deposit) and sell (or withdraw) transaction processing content of all applications to be processed by the system

- 2. A single method for reversing the above transaction

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c. for file updates:

A single method of performing the basic file maintenance functions of add, change, and delete to any file definition

Process Model 4

1. Processing Methodology - Add, Change, Delete
 2. Reverse Processing Methodology - None Required.
26. For the individual transaction, the processing organization, and the total system, a single method
- 5 of proving the integrity of the entire database by
- a. creating a Transaction Journal and hashed totals for at least the three different controls of (1) cash, (2) units, and (3) cost basis in at least three other files, deemed system control files;
 - b. creating a detailed records of Financial Instruments and hashed totals for at least the three different controls of (1) cash, (2) units, and (3) cost basis in at least three other files, also deemed system control files;
 - 10 c. performing any query that would sum all of the (1) cash, (2) units, and (3) cost basis data in any file and comparing it to the summations of similar data in any one or more, if not all, of the other system control files.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/23026

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) : G06F 17/60
US CL : 705/30
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
U.S. : 705/30

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,642,767 A (LERNER) 10 February 1987, (10.02.87) col. 1, line 5 through col. 2 line 43.	1-26
Y	US 5,117,356 A (MARKS) 26 May 1992, (26.05.92) col. 2, line 27 through col. 3, line 31.	1-26
Y	US 5,317,504 A (NAKAYAMA) 31 May 1994, (31.05.94) col. 1, line 58 through col. 2, line 68.	1-26
A	US 5,390,113 A (SAMPSON) 14 February 1995, (14.02.95) see abstract	1-26
A	US 5,237,498 A (TENMA et al.) 17 August 1993, (17.08.93) see abstract.	1-26

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"B" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"a" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 03 FEBRUARY 1999	Date of mailing of the international search report 11 MAR 1999
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