General Information Manual

Automated Processing of Material Handling Data at Department of Defense Storage Depots

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This publication is a product of an IBM Advanced Applications Development Study, part of IBM's continuing research into its customer's data processing requirements. It is designed as an educational text which, for best grasp of the subject, should be read and studied carefully.

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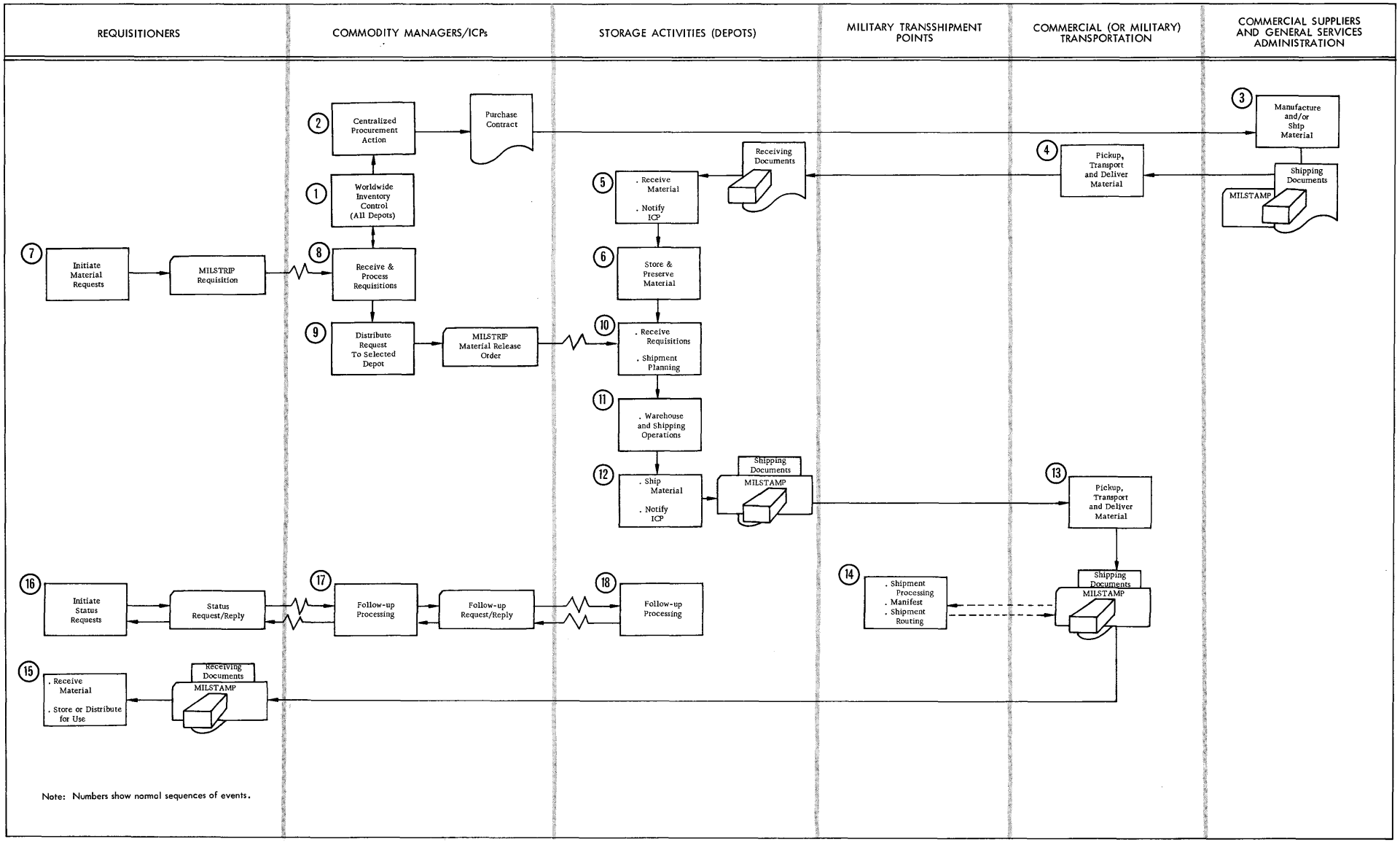
Figure 1 Department of Defense Logistics Network, Simplified Schematic



THE LOGISTICS NETWORK

ELEMENTS

The Department of Defense (DoD) logistics network consists of a number of distinct elements, both military and civilian, whose coordinated actions are necessary to accomplish the formidable task of providing prompt, efficient, reliable supply support to operating units of our military services throughout the world. Figure 1 shows the network's principal operational elements and the general flow of material and documents within the system.

Requisitioner

Any military unit, base, ship, or group authorized to order material. It submits requisitions, in prescribed MILSTRIP format, either directly to a supply depot or, most commonly, to the centralized Inventory Control Point (ICP) exercising control over the item being ordered. It also is authorized to conduct communication with the depot and ICP regarding the status of an individual requisition both before and after shipment.

Commodity Manager (Inventory Control Point)

The Defense Supply Agency (DSA) has established an organization to centrally control procurement and distribution of some items commonly used by more than one military service. These constitute about one third of the 4 million items in the Federal Stock Catalog, and are divided into ten commodity groups, each controlled by a single manager agency:

Clothing and Textiles	Construction
Medical	Automotive
Petroleum	Electronic
General Supplies	Subsistence
Industrial	Plant Equipment

Each of the Military Departments (Army, Navy, Air Force) also has established a similar structure of commodity manager agencies to exercise centralized control over groups of items used almost exclusively by a single service.

Each commodity manager agency arranges to store material it controls at a number of storage sites (depots or stock points) where it will be most accessible to requisitioners. The commodity manager agency acts as a centralized Inventory Control Point (ICP), maintaining stock levels and complete inventory records for all material it has stored at each site.

Storage Activities (Depots)

These receive, store, preserve and ship material for one or more commodity manager agencies. They receive requisitions referred to them by commodity managers and prepare material and documentation for shipment. This manual is concerned with the operations of such storage activities -- the wholesalers of the DoD logistics network, who have direct responsibility to commodity managers, store a broad range of items in bulk quantities, and ship to many consignees over wide geographical areas.

Another level of storage activity, the Base Supply Point, stores a limited number of items in small quantities for support of base tenants. These activities generally are responsible for ordering material from depots to maintain their own stock levels and are considered as requisitioners in this discussion.

Commercial/Military Transportation

Reliable and timely transportation resources are an extremely vital element of the logistics network. DoD relies heavily upon the commercial transportation industry of the United States (privately-owned trucking companies, railroads, airlines, steamships, pipelines, etc.) to transport material between suppliers, storage sites and users. Most shipments originating at Continental United States (CONUS) supply depots are moved by commercial transportation, either directly to a consignee or to a CONUS air or water terminal, for further shipment through an overseas terminal to a requisitioner.

Government-owned vehicles (trucks, rail cars, aircraft, ships) are the preferred method of transport under the following conditions:

1. High priority shipments between points in CONUS (military airlift, Logair, Quicktrans).

2. Movements of material between activities overseas in direct support of troop units. (Host nation commercial transport is frequently used in normal depot resupply operations).

3. Transporting material from a CONUS air or water terminal to an air or water terminal overseas (via MSTS, MATS).

United States Parcel Post also is used, but rigid size and weight restrictions are a limiting factor.

Military Transshipment Points

These are intermediate material handling activities which receive shipments in-transit between suppliers, depots and requisitioners and arrange for onward movement. The mode of transportation or vehicle is usually changed. There are three kinds of transshipment points:

1. Water Terminals: used extensively for movement of low priority shipments between CONUS and Overseas water ports. The terminals at which loading and discharging of vessels occur are referred to as Ports of Embarkation (POE) and Ports of Debarkation (POD), respectively. Shipments originating at many different activities are received at the POE by various modes of surface transport. They are segregated by POD. Required documentation is prepared for onward movement, and shipments are loaded onto vessels. Upon receipt of these combined shipments, the POD arranges on-carrying transportation and prepares documentation required to route each individual shipment to its ultimate consignee. Government owned vessels of the Military Sea Transport Service (MSTS) are used for many ocean shipments. Commercial ships are employed when they provide superior service to certain ports of discharge.

2. Air Terminals: function similarly to water terminals, for the transshipment of high priority shipments between CONUS and an overseas activity, between two CONUS activities or between two overseas points.

3. Consolidation and Distribution (C&D) Points: combine several shipments and route them as units to consignees. They also serve as break-bulk points, receiving and breaking down consolidated shipments destined for several different consignees. There is one C & D point in CONUS, but they are used widely in overseas areas.

Commercial Suppliers and General Services Administration

These are manufacturers and distributors who are the initial source of supply for DoD material. They ship bulk quantities of material directly to supply depots selected by the commodity manager. GSA procedures are fully integrated with those of DoD. For example, GSA complies fully with MILSTRIP and MILSTAMP requirements.

GOVERNING POLICIES

The ultimate objective of the DoD logistics network is to maintain operational forces in a state of material readiness. The Office of the Assistant Secretary of Defense (Installations and Logistics) has set forth standard policies to regulate and control the operation of this vast supply distribution system. These policies are the basis upon which detailed operating procedures are developed by the military services for each activity under their jurisdiction. The most important of these regulations are:

UMIPS (Uniform Material Issue Priority System).

This is a priority coding system. Each requisitioner assigns an IPD (Issue Priority Designator) code to each single-line item requisition. There are twenty codes, categorized into four groups, to designate combat readiness requirements, requisitioner's mission and urgency of an item to the mission.* The UMIPS code specifies the permissable time between requisition and receipt of ordered material (supply pipe-line time). Each element of the network is allotted part of this time to accomplish its assigned responsibilities. An activity's effectiveness is measured by its ability to respond within its allotted time.

*See IBM GIM E50-0006 for full description.

MILSTRIP*

The Military Standard Requisitioning and Issue Procedure provides and requires a standardized--

- o Single-line item requisition document (DD FORM 1348).
- o Release/Receipt document (DD FORM 1348-1).
- o All-inclusive coding system.
- o Supply status request procedure.

MILSTAMP**

Military Standard Transportation And Movement Procedure, provides--

- o Objectives, definition and guidance for planning all warehousing and transportation activities and documentation in response to requisitions.
- o Standard documents.
- o A uniform transportation coding system, compatible with MILSTRIP.
- o A standard tracing procedure.

NEED FOR AUTOMATIC DATA PROCESSING

The Defense Supply System is the world's largest business, procuring, storing and distributing four million different items with a total inventory value of over 40 billion dollars. Worldwide, there are about 750,000 transactions a day within the military supply system.

ADP systems already are used extensively throughout DoD in the management of certain phases of this enormous undertaking. It is the stated purpose of DoD policies to establish uniform documents and procedures to facilitate wider use of these systems.

DoD logistics policies have as objectives:

1. Increasing the speed with which material needs of operational forces are satisfied.
2. Minimizing the cost of operating the supply system by reducing on-hand inventories at all locations.

Storage depots, as the hubs of the supply distribution system, have been challenged by the need to perform all assigned functions within the prescribed times. Some volume ranges of typical large storage depots illustrate the magnitude of the tasks which must be performed:

- o Items stored 50,000 - 600,000
- o Warehouse locations 100,000 - 800,000
- o Weekly line items received 3,000 - 25,000
- o Weekly line items issued 10,000 - 50,000

Depot management teams must develop responsive procedures to efficiently plan, control, document and handle each transfer of material. ADP systems offer great advantages in this critical area of depot operations. The remainder of this manual discusses how ADP can profitably assist depot management.

*See E50---0006.
**See E50---0016.

THE STORAGE DEPOT

As a result of the trend toward centralized material management throughout DoD, storage depots generally do not have to maintain detailed stock records or procure material which they store. For most classes of items these are handled by an ICP.

Four principal factors influence material handling at a depot:

- o Physical arrangement of receiving, storage and shipping facilities.
- o The number of classes of material stored.
- o The number of items in storage.
- o The volume of daily receipt and shipment activity.

These must be considered thoroughly in developing any data processing system, manual or automated, to monitor material handling operations and produce necessary documentation.

Consider a depot storing only one or two classes of material, consisting of many bulky items - in a few, large, closely-grouped warehouses, conducting all receiving and shipping actions at one centralized point. This situation contrasts with that of a depot storing perhaps twenty classes of material, consisting of a few hundred thousand smaller items stored in multiple, scattered warehouses. Several of the warehouses necessarily are equipped with receiving and shipping (decentralized) facilities.

The first depot may experience little difficulty in using warehouse space, supervising personnel, or controlling the flow of documentation and material through the warehouse area. In the second, mere communication of data required to control these things may be a difficult task. The first may be challenged by the problem of physically handling and preparing documentation to ship large quantities of bulk material. The second may find material handling relatively easy. It may ship many small items by parcel post, reducing shipping documentation problems.

Regardless of these differences, both types perform the same basic functions to accomplish a common mission. They are faced with fundamentally similar problems differing only in importance.

MATERIAL HANDLING FUNCTIONS

With current trends toward standardization of policy and document format (e.g., MILSTRIP, MILSTAMP), the requirements of data processing systems themselves become increasingly standard.

There are five principal functions related to material handling within a depot: Receiving, Shipment Planning, Warehousing, Transportation and Analysis and Control.

Receiving

All depots must receive material for storage. Most receipts are new material shipped by civilian suppliers in response to purchase orders. Other receipts from external sources consist of returned material from consignees and bulk lots of material from other depots resulting from ICP redistribution orders. Some depots also perform a maintenance function. Reparables generated by this process constitute a fourth type of receipt for storage.

The objective of receiving operations is to store material as expeditiously as possible, so that it can be rapidly retrieved for issue when requested. Failure to accomplish prompt shelving and recording of storage locations disrupts not only receiving operations themselves, but many other subsequent accounting and material handling operations.

Receiving work consists of four phases: Arrival, Item Identification and Inspection, Locator File Operations and Storage of Receipts.

Arrival

Arriving carriers submit copies of delivery documents to a receipt control office for preliminary examination and instructions. If the depot has a centralized receiving system, this control office usually is situated in the same building where material is offloaded. The vehicle is directed to an appropriate bay, where the material is unloaded, a package count is taken and compared against delivery papers, and a check is made to insure that documentation is avaiiable to identify each line item in the shipment. A receipt is issued, and the vehicle is released. These actions sometimes are called Primary Receiving operations.

When a de-centralized receiving system is used, the receipt control office examines the delivery documents and determines (from commodity manager designators and Federal Stock classifications of the items) in which warehouses the material is to be stored. If there are only a few warehouses involved, the operator of the vehicle may be directed to each for offloading and Primary Receiving operations.

If many warehouses are involved, the receipt control office directs the vehicle to the warehouse which is to store most of the material. This warehouse also acts as a centralized receiving station. The entire shipment is off-loaded, primary receiving occurs and line items are routed to warehouses after proper storage locations have been determined. There are two kinds of documentation which accompany a shipment of material to a depot: 1) standard documents prescribed by DoD or a military service, and 2) those prepared by the delivering carrier. Delivery receipts prepared by individual carriers, commonly referred to as "pros" or commercial way-bills, are not specific in listing each line item in terms of standard Federal Stock Catalog nomenclature, but usually list only the number of pieces of a general commodity class being delivered. This is not specific enough to be useful to depot receiving operations and serves, primarily, as a carrier record of proof of delivery.

Standard Government documents are used as the source of information to process receipts. The most common are:

- GOVERNMENT OR COMMERCIAL BILL OF LADING: A contract for hauling prepared by the shipping activity. It does not specify individual line items in terms of Federal Stock Catalog nomenclature, but lists total pieces, weight and cube of grouped line items which fall into pre-established freight classification. When properly signed by shipper, carrier, and receiving activity it serves as a basis for transportation charges and payment.

- DD FORM 250: The purchase order used most in procuring material from civilian contractors. When an order is approved, advance copies are sent to the depots that will receive the material, and additional copies are forwarded to the contractor. When the material is shipped, the contractor must insure that the DD 250 accompanies the shipment to the depot. This form is very specific in describing material in terms of standard nomenclature, and is the key document in handling this kind of receipt when it arrives at the depot.

- DD FORM 1348-1: The standard MILSTRIP Release/Receipt document accompanies material transferred between depots. It also identifies material being returned to the depot by a consignee. For each of these kinds of receipts, one DD 1348-1 accompanies each line item and is the key document used in handling the material.

There are other special purpose documents sometimes used in addition to or in lieu of the DD 250 and DD 1348-1. They serve the same purpose of providing standardized descriptions of individual line items in a shipment unit. Regulations prescribe that an advance copy of DD 250 and DD 1348-1 be

forwarded to the receiving depot, and arrive before delivery. If the shipment is originated by a contractor or vendor, a copy of the DD 250 or its equivalent is sent to the depot by the contracting officer. For shipments originating at DoD activities, an advance copy of the 1348-1 is forwarded from the shipping activity at the time of shipment, using the fastest means available. Additional copies are either hand-carried by the operator of the delivering vehicle or affixed in an envelope to one of the material containers.

Thus, if shipping activities follow prescribed documentation procedures, most shipments arriving at a depot will be accompanied by documents describing each line item, and advance copies of these documents also will be available from due-in suspense files maintained by the depot.

Some depots make extensive use of the advance documents in receipt operations. When a shipment arrives, they immediately purge their files of matching documents which are then used in the receiving processes. Other depots use advance documents for receiving only if documentation accompanying the shipment is inadequate. Otherwise their files are purged after physical receiving processes have been completed, the documents serving as a reference file for due-ins and for other accounting and reporting purposes.

When primary receiving operations are completed, steps immediately are taken to inform the ICP that the material is on-hand at the depot. The ICP adjusts its inventory records and then may begin forwarding material requests to the depot for which the inventory has been received. Receipts therefore must be stored in a recorded storage location as rapidly as possible to insure that the material will be available for responding to these requisitions. Thus the second stage of receiving work consists of rapidly identifying and inspecting each line item, determining where it is to be stored and moving it to that warehouse location.

Item Identification and Inspection

The material is "spotted" at an identifiable position on the receiving floor. Here it is matched against the accompanying DD 250, DD 1348-1 or equivalent documents to insure that each line item has been received in the proper quantity and is identical with data stated on the documentation. A routine inspection for physical damage, labeling, method of pack, etc. also is conducted. If all appears to be in order, a copy of the receiving document is sent to the locator file.

During locator file operations, receiving personnel may match manufacturers' part numbers on containers against master catalogs which cross-reference these numbers to Federal Stock Numbers and descriptions. If the part number, description and FSN listed in the catalog do not match the data on containers and accompanying documents, research clerks are informed of the discrepancy and perform detailed investigation, matching material against various catalogs and records, to positively identify the item. Master catalogs also are consulted to determine what detailed testing or inspection procedures must be conducted before the material can be stored. These inspections are performed and noted on appropriate warehouse records.

Locator File Operations

During inspection work, locator clerks refer to files to determine where each item shown on receipt documents should be stored. Manual locator records are maintained on a variety of media: semi-punched cards, special index or ledger cards and stencil plates. Proper maintenance of such files is extremely difficult. Each item in storage has at least one record in this file which is organized in stock number sequence. Some items are stored at multiple warehouse locations because:

1. The total inventory of an item cannot be accommodated at one location.

2. Many small items are deliberately stored at a bin location in limited quantities for ease of issue, with bulk locations serving as an immediate source of bin replenishment.

3. A "lot" of an item may have special physical characteristics (e.g., condition, type pack, unit of pack) which differ from other lots of that same item, requiring that it be stored in a separate non-adjacent warehouse location. Most items have no such special characteristics. For those that do, the characteristics which can vary are few and are known factors. Different lots of an item also may have to be stored at separate locations because of special accounting requirements.

An item stored at more than one warehouse location may have a separate record for each of these locations, as in a punched card locator file; or all of them may be recorded on a single master item record.

When requests for receipt locations are received by locator clerks, they:

1. Select existing locator records for the indicated stock number. A record may not be found because:

   - o The FSN on the receipt document may be invalid.
   - o A record may exist but cannot be found because of manual filing or transcription errors.
   - o The record may have been removed temporarily from the files.
   - o The item stock number may have been changed, but a cross-reference between the new and obsolete numbers may not have been established.
   - o A new item may have been received.

   The precise reason for this situation usually is not apparent; so research personnel are notified, and a detailed investigation is initiated to resolve the problem.

   Real or apparent discrepancies in item identification occur too often, with considerable expenditure of costly, time-consuming effort. Frequently the document accompanying the shipment is correct, but changes have not been properly communicated and recorded on depot master records.

2. Examine the receiving document after the proper locator record has been extracted from the file, to see if the item just received has any special characteristics which may prevent it from being stored with already existing inventories of the same item. These variable characteristics, if any, are compared against those which may be indicated on existing locator records for the item. If the newly received material matches any of the existing stock in all important respects (the normal situation at most depots), it should be stored at these locations, space permitting. The locator clerk transcribes these location numbers and the item identification (FSN) onto some convenient intra-depot movement document which will accompany the item to storage.

3. Indicate "no location" on the document which will accompany the material to storage, if no locator record can be found in the file or if the newly received material has special characteristics which prevent it from being stored with existing stock. However, the item class usually indicates which warehouse should store the item. This is noted on the movement document so that the material may be forwarded to the proper warehouse supervisor.

4. Send the receiving document and individual movement documents specifying recommended storage locations to the receiving floor, where they are matched with the material. The receiving document is forwarded to an appropriate records section for any further processing necessary.

Storage of Receipts

If an existing location is specified on the movement document, the material is transported to that location and stored, space permitting. The movement document usually serves no other purpose and can be discarded. If the warehouseman finds that the material cannot be stored at the specified location, an unoccupied nearby location is selected. Locator clerks then must be notified that an additional location has been established for the item to update their records. This communication usually is accomplished either by telephone or by annotating new location data on the movement document and forwarding it to locator file personnel.

If "no location" has been indicated on a movement document received from the locator file, the item is transported to a reserved floor area in the warehouse in which it will eventually be stored. The warehouse supervisor determines where a suitable empty location exists and arranges for storage of the material. This information then must be communicated to locator file personnel for transcription onto their records. Properly accomplishing this feedback of location data is vitally important, since without it this portion of the inventory will not be locatable for subsequent issue.

Shipment Planning

The MILSTAMP regulation directs all shipping activities to establish a shipment planning function, to be responsible for:

- Scheduling material and documents through the internal processing cycle in accordance with UMIPS.
- Developing picking, packing and shipping instructions for each line item of material to be issued. This data is gathered from master data files which must be maintained by shipment planning.
- Pre-planning consolidation of individual line items into shipment units.
- Preparing documentation to be used by warehouse and transportation personnel in preparing each shipment for movement.

In short, Shipment Planning must preplan and provide data to accomplish complete, rapid response to requests for material. The speed and harmony of material handling actions depends upon the timeliness and quality of information which is developed and disseminated by Shipment Planning.

Depots already use punched card or ADP systems to assist them in some phases of these critical data processing operations. Manual and automated shipment planning procedures vary considerably from one installation to another, but the basic operating concept, as envisioned in MILSTAMP, is described under the following headings: Order Receipt, Scheduling, Data Retrieval, Consolidation and Document Preparation and Distribution.

Order Receipt

Requisitions are received in prescribed MILSTRIP format by mail, phone, teletype, or TELE-PROCESSING® equipment. Each item ordered has an individual requisition number assigned by the requisitioner. This control number must be used in all further references to the requisition. When a depot has punched card capability, requisitions not already in this form are keypunched and verified, and "date of receipt" is recorded on each.

Most requisitions are submitted directly to an ICP which forwards them to the depot, after editing for completeness and validity and checking stock availability. Relatively few requisitions (for items not controlled by an ICP) are sent directly to the depot by requisitioners. If they are, the depot must perform its own detailed editing and inventory control operations, after which these requisitions may be processed like those received from ICPs. In addition to these two types of material requests, an ICP may send redistribution orders to a depot, directing it to transfer a quantity of material to another depot.

Regardless of the source of these requests, or the ultimate shipping destination of the material, all are processed the same, and are called Material Release Orders (MRO) in the discussions that follow.

Scheduling

Scheduling is the process of:

- Assigning to each MRO specific dates by which certain depot operations must be performed to insure on-time shipment of material.
- Informing warehouse management of the impending workload schedule.

Because of the very short time allowed for complete depot processing, no formal scheduling is conducted for high priority (IPG I and II) MROs. Shortly after receipt they are separated from routine (IPG III and IV) MROs and forwarded immediately to other data processing operations.

Figure 2 Allowable Depot Processing Time

MILSTRIP ISSUE PRIORITY DESIGNATOR	MILSTRIP ISSUE PRIORITY GROUP	MILSTAMP TRANSPORTATION PRIORITY GROUP	TOTAL DEPOT PROCESSING TIME
1-3	I	I	16 hours
4-8	II	II	2 calendar days
9-15	III	III	7 calendar days
16-20	IV	IV	8 calendar days

Routine MROs, which account for most of the volume, are accumulated into large batches, usually received over a period of one or two days. The "required shipping date" for each MRO is easily determined from its IPG and "date of receipt." Working backwards from the required shipping date, two other dates may be calculated:

- Ready-by date (RBD): the latest date by which the warehouse must have completed all operations to prepare material for shipment. Also, the latest date by which transportation personnel must receive from the warehouse all source documents necessary to prepare movement documents to accompany the shipment to the consignee.

- Required Processing date (RPD): the latest date by which the warehouse must begin processing the MRO to complete all necessary operations by the RBD.

NOTE: these two dates and the names applied to them are not universal, but have been used here merely to describe critical time points in the depot processing cycle. Depot management knows from experience how much time must be allotted for performance of all warehouse and shipping operations and uses this information in calculating these dates.

For example, assume that experience indicates that routine MROs require four full work days to accomplish all of these operations: two days in the warehouse, and two days in shipping. Then, for an IPG 4 MRO received on Julian Date 100, the following dates would apply:

- Required Shipping Date 108 (The depot is allowed eight days processing time after, but not including, the date on which the MRO is received.)

- Ready-by Date 106

- Required Processing Date 105

For several reasons, scheduling is more difficult in practice than it may appear. Many depots, for instance, are only staffed to prepare and ship material for routine MRO s during a five-day work week using a single shift of employees. If the date of receipt (100) in the above example were a Saturday, the required shipping date would be the following Sunday (108). Since this weekend date is undesirable, shipment would have to be scheduled for Friday (106), and other dates computed accordingly. This tends to create heavy peak workloads, since IPG 4 MRO s received on calendar date 98 should also be scheduled for shipment on day 106. Therefore, warehouse management always must be aware of the pending workload distribution, so that they can plan steps to insure that each MRO is processed through warehouse operations on or before its RBD.

After schedule dates have been assigned to a batch of MRO s, a report describing the new workload is prepared for warehouse management. Its content and format, listing or summarizing new orders by due date, are best determined by an individual depot's needs.

Data Retrieval

Both high priority and routine MRO s are sent through a critical stage of processing where voluminous files of master information are consulted to gather data to be used later:

- To preplan consolidation of individual line-items into shipment units.
- To prepare each line-item for shipment.

The file medium, recording, maintenance and retrieval of this data depend, of course, on the data processing capability of a given depot. Typical elements of information which must be obtained for each MRO are:

- ITEM IDENTIFICATION DATA: Commodity Manager, alphabetical description, security classification, MILSTAMP air/water commodity codes.
- STORAGE AND TRANSPORTATION DATA: Dimensions, weight and cube per unit of issue, extended weight and cube (for quantity ordered), National Motor Freight Classification, Uniform Freight Classification (Rail), freight rating code, type of packaging, special handling, packaging or marking instructions, codes indicating compatibility for consolidation with other items.
- STORAGE LOCATION DATA: Current bin and bulk locations at which the material is stored.

(NOTE: See IBM GIM E50-0018 for a detailed discussion of these files and some of the problems encountered in using and maintaining them.) Each of these data elements will be explained at the point where it is used in later processing or material handling operations.

Consolidation

When all necessary line-item information has been gathered, MRO s are accumulated into the largest batches practicable for consolidation into shipment units. Consolidation consists of grouping together for shipment as a unit all MRO s which are common with respect to:

- Consignee.
- Issue priority group.
- Project code.
- Transportation compatibility (generally, items requiring the same degree of special handling or security in-transit and, whose carriage in the same vehicle will not cause deterioration or danger).

Some depots specify additional criteria for consolidation such as proximity of storage locations of the items to be combined. For instance, a depot that handles material for several Commodity Managers may have each type of material stored in a separate

warehouse. If these warehouses are widely separated, transporting all types of material to one control point for assembly into a single shipment unit may be too costly. In such instances, items may be consolidated only if they are owned by the same Commodity Manager. This example illustrates the influence material handling requirements may have on a depot's data processing operations.

After MRO s have been grouped into preplanned shipment units, Transportation Control Number (TCN) must be assigned to each unit. The MILSTRIP requisition number of the MRO containing the earliest required delivery date is selected as the TCN for each shipment unit. Once assigned, this becomes the shipment unit identifier and must be used by all activities in any communications relating to the unit after shipment from the depot. For convenience, most depots also assign an "internal order number" to each shipment unit at this time. This is an unofficial depot identifier which parallels the fourteen-character TCN, and is used strictly for facilitating internal control of the shipment unit.

The warehouse in which the shipment unit is to be assembled is determined. This may be the warehouse in which the bulk of the shipment is to be picked, or it may be the warehouse in which all shipments are regularly assembled. Next, a determination is made of whether or not the shipment unit meets the rigid size and weight restrictions imposed for Parcel Post delivery. If it does, and unless it has high priority, it is earmarked for this mode of shipment. All other shipment units are termed "freight shipments."

As a general rule MILSTAMP stipulates that shipments be consolidated as much as practicable, to minimize costs of transportation, handling and documentation at all activities. However, for IPG I and II MRO s, on-time delivery is most important, and consolidation is to be made only if it will not cause a delay in receipt of material by the consignee. When consolidation is not possible, single-line shipment units will result, and the TCN is identical to the requisition number of the MRO being shipped.

Consolidation must take place prior to issuance of MILSTRIP Release Receipt Documents (DD Form 1348-1) to the warehouse for picking and preparing material for shipment. Once the composition of a shipment unit has been determined by shipment planning, all other organizational elements of the depot must make every effort to maintain the integrity of the unit.

Document Preparation and Distribution

When all master line-item data has been accumulated and MRO s have been grouped into shipment units, each bearing a TCN, two working documents must be prepared to display this information to warehouse and shipping personnel:

- o One Shipment Planning Worksheet (SPWS) for each shipment unit.
- o A MILSTRIP Release/Receipt document (DD Form 1348-1) for each MRO.

Although a SPWS is required of all depots, its precise format is not established by the MILSTAMP regulation. It is, however, a multi-purpose document which must contain enough information to make it useful to -

- o Warehousing personnel in physically assembling and packing preplanned shipment units.
- o Shipping personnel in planning transportation requirements and preparing movement documents (which should serve as advance notice to them of shipment unit characteristics).
- o As a permanent record of shipping data for analyses and reporting purposes.

To best serve these purposes, the SPWS should contain at least the following information:

- o TCN (and internal order number, if used) of the shipment unit.
- o MILSTAMP transportation priority.
- o Project and fund codes (from original MRO).
- o Shipping address of ultimate consignee.
- o Military transshipment points (if any) through which the shipment will pass while enroute to this consignee.
- o Schedule dates for the shipment unit.
- o Estimated total weight and cube for the shipment unit.
- o Warehouse in which the shipment unit is to be assembled for carrier pickup.
- o The following data for each MRO:
  1. Requisition number
  2. Federal Stock Number and description
  3. Quantity and unit of issue
  4. MILSTAMP air/water commodity codes
  5. Extended weight and cube (estimated)
  6. Approximate dimensions per unit of issue
  7. Standard freight classifications
  8. Freight rating code
  9. Special handling, marking or packaging codes.

Blank fields also must be provided on the form for insertion of variable data (e.g., actual weights, number of containers, mode of shipment, etc.) which must be added during warehouse and transportation operations.

The release/Receipt document (R/RD) is a standardized, multi-purpose form designed to serve:

- o As the source document for selecting (picking) material from storage.
- o To identify material in transit, physically moving with the item to its consignee.
- o As a convenient receiving document for the consignee.
- o As a permanent record of shipment for each MRO.

Any line item data shown on the SPWS may be repeated on the R/RD, but it must contain at least the following information:

- o All original MRO data (coded), printed on the first line of the form.
- o Alphabetic description of the item.
- o Bin or bulk location from which the material is to be picked.
- o TCN (and internal order number, if used) of the shipment unit of which the item is part.
- o Schedule dates.
- o The warehouse to which the item must be forwarded for assembly after picking.

Documents now are ready for distribution.

Copies of the SPWS are forwarded to the transportation department and to individual warehouses responsible for assembling the shipment units. The R/RD s are sorted by warehouse location and forwarded to warehouse supervisors for processing. Copies of both the SPWS and R/RD also are retained by shipment planning personnel who must now exercise a control function, monitoring warehouse and shipping operations to insure on-time shipment.

Warehousing

"Warehousing" includes most actions involving physical handling of material within a depot. In addition to receiving work (which has been discussed separately), there are four basic warehouse functions:

- o Custody - all actions necessary to maintain material readily available for issue while in storage.
- o Picking - selecting material from its storage location for issue.
- o Assembly - physically grouping individual line-items of material which comprise a preplanned shipment unit.
- o Packing - marking, labeling, packaging, weighing and otherwise preparing material for shipment.

Depots consist of several large warehouses in which these functions are performed. Most of the available space in these is used to store material between its receipt and issue. A relatively small amount of the total warehouse area is reserved for receiving work, and another small area is reserved for assembling and packaging material for shipment.

From the viewpoint of material handling, warehouses are ideally closely grouped to minimize intra-depot transportation problems, and the entire depot is equipped with only one receiving area and a single shipping point. In practice, depot management usually is not so fortunate, and the arrangement of facilities is just one of many factors which play an important role in determining how certain warehouse operations will be performed.

Generally, warehouse personnel do not become involved in data processing operations, except that they sometimes are required to report the results of their work. For instance, most of the information required by the warehouse in performing issue work comes from shipment planning, and accurate physical inventory is impossible without current item locations provided by locator clerks. Thus, although the following discussion of warehouse functions is necessarily general, in establishing any data processing system for a particular depot the special needs of warehouse management, dictated by local conditions, must be given thorough consideration.

Custody Work

This consists of all operations necessary to insure that material is always suitably stored and ready for issue during the time it is in storage at the depot. The material must be correctly identified, maintained in undamaged condition, periodically inspected and inventoried, properly packed, and suitably stored for optimum use of storage space. In accomplishing all types of custody work, warehouse personnel make extensive use of data in the locator file. They need item locations to perform the work itself and must initiate changes to file data as a result of certain actions. Some typical custody operations are - -

1. REWAREHOUSING: Relocating bulk material already in storage to consolidate the total on-hand quantity, stored at multiple locations and placing an item with increasing demand in a more accessible location. To perform this work, it must first be known that unnecessary storage locations have been reserved for a particular item. Since such data is not provided in report form, this fact usually is detected by supervisors conducting visual inspections of a warehouse area. The material then is moved to a new location, and "kill" notices are sent to the locator file to delete obsoleted locations from the master item record.

   Occasionally, whole classes of material are moved from one warehouse section and stored in another, requiring that each item record be changed to reflect the deletion of old locations and the establishment of new ones. Since it is both impractical and highly inefficient to maintain a static warehouse, rewarehousing is almost continuously in process and generates a constant flow of file maintenance transactions.

2. PHYSICAL INVENTORY: Commodity Managers usually specify when a physical count of their material is to be conducted and which items are to be involved. Current locator records are essential to provide timely information on all locations at which each item to be counted is stored. This data must reflect recent location changes, to preclude recounts of overlooked material. During inventory taking, file maintenance transactions also might be initiated, e.g., when a location that is supposed to contain material is found empty.

These are samples of the many and varied actions encompassed in custody work. Almost all require access to locator records.

Each storage warehouse is divided into conveniently sized sections whose floor area is marked off into numbered "slots," where a specific quantity of material may be stored. An individual warehouse location is specified by stating a warehouse number, section and slot - normally a permanent designation. Once a scheme has been established for laying out and numbering sections and slots in a warehouse, it is rarely changed. However, a specific item stored in a given warehouse location may be changed as warehouse management transfers material within and between warehouses in attempts to optimize the use of available space.

Warehouse locations vary in size (cubic feet), but are of two general types:

- Bulk Storage: Used for quantity storage of material in bulk containers as originally packed by the manufacturer. (The bulk container itself may be the basic unit of issue or it may contain several units.) This is usually a large open floor area, marked off into unpartitioned slots. Cartons of material are stacked on pallets. The total available quantity of an item may be distributed among several bulk locations. Some items, depending on size, also may be stored at single bin locations.

- Bin Storage: Usually long rows of stacked shelves, divided into "slots" by vertical partitions. Bins are a convenient method of storing limited quantities of small items for rapid picking - always in their basic unit of issue. There normally is only one bin location assigned for a given item.

It is common practice to concentrate all bin storage facilities in as few warehouse sections as possible. The bin and bulk locations of an item may be widely separated, which may present problems when a single MRO requires that material be picked from both locations.

Warehouse management is charged with the responsibility of selecting material to fill two general types of MRO s:

- o High priority (IPG I and II): These are picked as soon as possible, seven days a week, around the clock and require especially smooth and rapid coordination of effort. Barring unforeseeable crises, most depots find that their daily volume is relatively constant and can be handled with a fixed amount of manpower on each work shift.

- o Routine (IPG III and IV): These make up most of the volume and always are batched and combined into shipping units. Even if the daily volume of routine MRO s is fairly predictable, the number which must be picked on any given day varies, because most depots pick and ship them only during a regular work week (see "Scheduling"). Thus, management is faced with the challenge of efficiently applying a fixed quantity of available man-hours to a fluctuating workload. They must constantly be advised of two things:

  1. How many line-items have been scheduled for picking on each of the next several days?

  2. In what warehouse sections will this work be performed? Most depots know from experience the average number of line-items which can be picked per man-day of effort in each warehouse section. (One type of material).

  Knowing these facts, and being at liberty to distribute personnel freely between work centers, management may then:

  1. Spread the workload more evenly by processing some MRO s earlier than scheduled so that all will be completed by their RBD.

  2. Plan personnel assignments in advance for warehouse sections in which the known workload will occur.

Although some depots do provide a limited amount of advance data to assist warehouse management, most have not established systems to provide the detailed guidance described. Such a reporting system would be a valuable tool to expedite work flow and more effectively use available manpower.

Normal Picking Procedures

The most commonly used document for selecting material for issue is the R/RD. Each warehouse supervisor receives these forms from shipment planning, usually in sequence by warehouse location within internal order number and RBD. Where material is to be selected from bulk storage, R/RD s are distributed to pickers who proceed to the specified warehouse location and select the proper quantity of the item. They may mark each container with the TCN or internal order number, then transport the material and associated R/RD to a designated point in the picking warehouse. If there are several areas in the depot where shipment units are assembled for carrier pickup, each R/RD should specify the areas to which the material must go. When sufficient picked material has been gathered in the picking warehouse, it is segregated by assembly warehouse, loaded onto intra-depot vehicles, and transported to the specified shipment assembly point. (If the item is to be shipped Parcel Post, this will have been noted on the R/RD, and the material is forwarded directly to the Parcel Post shipping station. Here, it is packaged and shipped with its R/RD, and no further actions are taken by warehousing or transportation personnel.)

In bin storage areas, which usually are equipped with some form of conveyor system, R/RDs for a single order are distributed to pickers who proceed through aisles of bins selecting items from specified storage locations. Material is inserted into a small "tote" basket, with its associated R/RDs, and is placed on a conveyor belt, at the end of which are personnel who segregate these baskets by final assembly warehouse. The baskets then are directed to the final assembly point (or Parcel Post shipping station) specified on the R/RD.

Frequently, material required to fill a single MRO must be picked from both a bin and a bulk location. For example, assume that fifteen pieces of an item have been ordered (each item listed in the FSC has only one unit of issue, in this case "piece"), and the material was received from the manufacturer in cartons of twelve pieces each. The most desirable method of filling this order is to pick one full

carton from bulk storage and three loose pieces from the bin location. This can be a significant problem, because time is lost in routing the R/RD and picking first from one location, then from another. Careful document control is necessary to prevent loss or delay at either of these places.

Picking

Whether picking from a bin or a bulk location, the warehouseman may encounter several situations requiring deviation from normal procedures:

1. A bin may not contain sufficient material to fill the MRO. The warehouseman then must:

   a) Determine where the item is stored in bulk containers and arrange to have these containers forwarded to the bin location;

   b) Replenish the bin stock to prevent delays in filling other MRO s for the same item.

2. The first bulk material location shown on the R/RD may not contain sufficient quantity to fill the MRO. The warehouseman then must proceed to the alternate location, if any, specified on the document and select the remaining quantity. Since the first location is now empty, he must inform locator file personnel so that they may remove or "kill," this location from the item record.

3. The total material at all specified locations may not be sufficient to fill the MRO. The warehouseman then must:

   a) Send appropriate "kill" notices to the locator file;

   b) Request additional locations at which the item is stored. If none are recorded, or if they too contain insufficient material, investigation personnel are notified, and procedures are initiated to find the required material. (The depot must assume that the material is on hand because the ICP, which maintains the inventory records, should not have forwarded the MRO to the depot unless they had sufficient stock to fill it.) If the material is found, the required quantity is picked for issue, and the locator file is informed of the location of the remainder. If it is not found, immediate steps must be taken to inform:

      1) The shipment unit assembly point, so that personnel may revise the pertinent SPWS to reflect the quantity that they should actually receive from picking.

      2) The transportation department, so that it may revise its copy of the SPWS; this revision may affect the advance planning for transportation.

      3) The ICP, so that it may arrange to ship the material from another depot.

4. The item stored at locations shown on the R/RD may not be the item ordered, because:

   a) Manual errors were made by locator file personnel, such as misreading the stock number or selecting the wrong locator record from the file.

   b) The item was moved in rewarehousing operations between the time the R/RD was prepared and when picking was attempted.

   Whatever the reason, the locator file must be interrogated and perhaps updated with kill notices.

All of these are time-consuming operations and must be held to a minimum. This emphasizes the importance of having accurate, currently updated location records and a system that provides rapid two-way communication of information between locator file personnel and the warehouse. Today, most depots rely upon telephone communications or the exchange of written information on standard forms.

Assembly

This is the process of physically bringing together all line-items composing a preplanned shipment unit. The key document used is the SPWS, which should fully describe the composition of each preplanned shipment unit and the warehouse in which it will be assembled for shipment.

A depot may designate only one point at which all assembly and carrier pickups occur, or it may have two or three such points. For exceptionally large shipments, most depots assemble in the warehouse in which most of the shipment is picked.

When initially released by Shipment Planning, SPWS s are forwarded to a document control desk at the specified assembly point. Here they are filed by TCN and RBD (or Internal Control Number), pending arrival of the material.

As each line item of material (accompanied by an R/RD) actually arrives from the warehouse in which it was picked:

- The associated SPWS is pulled from the pending file.
- The number of units of issue is checked to insure conformity with quantities stated on the R/RD and SPWS, and the item is checked-off on the SPWS.
- The material, with its R/RD, is "spotted" at an identifiable position on the assembly floor reserved for the shipment unit.
- This spot is noted on the SPWS which then is refiled pending arrival of the remainder of the material in the shipment unit.

Each line item is treated the same until all material for a shipment unit has been accumulated. The SPWS then is given to packing personnel.

Packing

Packing facilities normally are located at each point where assembly work is performed. In fact, some depots consider these two operations a single function. Two important tasks are accomplished in the packing operation:

- Final steps are taken to physically prepare material for shipment.
- Data is developed and recorded for later use by transportation personnel in preparing movement documents.

When a SPWS is received, the associated material and R/RDs are brought to the packing station. First, overpacking is performed - placing one or more items with the same freight class rating into a single container to prevent loss and minimize handling. (This is one reason that this element of master data is indicated for every item on the SPWS). Only items with common class ratings should be placed in a single container, because the transportation charge for each container is based upon the rate applying to the highest rated item within it. For example, if one pound of electronics parts, which have a high freight rate, were overpacked with 99 pounds of paper products, the depot would be charged as if it had shipped 100 pounds of electronics parts.

Next, any special packaging instructions shown on the SPWS are complied with, and each container is weighed and measured. The following required data then is marked on each container:

- TCN, IPG, project code and required delivery date (from SPWS).
- Depot address.
- Shipping address of ultimate consignee (from SPWS).
- Shipping address of military transshipment points (POE/POD) through which the shipment will be routed to the consignee (from SPWS).
- Actual weight and cube of the container.
- Total number of containers in the shipment unit (e.g., container number 3 of 7).
- Any special markings indicated on the SPWS.

As stated, the SPWS should contain special packing and marking instructions. This point requires some elaboration. There are two basic DoD publications from which guidance for these actions is derived: The Packaging Requirement Code (MILSTD 726) and the Military Standard Marking and Storage Publication (MILSTD 129C). Some of these instructions are supplemented and amplified by publications of individual services and government regulatory bodies. They specify such things as:

- Special packaging required for specific commodities.
- Special packaging required because of overseas destination - regardless of commodity.
- Minimum data to be included in marking containers (as listed above).

- o Method of applying markings (labeling, stenciling).
- o Special markings to indicate hazardous or classified material (explosive, radioactive).
- o Markings to indicate special handling requirements.

Most material requires no special packaging or marking and is packed and labeled routinely. Where an item does require special actions by packing personnel, these instructions should be extracted from the master item record during the shipment planning operation and noted on the SPWS. Most of these instructions, which apply not to a particular item in the stock catalog but to whole classes of material, can be coded in a readily interpreted form for display on the worksheet.

After the material has been physically readied for shipment, certain variable information must be noted on the SPWS to indicate actual shipment unit characteristics, so that movement documents may be prepared. This data includes:

- o Number of containers for each line item.
- o Actual weight and cube of each line item.
- o Change in the normal freight class rating for any line item for which a change is necessary.
- o Dimensions of the largest container in the shipment unit.
- o Total weight and cube of the entire shipment unit.
- o Total number of containers in the entire shipment unit.

The fact that an item can be shipped at other than its normal class rate indicated on the SPWS is discussed under "freight rating" later in this section.

When these operations are completed, copies of each R/RD are placed in a standard envelope affixed to the number one container of the shipment unit. The containers then are spotted on the shipping floor to await carrier pickup, and the SPWS is marked with this location.

Copies of the annotated SPWS and each R/RD are forwarded to transportation personnel. Additional copies are placed in a "completed" file at the warehouse document control desk or forwarded to a central records department.

Summary

From the foregoing, several things should be evident:

1. Most file maintenance changes to locator records are originated by warehouse personnel in performing custody work and in receiving and issue operations.
2. To perform almost any type of warehouse activity, the locator file must be called upon to rapidly provide accurate item locations.
3. With the heavy volumes and many kinds of transactions, and the requirements to maintain current and complete data and to respond to inquiries, a highly efficient automated data processing system may be profitably used.
4. Dissemination and feedback of data between a central reservoir of information (locator files) and personnel at many remote points (warehousemen) requires an efficient, tightly controlled communication and recording system, whose effectiveness determines the reliability of location information, and therefore has a strong impact on the speed and efficiency of all warehouse operations.

Transportation

The depot transportation department is responsible for arranging adequate transportation for on-time delivery and for determining routes and shipping charges. It also prepares required documentation to ship outgoing material and arranges "spotting" of incoming shipments. Transportation shipping operations are discussed here under five headings:

- o Pre-planning actions.
- o Receipt of warehouse documents.
- o General discussion of rating and routing.
- o Rating and routing at the storage depot.
- o Document preparation and distribution.

Because of their relative simplicity, Parcel Post shipments will not be considered. This material is shipped with its R/RD immediately after picking, and requires no additional documentation.

Pre-Planning

When SPWS s are released initially by shipment planning, a copy of each is forwarded to the transportation department. These are reviewed and, while material is being readied for shipment in the warehouses, the following actions are taken:

1. A MILSTAMP Transportation Account Code is assigned to each shipment unit.
2. A tentative determination of mode of shipment (rail, air, truck, etc...) is made by analyzing shipment unit characteristics (priority, freight classifications, approximate weight and cube).
3. Estimated transportation requirements for each shipping date also may be developed.
4. Release and clearance actions are taken as necessary.
5. The SPWS is filed pending notification that the material has been prepared for shipment.

A depot must apply to the Defense Traffic Management Service (DTMS) for releasing or routing instructions for shipments which exceed 10,000 pounds, are out-sized, or require special handling (e.g., explosives). The depot provides DTMS basic TCMD data plus certain amplifying information for each shipment unit for which clearance is required. The reply from DTMS specifies the mode of transportation to be used and routing instructions, including military transshipment terminals to which the material is to be sent. This information is noted on the SPWS.

When a shipment unit does not require releasing but will be routed through a military air or water terminal, the depot must obtain clearance. Clearance is requested by submitting a standard TCMD to the Terminal Clearing Authority (TCA) with jurisdiction over the applicable terminal. The TCA, knowing the transportation capability of each terminal, may return a MILSTAMP "challenge" document to the depot, denying the request and specifying an alternate terminal. If no challenge is received within a prescribed time, the depot routes the shipment as originally planned. This initial routing plan was developed in Shipment Planning which indicated on the SPWS the terminals (POE/POD) through which shipments to the consignee normally are routed. If this routing is changed, it is noted on the SPWS, and packing personnel are notified so that they may properly label containers.

Receipt of Warehouse Documentation

When each shipment unit is ready for shipment, the warehouse forwards an annotated copy of its SPWS to the transportation department (see PACKING). This is matched with the copy already on file. At that point, transportation personnel will attempt to consolidate this shipment unit with others ready for movement to the same destination. For instance, several shipment units for one ultimate consignee might be ready for shipment on the same day, or perhaps shipments for several different consignees, all initially bound for the same POE, are ready for shipment together. Just as individual line items were earlier combined into shipment units, these now are grouped into larger "transportation units" whenever possible (NOTE: although shipment units may be so combined, each shipment unit retains its identity).

The SPWS s for the transportation unit then are given to a rate clerk who will rate and route the shipment. He determines the mode of transportation and estimates the cost of this service based on the characteristics and destination of the material. Before examining rating and routing at a storage depot, a discussion of these complex functions in general terms may be helpful.

General Rating and Routing

Although there are other methods of transporting material, this discussion is restricted to common carrier truck and railroad. For truck shipments there are two general types of rates: Class and commodity.

Class Rates (Truck) - A class rate is one which applies not to a specific item, but to a class or category of items with similar transportation characteristics. All motor carriers adhere to a uniform system of grouping many thousands of items into a relatively few classes for determining freight charges. These National Motor Freight Classifications (NMFC) are a published alphabetical listing of standard material descriptions, each individually identified by a 6-digit code number. They describe almost any article a trucking company may be called upon to transport. Almost all items in the Federal Stock Catalog (FSC) fall within one of these NMFC s, of which there are about 15,000. Obviously, many different FSC items have the same NMFC Code.

Associated with each NMFC is a "class rating" for that class of material. These are simply a scale of relative numbers with 100 as a base rating. All other class ratings express the relative cost of transporting one class of material against the cost of transporting another class whose class rating is 100. Thus a rating of 70 means that the charge for hauling that class is 70 percent of the charge for hauling class 100 material. A rating of 200 indicates that the cost is twice the base, class 100, cost. Figure 3 is a sample page from an NMFC listing.

Figure 3 Sample National Motor Freight Classification Page

Item	ARTICLES	CLASSES (Ratings) LTL	CLASSES (Ratings) @Vol.	@ Vol. Min. Wt.-Lbs.
172330	**Salesmen's Samples**, other than Boots, Shoes, Hats, Caps, China or Porcelainware, NOI, or Earthenware or Stoneware, NOI, in salesmen's sample trunks, locked, or in trunks in crates, or in salesmen's hand sample cases in boxes or crates: When contents consist of articles which in boxes are classed (rated) higher than class 100—same rate as if in wooden boxes.			
	When contents consist of articles which in boxes are classed (rated) class 100 or lower..	125	125	AQ
172350	**Sandalwood Chips**, in bags, barrels or boxes	100	70	30,000
172360	**Sash**, glazed or not glazed, **or Sash and Frames combined, or Windows**, airplane, boat, motor bus or railway car, in boxes or crates	125	70	24,000
172420	**Sash Parts or Window Frame Parts**, Airplane, Motor Boat, Motor Bus or Railway Car, in boxes or crates	100	55	30,000
172430	**Sausage or Food product casings**, cellulose or plastic film, in boxes	70	Ⓣ45	Ⓜ24.6
172450	**Sausage Casings**, dried, NOI, in barrels or boxes	100	Ⓣ37½	Ⓜ30.6
172470	**Sausage Casings**, frozen, pickled or salted, in barrels, boxes, kits, pails or tubs, or in metal cans in crates	65	37½	30,000
172530	**Saw Blades**, band, ends welded together, in boxes or crates	85	55	30,000
172540	**Saw blades** (saws without frames or handles), NOI, **circular saw blades or saw teeth**, in boxes or crates, wrapped in fibreboard or on boards, **or band saw blades**, ends not welded, coiled, in boxes or crates	77½	50	30,000
172540	**Screens**, Textile printing, surfaces protected with fibreboard, in packages	400	300	10,000
172560	**Screens**, Textile printing, surfaces protected with not less than ¼ inch wooden boards, spaces between boards not over ¼ inch, in packages	250	150	18,000
172580	**Sculpture or Statuary**, NOI, cement, concrete or iron, in barrels, boxes or crates	125	85	12,000
172600	**Sculpture or Statuary**, NOI, metal, NOI, plaster, stone or terra cotta, in barrels or boxes.	150	85	12,000
172620	**Sealing Tape**, cloth or cloth and paper combined, gummed, in packages	85	55	30,000
172640	**Seals**, NOI, other than packing devices, forms or shapes, see Note, item 172642, in barrels or boxes	70	55	36,000
172642	**Note**—Classes (ratings) apply on seals which are designed to prevent or to indicate tampering with or theft from containers or equipment on which they were designated to be used.			
172660	**Searchlight bodies or shells**, sheet steel, LTL, in crates; Vol., loose or in packages	150	85	10,000
172680	**Seats**, bath tub, baby, nested, in boxes	85	Ⓣ55	Ⓜ20.4
172700	**Seats**, toilet, baby:			
	Plastic or Wood, with or without fittings or fastenings of other materials:			
	SU, in boxes	250	Ⓣ150	Ⓜ10.1
	Flat or folded flat, in boxes	125	Ⓣ100	Ⓜ12.4
	Wood, steel and cotton fabric or rubber combined, folded flat, in boxes	85	55	24,000
172750	**SEEDS:**			
172770	**Acorns**, in bags, barrels or boxes	70	35	30,000
172790	**Ajowan**, see Note, item 174002, in bags, barrels or boxes	85	55	30,000
172810	**Alfalfa**, see Note, item 174002, in bags, barrels or boxes	70	35	30,000
172830	**Anise**, see Note, item 174002, in bags, barrels or boxes	70	40	30,000
172850	**Annatto**, see Note, item 174002, in bags, barrels or boxes	70	40	36,000
172870	**Apricot (apricot pits)**, in bags, barrels or boxes	65	35	36,000
172890	**Beggar weed**, see Note, item 174002, in bags, barrels or boxes	70	40	30,000
172910	**Blue Lupine**, in bags	65	35	36,000
172930	**Broom corn**, see Note, item 174002, in bags, barrels or boxes	70	35	30,000
172950	**Canary**, see Note, item 174002, in bags, barrels or boxes	70	35	30,000
172970	**Caraway**, see Note, item 174002, in bags, barrels or boxes	70	40	30,000
172990	**Cardamon**, see Note, item 174002, in boxes. See item 60000 for classes (ratings) dependent upon agreed or released value	150	70	30,000
173010	**Celery**, see Note, item 174002, in bags, barrels or boxes	70	40	30,000
173030	**Cevadilla (sabadilla)**, see Note, item 174002, in bags, barrels or boxes	92½	50	30,000
173050	**Cherry (cherry stones)**, in bags, barrels or boxes	65	35	36,000
173070	**Chili pepper**, see Note, item 174002, in bags, barrels or boxes	70	37½	30,000
173090	**Clover**, see Note, item 174002, in bags, barrels or boxes	70	35	30,000
173110	**Coriander**, see Note, item 174002, in bags, barrels or boxes	70	35	30,000
173130	**Cotton**, see Note, item 174002, LTL, in bags, barrels or boxes; Vol., in bulk or in packages	55	35	30,000
173150	**Crotalaria**, see Note, item 174002, in bags, barrels or boxes	70	40	30,000
173170	**Cumin**, see Note, item 174002, in bags, barrels or boxes	70	40	30,000
173190	**Dill**, in bags, barrels or boxes	70	37½	30,000
173210	**Fennel**, see Note, item 174002, in bags, barrels or boxes	70	37½	30,000
173230	**Fenugreek, see Note, item 174002, in bags, barrels or boxes**	**70**	**37½**	**36,000**
173250	**Flax (linseed)**, see Note, item 174002, LTL, in bags, barrels or boxes; Vol., in packages or in bulk in cloth or paper lined vehicles, see Note, item 174004	65	37½	56,000
173270	**Flower or garden**, NOI, see Notes, items 174002, 174006, 174008 and 174012, in bags, barrels or boxes, or in seed cabinets in boxes or crates, or in trays, with equipment of KD frames, in fibre boxes. See item 60000 for classes (ratings) dependent upon agreed or released value	70	Ⓣ45	Ⓜ30.6
173290	**Grape or raisin**, LTL, in bags, barrels or boxes; Vol., in bulk or in packages	50	35	40,000
173310	**Grass seed**, NOI, see Note, item 174002, in bags, barrels or boxes	70	35	30,000
173330	**Hairy Indigo**, see Note, item 174002, in bags	70	35	30,000
173350	**Hemp**, see Note, item 174002, in bags, barrels or boxes	70	35	30,000
173370	**Honey bean (St. John's bread seeds)**, ground or powdered, in bags, barrels or boxes	70	37½	36,000
173390	**Kapok**, see Note, item 174002, in bags, barrels or boxes	70	35	30,000
173410	**Kernels**, apricot or peach, in bags, barrels or boxes	70	40	30,000

Notice that for each type of material, both less-truckload (LTL) and truckload class ratings are provided. The full truckload rating is the lower of the two. The one to be used is determined by comparing the weight of material to be shipped against the "volume minimum weight" in the far right-hand column. The truckload rating may be used if the actual weight exceeds this figure. Note that shipping origins and destinations are not a factor in the NMFC listing, nor does it indicate the actual cost for hauling. Knowing the classes of material to be shipped, one merely uses this list to ascertain class rating codes, and then must consult a freight tariff to determine the actual dollar rate.

Freight tariffs are carrier price lists consisting of tables for converting NMFC rating codes into actual shipping charges. The dollar amount associated with each class rating varies with the distance material is to be shipped. Tariffs may be published by a single trucking company, but more often a joint tariff is issued by a group of carriers serving a certain geographic area. Several tariffs, issued by competing carriers or carrier associations, might cover the same shipping points. A shipper must use the most favorable one to compute shipping charges. Having the tariff for the general area to which a shipment is being made, a rate clerk must refer to two sets of tables in this book.

1. Rate Basis Table (figure 4) indicates a rate basis code for each set of origins and destinations governed by the tariff. The applicable rate basis (roughly equivalent to mileage between shipment origin and destination) is selected from this convenient matrix.

2. Rate Table (figure 5) indicates, for each rate basis, the dollar rate applicable to each class rating code. The dollar charge for shipping an item is determined by multiplying its weight by the rate.

Figure 4 Sample Rate Basis Tariff Page

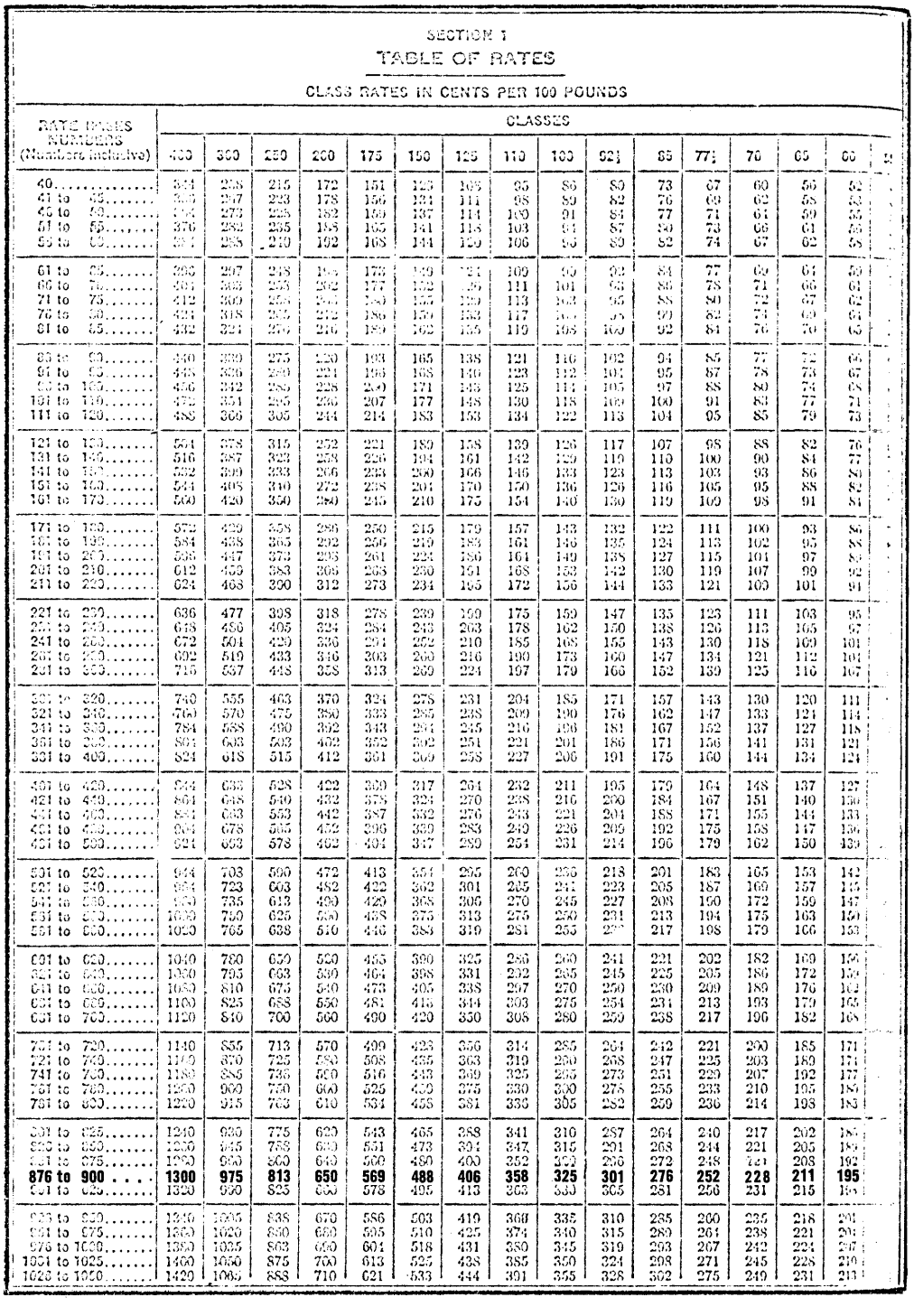
SECTION 1

APPLICATION OF RATE BASES

RATE BASES APPLICABLE (For rates, see pages 282 to 337)

BETWEEN (See Item 100) AND (See Item 100)	Cheat Bridge...W. Va.	Cheboygan..Mich.	Cherry Tree...Pa.	**Chicago . . . Ill.**	Childwold...N. Y.	[illegible]burg...Ky.	Chillicothe...Ohio	Cincinnati...Ohio Cincinnati[illegible]...Ohio	Circleville...Ohio	Clare......Mich.	Claremont...N. H.	Clarksburg...W. Va.	Clearfield...Pa.	Cleveland...Ohio	Clifford...Mich.	Clinton.....Iowa	Coalport.....Pa.
[illegible]pelier..............Vt.	777	807	579	348	[illegible]	1001	814	867	794	778	87	752	557	628	687	1036	551
[illegible]land..............Ky.	395	620	457	425	765	57	135	143	155	435	625	270	377	320	143	582	471
[illegible]..............Ill.	643	410	507	(i)	[illegible]	733	555	802	348	319	[illegible]	619	546	553	536	(i)	611
M[illegible]rison..............Ill.	748	478	703	(i)	533	478	451	388	446	317	1035	624	631	460	431	(i)	417
[illegible]ville..............Vt.	786	878	588	920	183	685	705	848	775	759	135	751	553	600	668	1067	560
Mount Clemens........Mich.	492	282	476	280	522	565	251	275	231	163	553	384	410	185	89	427	440
Mt. Morris...........N. Y.	482	515	224	561	261	620	150	183	410	595	667	381	195	244	305	699	228
[illegible]erling..........Ky.	427	622	189	394	825	10	166	111	186	457	667	308	468	350	445	500	503
Mount Upton..........N. Y.	495p	655p	304p	701p	152p	759p	566p	622p	549p	536p	272p	461p	263p	583p	445p	842p	270p
Mt. Vernon..............Ill.	675	649	682	(i)	961	277	373	277	378	518	1003	551	507	487	527	(i)	696
Mt. Vernon............Ohio	331	435	277	316	589	249	93	159	73	301	721	215	262	115	258	451	291
[illegible]lety............W. Va.	182	742	331	612	733	370	203	362	305	307	814	124	362	352	565	748	343
[illegible]............W. Va.	250	708	403	552	801	72	226	274	246	573	804	257	194	381	520	677	470
[illegible]..............Ind.	453	441	433	178	701	195	155	105	159	205	833	329	437	227	288	304	447
[illegible]ysboro..............Ill.	728	694	730	(i)	1080	628	425	329	330	563	1141	604	745	535	572	(i)	744
[illegible]tine..............Iowa	788	539	745	(i)	676	617	750	[illegible]	485	568	1108	664	733	511	485	(i)	759
[illegible]egon............Mich.	619	251	553	184	567	[illegible]	368	[illegible]	345	729	828	511	540	312	174	248	567
[illegible]..............W. Va.	237	739	470	526	767	256	257	275	255	566	821	288	484	395	524	650	457
[illegible]agansett Pier.......R. I.	625b	906b	502b	956b	[illegible]	921b	767b	[illegible]	776b	787b	164b	589b	477b	635b	696b	1004b	474b
[illegible]sburg..........N. Y.	476	744	507	760	216	775	604	676	594	624	303	442	274	469	534	528	279
[illegible]..............N. H.	722	905	574	555	542	1010	820	873	[illegible]	785	90	588	539	634	695	1093	546
[illegible]............W. Va.	197	552	201	456	565	517	164	258	164	417	704	59	219	162	375	594	215
[illegible]..............Ill.	765	658	753	(i)	1013	450	463	286	459	528	1145	641	762	539	545	(i)	767
[illegible]k..............Ohio	506	451	263	328	335	237	82	147	61	316	735	100	250	140	274	463	279
[illegible] Berlin............N. Y.	547p	645p	349p	694p	101p	749p	559p	612p	539p	526p	253p	512p	314p	373p	435p	832p	321p
[illegible] Bethlehem..........Pa.	327	607	103	518	454	489	313	383	292	472	557	229	75	187	427	353	105
[illegible] Brunswick.........N. J.	445	832	328	865	352	743	589	685	574	712	280	411	311	531	622	991	300
[illegible]urgh..........N. Y.	501	817	360	867	265	760	645	732	637	698	243	467	335	546	607	1005	333
[illegible]ryport..........Mass.	749	938	607	988	587	943	853	596	833	819	133	715	572	667	728	1126	579
[illegible] Castle..............Va.	236	838	418	682	761	403	386	425	376	703	735	313	432	511	660	807	405
[illegible] Freedom, Pa.-Millers, Md.	304	811	163	749	526	592	448	544	152	551	153	270	215	425	601	885	210
[illegible] Haven..........Conn.	572	871	451	921	220	870	716	812	723	752	102	538	426	600	661	1059	423
[illegible] London..........Conn.	623	903	502	955	355	921	767	863	779	757	164	589	477	635	696	1094	474
[illegible] Market..............Va.	291	835	270	737	553	457	411	479	481	551	531	259	284	418	658	862	257
[illegible]..............Vt.	825	890	627	941	195	557	507	590	757	771	125	786	592	621	680	1079	597
[illegible]..............Ill.	625	587	612	(i)	591	270	322	230	317	456	1023	501	627	417	160	(i)	626
New York . . . . N.Y.	**484**	**852**	**363**	**890**	**326**	**782**	**638**	**724**	**633**	**732**	**255**	**450**	**338**	**562**	**642**	**1028**	**335**
[illegible]..............Mich.	551	356	494	89	703	331	284	241	264	205	838	430	483	259	214	227	508
[illegible]..............Pa.	269	669	121	575	513	491	337	420	325	535	606	163	153	252	492	711	117
[illegible]..............Va.	468	1053	485	914	555	534	588	656	608	919	603	477	468	636	861	1039	458
[illegible] Adams..........Mass.	623	781	150	831	230	886	696	749	676	662	103	589	415	510	571	969	422
[illegible] Manchester.......Ind.	500	397	457	123	636	256	211	168	206	255	828	376	445	222	247	252	471
[illegible] Vernon...........Ind.	471	528	484	214	776	148	169	73	174	383	908	347	499	302	374	342	498
[illegible]..............Va.	392	758	588	580	857	218	272	304	293	623	908	399	605	457	581	679	601
[illegible]..............N. Y.	496	655	301	704	152	759	560	622	549	536	272	461	253	383	445	842	276
[illegible]..............Va.	313	915	430	759	679	479	433	501	453	750	648	590	444	578	737	884	417
[illegible]..........W. Va.	231	669	424	513	781	233	187	255	207	534	814	218	455	342	492	538	436
[illegible] City..........Ind.	598	623	611	272	876	189	205	199	301	491	1028	474	626	422	482	350	625
[illegible]burg..........N. Y.	648	714	451	765	166	821	631	684	511	595	282	611	416	445	504	903	423
[illegible]..............Pa.	359	553	147	464	429	489	297	362	277	419	561	251	116	133	378	507	149
[illegible]..........W. Va.	269	663	418	507	793	227	181	249	201	528	880	212	449	336	485	632	430
[illegible] Montrose..........Mo.	764	682	751	(i)	1023	105	461	385	456	551	1156	640	766	550	568	(i)	765
[illegible]..........N. Y.	413	522	162	528	330	579	391	444	371	402	162	315	126	266	212	574	164
[illegible]..........Ky.	377	601	439	439	774	75	116	161	136	466	505	258	458	301	424	550	453
[illegible]..........Ill.	619	606	626	(i)	905	252	317	221	322	475	1037	495	641	431	479	(i)	640
[illegible]..........N. Y.	516	702	318	751	170	792	615	660	595	583	225	481	283	430	492	889	290
[illegible]..........Va.	313	912	347	759	596	481	433	503	453	748	565	336	361	495	737	884	334
[illegible] Road (B.&O.) W. Va.- [illegible]mont (W. Md.)...Md.	190	730	163	636	501	487	333	423	338	596	546	154	179	313	553	772	152
[illegible]..........N. Y.	534	590	330	641	156	584	430	526	435	471	318	487	208	321	380	779	308
[illegible]..........Mich.	521	217	455	229	580	394	280	304	260	72	711	413	441	214	78	355	469

Figure 5 Sample Rate Table Page



SECTION 1

TABLE OF RATES

CLASS RATES IN CENTS PER 100 POUNDS

RATE BASES NUMBERS (Numbers inclusive)	CLASSES														
	400	300	250	200	175	150	125	110	100	92½	85	77½	70	65	60
40	344	258	215	172	151	129	108	95	86	80	73	67	60	56	52
41 to 45	350	262	218	175	153	131	111	98	89	82	76	69	62	58	53
46 to 50	356	267	223	178	156	134	114	100	91	84	77	71	64	59	55
51 to 55	376	282	235	188	165	141	118	103	94	87	80	73	66	61	56
56 to 60	387	290	240	192	168	144	120	106	96	89	82	74	67	62	58
61 to 65	396	297	248	198	173	149	124	109	99	92	84	77	69	64	59
66 to 70	404	303	253	202	177	152	[illegible]	111	101	93	86	78	71	66	61
71 to 75	412	309	258	[illegible]	[illegible]	155	[illegible]	113	103	95	88	80	72	67	62
76 to 80	424	318	265	212	186	159	133	117	[illegible]	98	90	82	74	69	64
81 to 85	432	324	270	216	189	162	135	119	108	100	92	84	76	70	65
86 to 90	440	330	275	220	193	165	138	121	110	102	94	86	77	72	66
91 to 95	448	336	280	224	196	168	140	123	112	104	95	87	78	73	67
96 to 100	456	342	285	228	200	171	143	125	114	105	97	88	80	74	68
101 to 110	472	354	295	236	207	177	148	130	118	109	100	91	83	77	71
111 to 120	488	366	305	244	214	183	153	134	122	113	104	95	85	79	73
121 to 130	504	378	315	252	221	189	158	139	126	117	107	98	88	82	76
131 to 140	516	387	323	258	226	194	161	142	129	119	110	100	90	84	77
141 to 150	532	399	333	266	233	200	166	146	133	123	113	103	93	86	80
151 to 160	544	408	340	272	238	204	170	150	136	126	116	105	95	88	82
161 to 170	560	420	350	280	245	210	175	154	140	130	119	109	98	91	84
171 to 180	572	429	358	286	250	215	179	157	143	132	122	111	100	93	86
181 to 190	584	438	365	292	256	219	183	161	146	135	124	113	102	95	88
191 to 200	596	447	373	298	261	223	186	164	149	138	127	115	104	97	89
201 to 210	612	459	383	306	268	230	191	168	153	142	130	119	107	99	92
211 to 220	624	468	390	312	273	234	195	172	156	144	133	121	109	101	94
221 to 230	636	477	398	318	278	239	199	175	159	147	135	123	111	103	95
231 to 240	648	486	405	324	284	243	203	178	162	150	138	126	113	105	97
241 to 250	672	504	420	336	294	252	210	185	168	155	143	130	118	109	101
251 to 260	692	519	433	346	303	260	216	190	173	160	147	134	121	112	104
261 to 270	716	537	448	358	313	269	224	197	179	166	152	139	125	116	107
271 to 280	740	555	463	370	324	278	231	204	185	171	157	143	130	120	111
281 to 290	760	570	475	380	333	285	238	209	190	176	162	147	133	124	114
291 to 300	784	588	490	392	343	294	245	216	196	181	167	152	137	127	118
301 to 310	804	603	503	402	352	302	251	221	201	186	171	156	141	131	121
311 to 320	824	618	515	412	361	309	258	227	206	191	175	160	144	134	124
321 to 330	844	633	528	422	369	317	264	232	211	195	179	164	148	137	127
331 to 340	864	648	540	432	378	324	270	238	216	200	184	167	151	140	130
341 to 350	884	663	553	442	387	332	276	243	221	204	188	171	155	144	133
351 to 360	904	678	565	452	396	339	283	249	226	209	192	175	158	147	136
361 to 370	924	693	578	462	404	347	289	254	231	214	196	179	162	150	139
371 to 380	944	708	590	472	413	354	295	260	236	218	201	183	165	153	142
381 to 390	964	723	603	482	422	362	301	265	241	223	205	187	169	157	145
391 to 400	980	735	613	490	429	368	306	270	245	227	208	190	172	159	147
401 to 410	1000	750	625	500	438	375	313	275	250	231	213	194	175	163	150
411 to 420	1020	765	638	510	446	383	319	281	255	236	217	198	179	166	153
421 to 430	1040	780	650	520	455	390	325	286	260	241	221	202	182	169	156
431 to 440	1060	795	663	530	464	398	331	292	265	245	225	205	186	172	159
441 to 450	1080	810	675	540	473	405	338	297	270	250	230	209	189	176	162
451 to 460	1100	825	688	550	481	413	344	303	275	254	234	213	193	179	165
461 to 470	1120	840	700	560	490	420	350	308	280	259	238	217	196	182	168
471 to 480	1140	855	713	570	499	428	356	314	285	264	242	221	200	185	171
481 to 490	1160	870	725	580	508	435	363	319	290	268	247	225	203	189	174
491 to 500	1180	885	735	590	516	443	369	325	295	273	251	229	207	192	177
501 to 510	1200	900	750	600	525	450	375	330	300	278	255	233	210	195	180
511 to 520	1220	915	763	610	534	458	381	336	305	282	259	236	214	198	183
521 to 530	1240	930	775	620	543	465	388	341	310	287	264	240	217	202	186
531 to 540	1260	945	788	630	551	473	394	347	315	291	268	244	221	205	189
541 to 550	1280	960	800	640	560	480	400	352	320	296	272	248	224	208	192
876 to 900	**1300**	**975**	**813**	**650**	**569**	**488**	**406**	**358**	**325**	**301**	**276**	**252**	**228**	**211**	**195**
551 to 625	1320	990	825	660	578	495	413	363	330	305	281	256	231	215	198
626 to 650	1340	1005	838	670	586	503	419	368	335	310	285	260	235	218	201
651 to 675	1360	1020	850	680	595	510	425	374	340	315	289	264	238	221	204
676 to 1000	1380	1035	863	690	604	518	431	380	345	319	293	267	242	224	207
1001 to 1025	1400	1050	875	700	613	525	438	385	350	324	298	271	245	228	210
1026 to 1050	1420	1065	888	710	621	533	444	391	355	328	302	275	249	231	213

To illustrate class rating assume that a shipper has 4,000 pounds of bagged fenugreek to be shipped by truck from New York to Chicago. To find the cost of transportation he - -

- o Checks the NMFC to find the standard freight description most closely describing his material. This is entry number 173230 (figure 3).

- o Notes the NMFC class rating code of 70. Since his shipment does not exceed 36,000 pounds, he is not eligible for the reduced truckload rating.

- o Consults one of the freight tariffs covering shipments from New York to the Chicago area. He notes that the rate basis between these two points is 890 (figure 4).

- o Refers to the rate table in this same tariff (figure 5), and sees that the rate for transporting class 70 material is $2.28 per hundred pounds. Therefore, the total cost for 4,000 pounds is $91.20.

- o If he is using a joint tariff, he must contact one of the participating carriers to arrange for service, and prepare necessary movement documents such as a bill of lading.

Although the basic approach to class rating is well standardized by the NMFC system, it can be a much more complicated task than the straightforward operation outlined above. This is largely because of the multiplicity of class rate tariffs with their many footnotes, special rules, exceptions and modifications to the basic NMFC. To cite just a few typical examples:

- o Most carriers will haul certain material on a "Freight all Kinds" (FAK) basis. Only specifically mentioned categories of material are eligible for this reduced rate, usually a flat fee per hundredweight, and then only if the shipment exceeds a certain minimum weight.

- o Some tariffs provide special class rating codes for certain categories of material. These are exceptions to class ratings contained in the NMFC and take precedence over those standard ratings. This may be done for a variety of reasons, such as to meet competition for hauling certain material within a given area.

- o Some carriers disregard "volume minimum weights" contained in the NMFC, and publish their own for certain material. They may even make a finer distinction than truckload and LTL shipments, offering diminishing rates for shipments of 5,000, 10,000 and 20,000 pounds.

- o Sometimes, a minimum charge is applicable regardless of the weight of material, to insure that the carrier is adequately remunerated for handling very small shipments.

- o There are often a variety of accessorial charges added to basic freight costs for special services.

Although there are good reasons for such exceptions, there is no uniform pattern for determining what they are or when they apply. It is generally recognized that there is great need for tariff simplification. Until this occurs great reliance must be placed upon highly experienced rate clerks, well versed in the provisions of each tariff which he uses.

Commodity Rates (Truck)

A commodity rate is a dollar rate quoted for a specific item instead of by freight classification. These rates, usually lower than the class rate, apply only when the item is shipped between certain points specified in the carrier's tariff. Commodity rates are special inducements offered to acquire the business of shippers who regularly ship high volumes of a particular item. They may be issued as addenda to the carrier's class rate tariff or published as a separate tariff. All tariffs are constantly being revised through additions and deletions.

Railroad Rating

The methods of determining rail shipping costs are almost identical to those used for motor carriers. In fact, the NMFC is patterned after its rail counterpart, the Uniform Freight Classification (UFC). The UFC specifies both less-carload (LCL) and carload class rating for each type of material. Individual rail tariffs contain class, commodity and FAK rates plus numerous exceptions and rules similar to those for motor carriers.

Depot Rating And Routing

Theoretically, to determine the proper mode of shipment, a depot rate clerk must compute the cost of each mode and, assuming that their delivery times are about equal, select the cheapest one. In practice, however, the mode of shipment is often readily apparent to experienced personnel who know the total weight, type of material, destination and allowable transit time for a shipment. Or it is provided by DTMS (see above). Statistics show that, although most of a depot's *tonnage* may be shipped in carload or truckload lots, the majority of *individual shipments* are less than 10,000 pounds and constitute the largest part of the Transportation Department paperwork. These small shipments usually are shipped by motor carrier using LTL ratings.

The rate clerk uses a SPWS to assist him in rating shipments. Recall that the SPWS contains:

- NMFC and LTL class rating code for each line item.
- Total weight per line item.
- Shipping Destination (POE and/or consignee).

In rating LTL shipments he first selects a "rate basis" from an applicable tariff, then uses the "rate table" to compute the cost of shipping each line item. By adding the line item charges, he arrives at a total estimated transportation cost for the shipment. One possible exception is where packaging of an item changes its class rating. Entry 172700 in Figure 3 is an example of this. Normally this commodity is shipped "flat or folded flat in boxes", with a LTL class rating of 125. This class rating would be part of the master record of any item whose NMFC is 172700 and would appear on the SPWS each time the item was ordered. However, the item may at some time be shipped "set up" (SU), in which case its class rating code is 250. If so, packing personnel must notify the rate clerk by a note on the SPWS (see Packing). The rating clerk then uses the NMFC number to look up the applicable class rating.

For shipments exceeding 10,000 pounds, DTMS specifies the mode of transportation and may indicate specific carriers. The rate clerk, knowing the shipment unit characteristics, first must use that carrier's tariff to check for commodity or special rates which may apply. If the shipment is not eligible for such rates, he uses the UFC (or NMFC) to find "volume minimum" weights and obtain carload (or truckload) class rating codes if they apply. This task is simplified because the UFC and NMFC numbers associated with each line item are shown on the SPWS. When this classification data has been accumulated, he then proceeds with normal class rating procedures using the carrier's tariff.

After rating and routing are completed, carrier pickup service is arranged, usually by telephone. The SPWS, now containing rating, routing and carrier information is used as the source document for preparing movement documents.

Transportation Documentation

Primary responsibilities of a depot's Transportation Division are the preparation of movement documents necessary for the conveyance of material from the depot to its consignees and the monitoring of carrier performance.

The movement documents prepared include:

- o Government Bills of Lading (GBL)
- o MILSTAMP Transportation Control and Movement Documents (TCMD cards)
- o MILSTAMP Intransit Data Cards (IDC)
- o Other MILSTAMP cards as required

A Government Bill of Lading is a contract used to transport material, at government expense, on commercially owned or operated vehicles. Its principal functions are:

1. Proof of receipt of the property by the carrier upon signature by its representative.
2. Proof of receipt of the material by the consignee upon his signature (accomplishing the bill of lading). It then is the basis for the carrier's submission of a bill to the government for payment of freight charges.
3. Submission of proof of receipt by the consignee justifies payment by the government when billed by the carrier.
4. The GB/L identifies the government fund or appropriation to which transportation costs are charged.
5. Tariff entries, freight descriptions, weight and measurement data provide the carrier with the means of determining transportation charges.
6. The Transportation Control Number (TCN) of each shipment unit is included in the GB/L.

During warehouse operations, any changes to the planned shipment unit are annotated on the SPWS and it is sent to Transportation where it serves as the data source for preparation of the GB/L. Though estimates of the shipping charges are made by the depot's Transportation Division, the actual charges are calculated by the freight carrier based upon the data shown on the GB/L. It is essential that the GB/L accurately describe the material shipped so that the transportation charges can be correctly assessed by the carrier.

The SPWS also serves as the source document for the preparation of MILSTAMP cards - TCMD, IDC, etc.

The Transportation Control and Movement Document (TCMD), prepared by the depot, has three functions:

1. The movement document (way-bill or manifest) for shipments moving on government owned or controlled vehicles.

2. Advance notice to the consignee or transshipment point.

3. Source of TCMD data to be used in offering shipment units to Movement Control Authorities (MCA) or Terminal Clearance Authorities (TCA).

An Intransit Data Card (IDC) is prepared by the Transportation Division for the movement of shipment units wholly within Continental United States or wholly within an Overseas Theatre. (IDCs covering export shipment units are created by the terminal POE.) The IDC is returned to the depot by the consignee. From the data on the IDC, the depot is able to produce a series of reports which reflect:

1. Performance against order and ship time standards as prescribed by UMIPS,

2. Performance of each segment of the logistics system, and

3. Realistic point-to-point transit times by mode.

Other MILSTAMP cards serve to supplement the basic TCMD and indicate special or unusual characteristics of the material being shipped. These allied cards include:

1. Shipment Units in Consolidation card

2. Household Goods and Baggage card

3. Privately Owned Vehicles card

4. Explosives Lot Number card

5. Explosives or Dangerous Articles card

6. Excess Dimensions or Weight card

Analysis and Control

Additional data processing must be accomplished to provide management with information both before and after shipment of each MRO. This includes maintaining records for:

- INTERNAL CONTROL - to monitor timely and orderly completion of issue procedures for each material request between receipt and shipment.

- EXTERNAL REPORTING - to give outside activities prescribed information on the results of issue operations.

- INTERNAL ANALYSES - statistical studies of past depot performance to assist in planning procedures to improve service.

- EXTERNAL ANALYSIS - Statistical studies of past carrier performance to assist in establishing realistic point-to-point transit times.

Internal Control

Each depot must have some kind of monitoring system to insure that positive actions are taken for each MRO received. In concept this is a straightforward record keeping operation, but in practice it is more complex because of the high volume of transactions. The system must have the following minimum input data:

1. A record of every MRO received, in sequence by required shipping date.

2. Notification that documents for each MRO have been prepared and released for processing (e.g., copy of R/RD).

3. Feedback from transportation personnel that the item has been shipped (e.g., completed copy of R/RD or SPWS).

When notice is received that shipment has occurred the control file is purged, and the documents are forwarded to personnel responsible for notifying external activities. This control file is constantly reviewed, and expediting actions are initiated whenever a required shipping date has been exceeded. Especially close control must be maintained over IPGs I and II MROs which sometimes actually are "walked through" issue operations to insure that no unnecessary delays occur.

External Reporting

On or before the required shipping date, the depot must transmit a positive report to the appropriate ICP, stating supply action taken on each MRO. Two standard MILSTRIP documents are used for this:

- MATERIAL RELEASE CONFIRMATION (MRC): Perpetuates original MRO data and states the quantity actually shipped. Also indicates the date and mode of shipment and the GB/L number under which the item was shipped.

- MATERIAL RELEASE DENIAL (MRD): Used when the quantity shipped is less than the quantity requested. Also perpetuates original MRO data and indicates the quantity not shipped.

After shipment, the depot must retain readily accessible records reflecting the disposition of each MRO. Besides their obvious use for audit, these records also must be accessible on an exception basis to provide data for MILSTRIP/MILSTAMP follow-up replies. When material has not been received by the required delivery date, a requisitioner is authorized to submit status requests to the activity to which he initially submitted his requisition (usually, an ICP). The ICP sends a MILSTRIP status reply indicating supply actions taken as reflected in their MRC file. If the material should have been received by the status request date, the ICP also instructs the responsible depot to initiate MILSTAMP tracer actions. To do this for the MRO in question the depot must have a minimum of:

- Original requisition number.

- TCN of the shipment unit in which the item moved.

- Transportation priority, mode and date of shipment.

- POE through which shipment was scheduled to pass (if any).

- Type of pack of the shipment unit.

- ETA (estimated time of arrival at consignee).

Combining this history data with that on the status request, two MILSTAMP documents are prepared and transmitted:

- STATUS FOLLOWUP REPLY - directly to the consignee.

- TRACER ACTION - to the POE.

In addition to these procedures, every depot must submit periodic activity reports to higher authority. The content and format of these reports, usually a statistical recap of depot volumes and performance, are specified by the ICP or Military Department for whom they are prepared.

Internal Analyses

As each MRO is processed and shipped, large amounts of statistical data are generated. If collected, categorized and summarized systematically, this data can be used to produce extremely useful management reports. All depots use this accumulated data to some extent, but since the reports vary so widely from one activity to another, no attempt can be made here to describe any one in detail. However, they generally provide analyses of such things as: volume of work processed for each commodity manager, studies of overall depot response against established time standards, and warehouse effectiveness in handling each type of material.

External Analyses

The Intransit Data Card contains transportation priority, mode and date shipped and received by each DoD activity which handled the shipment unit. When the shipment unit reaches the ultimate consignee, he returns the IDC to the originating depot. The TCN on the IDC permits the depot to retrieve, from the SPWS, the identification of the carrier who transported the shipment from the depot. This permits the depot to analyze such facts as:

1. Transit time by mode and carrier to various destinations (carrier performance).

2. Overall transit times from the depot to the consignee.

3. Performance by transportation priority.

THE DATA PROCESSING SYSTEM FOR DEPOT MATERIAL HANDLING

The following pages are primarily intended to be instructional, pointing out data processing requirements and proposing a suggested method of applying IBM data processing techniques to integrate functions related to depot material handling. It is hoped the reader will be better equipped thereby to explore the particular needs of the activity which he serves.

In addition to a central processing unit, its location dependent upon overall depot workload, the concept utilizes the following types of equipment:

- o Large capacity random access storage
- o Sequential (magnetic tape) storage
- o An internal TELE-PROCESSING system linking selected warehouse stations with the random access file
- o A TELE-PROCESSING system linking the depot with external activities, such as ICPs and POEs.

The suggested system is presented by examining each functional area of a depot's material handling work --- Receiving, Shipment Planning, Warehouse Operations, Transportation Operations and Analysis and Status Reporting --- in terms of "Systems Considerations", i.e., those applications in which the use of IBM equipment provides distinct improvements; and "Systems Highlights", i.e., explanations of how the suggested system responds. An understanding of these requirements and responses will permit full appreciation of the flow charts, setting forth major procedural steps, and the definition of file and document contents, which follow.

RECEIVING

Considerations

1. Preplan the availability of personnel and equipment to handle the impending receipt workload.
2. Store each item in a fixed recorded storage location as quickly as possible. Some common locator file problems which impede this operation are:
   - o Manual systems of inquiry, research, transcription, and response are inherently slow.
   - o Additional delays are experienced because locator clerks must handle several other types of transactions.
   - o Extensive catalogue research is required to determine the validity of any FSN which has no master item record and to relate a manufacturer's past number to a FSN.
   - o File data may be unreliable if file maintenance is not current or has been improperly performed. Even though material may be "on hand" at the depot, it is not readily "available" for issue until it is stored and its location is recorded.

System Highlights

1. Use advance TCMD and other standard data to prepare workload forecasts.

2. Master item records will be stored in a random access file, with direct access available through remote terminals situated at receiving stations.

Using advance copies of receiving documents, due-in cards will be punched for each line item. These will immediately be processed against the master item record file to insure that matching records exist. If not, research can be conducted and a master record established (without locations) prior to arrival of the material. The cards are then filed until the shipment arrives. Of course, if an invalid FSN has been shown on the documentation the research will be inconclusive and the situation cannot be corrected until the material is visually inspected.

When material arrives, cards are pulled and inserted into the remote terminal; variable item characteristics are manually entered through a keyboard. The locator file response is in punched card form, showing FSN and locations at which the item is presently stored.

If no locations exist for the item, the locator file response indicates the warehouse in which the class of material is normally stored. When a suitable location has been selected, the card is inserted into a warehouse terminal and the location is entered in the Master Item Record through the manual keyboard, thus immediately updating the file.

SHIPMENT PLANNING

Considerations

Shipment planning is the heart of a depot's data processing activity related to material handling. It is here that orders are first received, scheduled, combined with a variety of master data, sequenced, grouped into shipment units and issued to operational departments in the form of standard documentation. These documents are, in effect, sets of detailed instructions describing work to be accomplished by specific scheduled dates. While issue work is actually being performed, shipment planning must monitor its progress and collect operational data to assemble post-shipment history records for reporting purposes.

The quality of work performed by shipment planning has a profound effect on overall depot performance: where it is done well, succeeding steps of the issue process are greatly benefited; where it is done inadequately, noticeable inefficiencies may result in subsequent material handling operations.

Because of volume, compressed processing time cycles, and scope of the work, performing all of the interrelated shipment planning operations is a difficult, if not impossible, task without an integrated approach using an ADP system.

System Highlights

An ADP system can provide valuable assistance in handling most of the routine data manipulation and record keeping involved in shipment planning. The system flow charts in this chapter describe how these basic requirements may be satisfied. But in addition to performing these routine functions, this conceptual approach has been designed to further utilize inherent IBM data processing equipment capabilities.

1. Upon receipt, routine MROs are assigned schedule dates and recorded on disc or tape. They are then processed against the master item record file where, for each MRO:

    - o A bulk and bin location are extracted from the Master Item Record.

    - o The quantity to be selected from each of these locations is computed. When material to fill a single MRO must be picked from both locations, two records will be created - one with the bin location and another with the bulk location. Each of the records also contains all original MRO data and schedule dates, plus that portion of the total quantity to be picked from the specified location. An identifying "tag," indicating that the requisition has been "split," is also a part of each record.

    - o The approximate weight of material for each record is computed and the expanded MRO records are merged into a pending file.

"Splitting" requisitions is a departure from existing procedure and is being suggested because it offers several positive advantages:

- o It facilitates the preparation of a more accurate workload planning report for each warehouse section.

- o Two 1348s will be prepared for the MRO allowing concurrent picking from both locations; reducing processing time and lessening the need for exchanging documents between warehouses.

- o All bin material is commonly packed together into as few containers as possible. Each bulk container, on the other hand, is usually shipped "as is." Thus, a separate 1348-1 for each portion of the item should assist the consignee in matching documents against a physical count of material.

It is most important to realize that two records are created primarily for internal convenience, and is only a temporary measure. When shipment occurs, these must be re-combined into a single record, on the basis of their common requisition number, to facilitate external reporting (only one MRC and MRD may be transmitted per MRO). Thus, provisions are made to insure that both portions of the MRO are shipped simultaneously as parts of the same shipment unit.

2. Once a day, the pending file is used to prepare a Workload Planning document, displaying for warehouse management the backlog of routine work per warehouse section for each of the next several days. A sample report, prepared on Julian date 104, is illustrated in figure 6:

Figure 6 Sample Workload Planning Report

WORKLOAD PLANNING (IPG 3 & 4)

DATE OF REPORT: 104

			TOMORROW'S REQ'D WORKLOAD				TOTAL OPTIONAL WORKLOAD				PREFERRED OPTIONAL WORKLOAD			
			RPD 105				RPD 106		RPD 107		RPD 106		RPD 107	
WAREHOUSE	SECTION	PICKING RATE	NUMBER OF LINES	PIECES	WEIGHT	PERSONNEL REQ'D	NUMBER OF LINES	PERSONNEL REQ'D	NUMBER OF LINES	PERSONNEL REQ'D	NUMBER OF LINES	PERSONNEL REQ'D	NUMBER OF LINES	PERSONNEL REQ'D
403	A	80	340	582	1560	4.3	505	6.3	240	3.0	45	.6	10	.1
403	B	64	120	342	2060	1.9	86	1.3	200	3.1	8	.1	0	.0
403	C	160	210	742	410	1.3	440	2.7	390	2.4	78	.5	35	.2
TOTAL 403		*	670			7.5	1031	10.3	830	8.5	131	1.2	45	.3
404	A	4	7	7	16890	1.8	1	.3	3	.8	0	.0	0	.0
TOTAL 404		*	7			1.8	1	.3	3	.8	0	.0	0	.0
408	A	72	100	280	5620	1.4	140	2.0	125	1.7	6	.1	10	.1
408	B	72	136	194	5040	1.9	180	2.5	153	2.1	6	.1	8	.1
408	C	72	82	130	3890	1.1	270	3.8	171	2.4	18	.3	4	.1
408	D	72	98	112	4600	1.4	140	2.0	115	1.6	0	.0	5	.1
408	E	72	40	48	3200	.6	160	2.2	95	1.4	0	.0	3	.0
408	F	72	165	280	8970	2.3	250	3.5	198	2.8	20	.3	52	.7
408	G	72	270	1130	23320	3.8	350	4.9	300	4.2	45	.6	12	.2
TOTAL 408		*	891			12.5	1490	20.9	1157	16.2	95	1.4	94	1.3
AREA TOTALS		* *	1568			21.8	2522	31.5	1990	25.5	226	2.6	139	1.6

- o Picking Rate: a constant, developed from experience. The average number of MROs which can be picked per man-day of effort in a particular warehouse section.

- o Tomorrow's Required Workload: The number of MROs which each section MUST begin processing, and for which documents will be prepared, on day 105; also shows the estimated number of man-days required to perform this work.

- o Total Optional Workload: the total number of MROs and the required work force for each of the following two days; this is shown because a section manager, whose workload on day 105 is light, may request that some of these documents be released for processing earlier than required.

- o Preferred Optional Workload: that portion of the TOTAL optional work which is for consignees who also have one or more MROs bearing an RPD of 105. Thus, a section manager desiring additional work should select it from this category since he will thereby assist in creating larger shipment units on day 105.

Simultaneously with the preparation of this report, a partially prepunched Workload Selection Card is prepared for each warehouse section. After consultation, in which warehouse management determines the most desirable method of handling the forecast workload, they may indicate on this card what portions of the optional work they can handle the following day. The cards are then returned to shipment planning for processing and document preparation.

This comprehensive planning system is an extremely powerful tool in the hands of a management team, allowing them to do such things as:

- o Smooth-out a peak workload over several days.
- o Assist in improving consolidation by accepting work earlier than scheduled, when they are capable of handling it.
- o Determine, in advance, the most efficient distribution of personnel between work centers where the projected workload will occur.
- o Assign personnel in advance to perform planned custody work, rather than waiting to see how much excess manpower is available.
- o Exercise, to a limited extent, control over the number of documents circulating in the warehouse at any given time. (It appears inappropriate to prepare picking documents immediately upon receipt of an MRO. This not only decreases potential consolidation, but there is a practical limit to the amount of work which a warehouse can handle with fixed resources. Also, storage locations may change between the time a document is prepared and the time material is picked.

3. The Workload Selection Cards are used to extract the required workload and the number of additional line items requested from the pending file. Then, Shipment Units are developed, and SPWSs, 1348-1s, and the following supplementary documents are produced:
   - o For Warehousing - Bin Replenishment Cards, Shipment Unit Control Cards.
   - o For Transportation - Shipment Unit Control Cards, GBL Line Entry Cards.

Considerations

Although warehouse personnel are only indirectly involved in data processing, it plays an extremely important role in the overall success of a depot's warehousing operations. Issue documents prepared by shipment planning are, in effect, instructions which warehousemen use in preparing material for shipment. The more accurate and complete this information is, the better this work will proceed without interruption.

In addition to providing basic issue documents, shipment planning can, through the use of an IBM data processing system, assist the warehouse in several other ways such as:

- Providing a summary of the impending workload to facilitate advance planning, (allocation of work gangs, etc.) as discussed in Shipment Planning.
- Providing a convenient feedback medium for the warehouse to use in informing Shipment Planning of actions taken and exceptions encountered during issue operations.
- Assisting the warehouse in maintaining bin stock levels - especially significant at depots where a great number of items are stored in both bin and bulk quantities.
- Maintaining current storage location data and making it immediately available upon request.

Operation of the locator file is a topic of special importance in any discussion of warehousing because:

- Although it may be handled by a separate clerical group, the file is a central reservoir of information maintained for the use of personnel distributed throughout the warehouse area.
- Warehousemen require access to location data to perform almost every type of operation--receiving, issue, and custody work.
- Poor reliability and slow response from the file have a very detrimental affect on warehouse operations.
- Changes to locator file data are continuously being generated by warehouse personnel, but there are often considerable delays in communicating and recording this information.

Thus, since the Warehousing Division is completely involved in using and maintaining the locator file, a need exists for a system which effectively overcomes the inherent deficiencies of manual filing and retrieval systems.

System Highlights

In addition to a method for producing required issue documentation, the following documents and procedures have been incorporated into the ADP procedure to assist Warehousing management:

1. Bin Replenishment Card - shows the bulk and bin locations and the quantity of an item which must be transferred from bulk storage to replenish bin stock. The quantity (units of issue) to be transferred is such that:

   - o The day's scheduled bin picking may proceed without interruptions caused by depleted inventory.

   - o The bin will be at approximately full capacity at the conclusion of the work day.

To establish such a system, the approximate bin capacity (units of issue) and starting bin inventory must be known for each item. Then, as released MROs are processed against the Master Item Record File in Shipment Planning, (prior to issuance of picking documents), bin demand is accumulated. When this accumulated demand fully depletes bin inventory, a replenishment card is punched with a quantity equal to total bin capacity plus demand, less the starting inventory. After the transfer of material from bulk to bin has taken place, these cards may be accumulated to produce periodic bin activity reports to assist management in revising location assignments to facilitate more efficient picking.

2. Shipment Planning Worksheet: Some of the salient features of the sample SPWS shown in figure 7 are:

   - o In addition to document number and FSN, the TCN, serial line item number, picking warehouse number and assembly warehouse number are shown for each MRO in the shipment unit. Since all this data is duplicated on 1348-1s, easy communications between picking and assembly personnel is facilitated.

   - o All items coming from bin storage are designated by asterisks for the convenience of assembly. Line items 4 and 5 represent a "split" MRO coming partially from bin and partially from bulk storage.

   - o Freight class rating codes are displayed and sequenced to assist in overpacking decisions.

   - o The form serves as a uniform medium for Packing to record package numbers and actual shipment unit characteristics for transportation.

   - o It is a comprehensive document which displays all routine instructions required for Assembly and Packing operations.

3. Shipment Unit Control Cards - when issue documents are released to the warehouse, Shipment Planning maintains a Status Record in storage describing each shipment unit and the MROs of which it is composed. As the unit proceeds from warehousing to Transportation and is finally shipped, this progress is monitored by Shipment Planning. To facilitate the monitoring process, a Shipment Unit Control Card is forwarded to the warehouse with each SPWS. When the shipment unit has been physically readied for shipment, the warehouse inserts the actual RBD on their card and returns or transmits it to Shipment Planning where it is used to update the Status File. (A similar procedure is recommended for Transportation, using another Shipment Unit Control Card.) Changes may be made in the preplanned shipment unit. For example, a partial shipment of a line item may occur, or, if one line item will delay an entire shipment it may have to be withdrawn from the shipment unit and shipped independently. For each such change, a separate card is punched indicating: TCN, line items serial number, type of change and revised quantity (if applicable). These are forwarded with the SUCC to Shipment Planning.

Figure 7 Sample Shipment Planning Work Sheet

FROM:

TO: TRANSPORTATION OFFICER
USA ARMOR & ARTY FIRING CTR
FT STEWART GEORGIA

RDD: 3123
TCN: A3304330930001

SHIPMENT PLANNING WORK SHEET

COMM. MGR.	IPG	IPD	READY BY DATE	REQ'D SHIPPING DATE	PROJ.	TRANS. ACCT.	ROUTING:
M	4	20	106	3108	AMA		

ASSEMBLY W/H	DTE TO TPN	DTE SHP'D	ETA	DDD	POE
506	106	108	6	114	

BILL OF LADING NUMBER	CARRIER CODE	POD
G 114673	360	

LTL TARIFF	RATE BASIS	MIN. CHARGE	CLASS "100" RATE	FAK TARIFF MIN. WT.	FAK TARIFF RATE	SPECIAL INSTRUCTIONS MARKING	SPECIAL INSTRUCTIONS PACKING	FUND CHARGED
N 1420	110	2.40	3.00	6M	2.00			A7

W/H NO.	L/I NO.	DOCUMENT NUMBER S	REQN'R	DATE	SERIAL	STOCK NUMBER FSC	FIIN	ADD'L	ITEM DESCRIPTION	QTY.	U/I	LESS LOAD FREIGHT CLASSIFICATION DATA UFC	NMFC	RATING	EX	RATE	COST	COMMODITY	AIR DIM.	LNGTH	WDTH	HGHT	LINE ITEM TOTALS WEIGHT	CUBE	TOTAL PACKAGES	TYPE PKG.	PACKAGE NUMBER(S)
506	*001	A	3304330930002			65052998599			T9ISULF	12	BT	033800	060000	070		2.10	.53	534	A				25	1	—	—	1
505	002	A	3304330930003			65055317757			CHLORPH	8	BT	033800	060000	070		2.10	3.38 ~~3.19~~	533	A				161 ~~152~~	6	4	CT	6-9
505	003	A	3304330940004			65051607400			PROCAINE	1200	BT	033800	060000	070		2.10	2.51	534	A				120	8	3	CT	10-12
506	*004	A	3304330940007			65252988088			FIXER P	5	PG	033800	060000	070		2.10	2.10	534	A				100	4	1	BX	1
505	005	A	3304330940007			65252988088			FIXER P	~~48~~ 24	PG	033800	060000	070		2.10	10.21 ~~20.15~~	534	A				~~960~~ 486	~~34~~ 17	4	BX	13-16
506	*006	A	3304330950003			65056855167			VITAMINS	21	PG	033800	060000	070		2.10	.23	544	A				11	1	—	—	1
506	007	A	3304330950026			65202999676			IMPRESS	12	CN	033800	060000	070		2.10	20.48 ~~20.15~~	534	A				~~960~~ 975	72	1	CT	17
506	008	A	3304330940002			65102002185			BAND COMP	72	PG	032330	056480	085		2.55	3.11	534	A				122	7	3	CT	18-20
506	*009	A	3304330930001			65307841250			COVER L	48	EA	028160	049390	100		3.00	3.90	534	A				130	5	4	CT	2-5
505	010	A	3304330950006			65158172276			NEEDLE	12	BX	070100	139640	100		3.00	21.15 ~~21.60~~	534	A				~~720~~ 705	5	1	CT	21
																	(67.60)						2835	126			

* BIN ITEMS

PAGE 1 OF 1 PAGES	REMARKS:	FAK COST (EST.)	CLASS RATE COST (EST.)	COMMODITY	A/D	MODE	TYPE PK	TOTAL WEIGHT	TOTAL CUBE	TOTAL PACKAGES
		120.00	~~77.47~~	534	A	B	CT	~~3300~~	~~143~~	21

4. Locator System: Through remote terminals located at key points in the warehouse area, warehouse personnel are provided with direct access to storage location records. The principal advantages of this system for issue and custody work are:

   - o Immediate response to inquiries.
   - o File maintenance is performed as changes occur; the speed of this operation insures the availability of current location data.
   - o Files are updated by a single transcription of data through a remote keyboard.
   - o Transcription accuracy is assured through printback of change data at the recording terminal.

The randomly accessible locator records may be used in other ways, such as in assisting management to more productively utilize available warehouse space. Periodic printouts showing each item and its storage locations will indicate those items which are unnecessarily occupying multiple storage locations. This listing may be used as a guide to plan rewarehousing.

TRANSPORTATION

Considerations

The depot Transportation Department begins planning for movement of material at the time shipment planning documents are released to the warehouse, and its actions are not culminated until the shipment leaves the depot. In the interim, Transportation must:

- o Know shipment unit characteristics to obtain release and clearance, when required, and to plan the best possible movement of material from the depot.
- o Compute estimated transportation charges for each shipment unit.
- o Arrange for carrier pick-up of each shipment unit.
- o Prepare shipment movement documents.
- o Provide shipment planning with positive proof of shipment to update status records and inform the ICP of the shipment date of each MRO.

System Highlights

1. Shipment Planning Worksheet: The sample SPWS in figure 7 comprehensively displays data which is required by the Transportation Division:
   - o All shipment unit characteristics necessary for obtaining release or clearance are shown. These actions may be completed while the material is being prepared in the warehouse.
   - o Basic LTL and FAK tariff information have been extracted from the consignee master record; the minimum shipping charge is also shown.
   - o LTL shipping costs have been computed for each line item based on the estimated weight prior to packing. These may require adjustment when actual shipping weights become known.
   - o Using data shown on the advance copy of the SPWS, mode of shipment may be tentatively assigned; the rate clerk can also determine whether standard class rates will be used or whether more favorable options can be applied (e.g., FAK or commodity rates).
   - o Handwritten entries on the far right side of the form (entered subsequent to packing) show packaging data and actual weight and cube for each line item. Based on this data, actual LTL shipping charges may be readily computed without additional research.
   - o The form is a convenient medium for recording final shipment data such as GBL number, carrier code, data of shipment, etc.

By displaying rate data we are not attempting to provide a total solution to the rating problem. Rating, as it presently exists, is far too difficult a task to develop a generalized solution encompassing all tariff provisions and commodity rate options. However, since the majority of shipments are made by truck at standard LTL class rates, rate clerks need only look for possible exceptions. Providing them with LTL data drastically reduces the amount of manual research which they would otherwise have to perform.

2. GBL Line Entry Cards: These partially pre-punched cards are received from Shipment Planning along with each advance SPWS. One card is received for each probable GBL entry. (When class rates are used, all FSC items having the same NMFC or UFC and class rating-code appear as a single entry on the GBL). As an example, four cards would be punched for the shipment unit described in figure 7: one card covering the first seven line items, and separate cards for each of the last three items. When the annotated SPWS is received from the warehouse:

   - The transport mode is determined and rates are computed if different from those shown on the SPWS.
   - Mode of shipment, total pieces, weight and cube are punched into the GBL line entry card.
   - These cards are then used, along with other types of master cards, to prepare the GBL; simultaneously, required MILSTAMP documents (TCMD and In-transit Data Card) are produced and historical tape records are generated.

3. Shipment Unit Control Cards: One of these cards is received with each SPWS from shipment planning. When material is ready for shipment, the Transportation Division punches variable data into the card and uses it:

   - In preparing the GBL.
   - As a feedback document for Shipment Planning. It serves as positive notification that shipment has occurred.

ANALYSIS AND CONTROL

Considerations

In addition to its uses related to the physical movement of stock, a depot data processing system must be capable of performing the following functions:

- Monitor the progress of each MRO being processed by the depot to assure timely performance of issue functions.
- Respond to MILSTRIP and MILSTAMP reporting requirements including dispatch to the ICP of an MRC or MRD for each MRO.
- Maintain historical activity records for response to MILSTRIP and MILSTAMP tracing actions and for evaluation of the performance of each depot organization and each transportation company.

System Highlights

In the system described here, four files are used for monitoring and control:

1. Unshipped MROs - a record is created in this file for each MRO immediately upon receipt. When the MRO is released to the warehouse its record is "tagged" to indicate that processing has begun. The record remains in the file until either shipment is made or, in the case of a stock-out condition, until an MRD is sent to the ICP. The file is a source of information for responding to MILSTRIP status inquiries prior to shipment.

2. In Process In Warehouse - as each MRO is released to the warehouse by Shipment Planning, its corresponding record is added to this file. These records, sequenced by serial line item number (shown on SPWS) and TCN, remain in the file until a Shipment Unit Control Card and associated Line Item Change Cards, if any, are received from the warehouse. At that time: (a) records for which Line Items Change Cards have been submitted are altered; an MRD is punched for any item on which the quantity being shipped is less than the quantity ordered; (b) all MRO records matching the TCN in the SUCC are transferred into the In Process In Transportation File, unless a Line Item Change Card indicates that an item has been deleted from the preplanned shipment unit; (c) a daily exception report is prepared displaying those shipment units which have not been reported as completed by their RBD.

3. In Process in Transportation - contains a record for each MRO which is physically ready for shipment and for which movement documents are being prepared. When a shipment is made, the corresponding SUCC is forwarded by the Transportation Department to Shipment Planning and: (a) "split" MRO records (items picked from both bin and bulk storage) are combined into a single record on the basis of their common Requisition Number; (b) an MRC is punched for each MRO; (c) each MRO record is transferred to a Shipped File, and the matching record originally recorded in the Unshipped MROs File is deleted; (d) a daily exception report is produced indicating those shipment units which have not been shipped by their required shipping data.

4. Shipped File: contains an abbreviated record for each MRO shipped from the depot. This file may be used for a wide variety of analyses and is also the source of information for responding to MILSTAMP status inquiries.

This overall system is a powerful management tool providing data to exercise positive control over each MRO. The system insures that each MRO received is actually processed and, through the medium of timely "late" reports, permits expediting action to PREVENT delayed shipment. Data required for depot performance analyses is generated as a by-product of the monitoring system.

Another type of analysis is concerned with Intransit Data Cards. When received from consignees, these cards are processed against the Bill of Lading Statistical File, TCN being the common field, to prepare Transit Time analyses by carrier name and destination.

FLOW CHARTS

To show how automatic data processing equipment can be used to meet DoD storage depot data processing requirements, flow charts incorporating major procedural steps have been prepared. These do not necessarily represent the only possible systems design to meet the requirements. However, these charted procedures are based upon intensive studies of DoD procedures and regulations and upon numerous discussions with personnel responsible for depot material handling operations. Naturally, the sequence and arrangement of processing steps are dictated by local depot requirements.

The system design covers ten data processing applications:

- Receipt Planning - MILSTAMP Shipments Units.
- Depot Receiving - Line Items.
- Order Receipt, Scheduling and Receiving - Routine MROs.
- Shipment Planning Documentation - Routine MROs.
- Warehousing Operations - All MROs.
- Transportation Operations - All MROs.
- Analysis and Control - Routine MROs.
- Analysis and Control - All MROs.
- High Priority Processing.
- High Priority Analysis and Control.

Each application is described textually in numbered steps and illustrated by a standard systems design flow chart keyed to the text. Manual operations are included where necessary to show the full sequence of data flow.

Additional references, keyed in the flow charts thus ❷ are included in the Appendix starting on page 64. These refer to the detail of input/output documents and record contents which are pertinent to the step represented by the flow chart symbol. This detail is arranged in the Appendix in the same order in which it first appears in the text and flow charts.

Receipt Planning - MILSTAMP Shipment Units

(1) DoD Regulations state that effective 1 October 1964 shipments sent to a depot must be preceded by a TCMD for each shipment unit (S/U).

(2) The TCMDs will be held for daily processing. (Almost all shipments being sent to the depot are routine priority).

(3) The day due at the depot is computed from the shipping date and ETA on the TCMD, and is included on the New S/Us Due file.

(4) The New S/Us Due file is sorted into TCN within priority group sequence.

(5) The TCMD cards are forwarded to the depot receiving area and are put in a S/Us Due Card file in TCN within priority group sequence.

(6) When the material is received the TCN is determined, and the TCMD is pulled from the S/U Due Card file to signify receipt of the S/U at the depot.

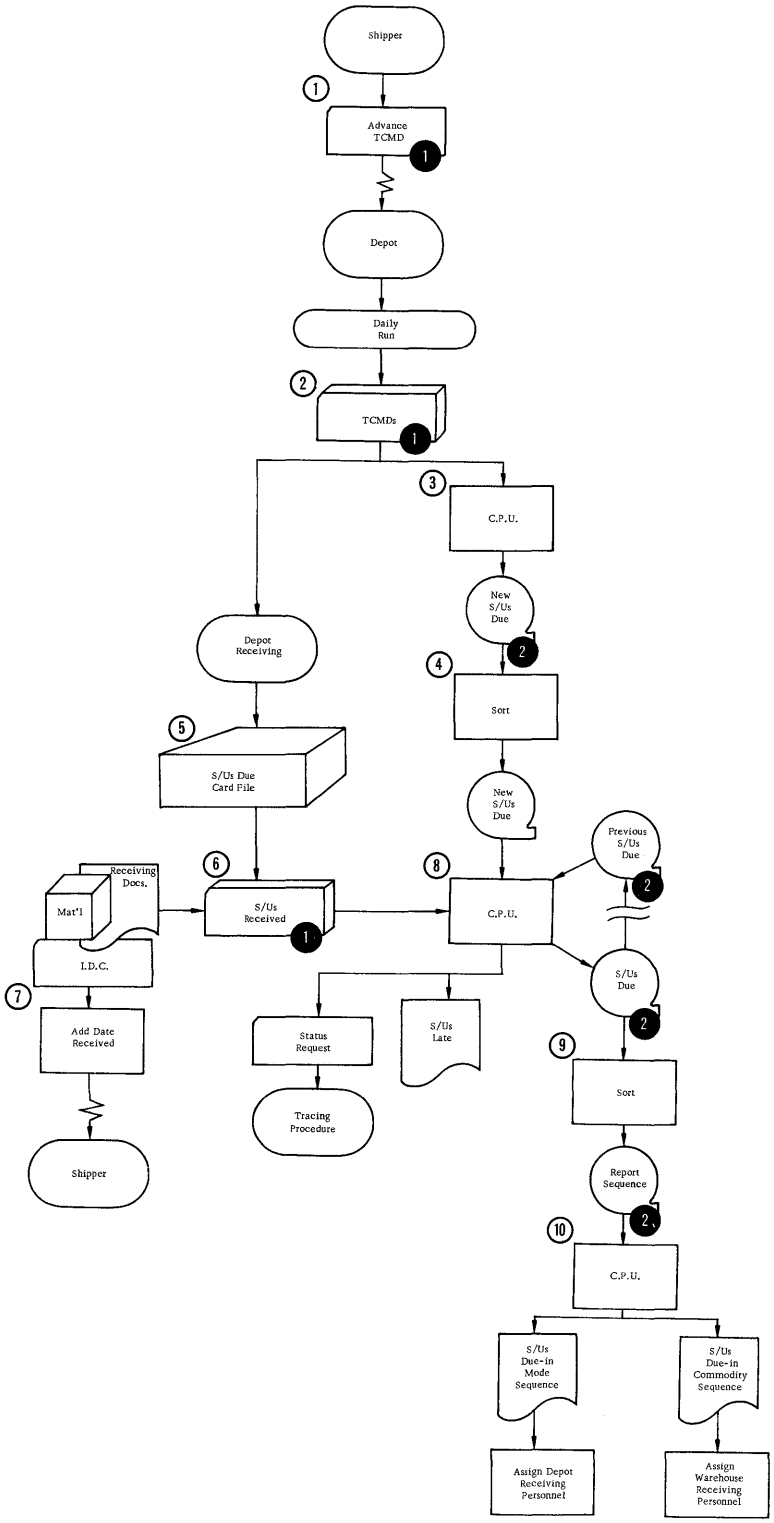
(7) If a MILSTAMP Instransit Data Card (IDC) accompanied the shipment, the date offered for delivery is punched into the IDC, and it is transmitted to the shipper of the material who will use it for various analyses and studies.

(8) The S/Us Received cards, the New S/Us Due file and the Previous S/Us Due file, all in TCN within IPG sequence, are used to create an updated S/Us Due file. If the S/U is overdue, a Status Request card and a listing of late S/Us are prepared.

(9) The S/Us File is sorted into whatever sequences are required for receipt planning. Two examples are: (a) TCN, within day due, within commodity, within transportation mode, and (b) TCN within day due within mode within commodity code.

(10) A report of S/Us due by mode is helpful to the depot receiving manager in the assignment of his material handling personnel according to the pending workload for each mode. A report of S/Us due by commodity code aids each warehouse manager in planning his assignment of personnel to each warehouse to receive and store the S/Us due.

Receipt Planning - MILSTAMP Shipment Units



Depot Receiving - Line Items

(1) The procurement agency or other DoD shipping activity that initiates a shipment of material (new, returned or transferred) is required to send to the depot an advance notice that identifies each line item in the shipment.

(2) A Receipt Due-in Card is key punched and verified for each line item being shipped to the depot.

(3) The Receipt Due-in Cards are checked against the Master Item and Locator Records to assure that a record exists for each item due. If no Master Item Record exists for the FSN or manufacturer's stock number, an exception listing is produced.

(4) The Receipt Due-in Cards are sorted into document number sequence and filed at the depot receiving area awaiting the material.

(5) Invalid FSNs are researched to determine correct coding and the corrections are made to the Receipts-Due File.

(6) If a valid FSN (e.g. a new item), is on the exception listing, the data necessary to establish a Master Item and Locator Record is gathered and added to the Master Item File prior to the receipt of the material.

(7) Upon receipt of the material and receiving documents, each item is identified and the quantity received is determined.

(8) If the items in the shipment were in the Receipts-Due File, the quantity received and date of receipt are punched into the Receipts Due Card.

(9) If the item did not have a card in the Receipts-Due File an investigation is made to determine the source of the receipt and the necessary material receipt data.

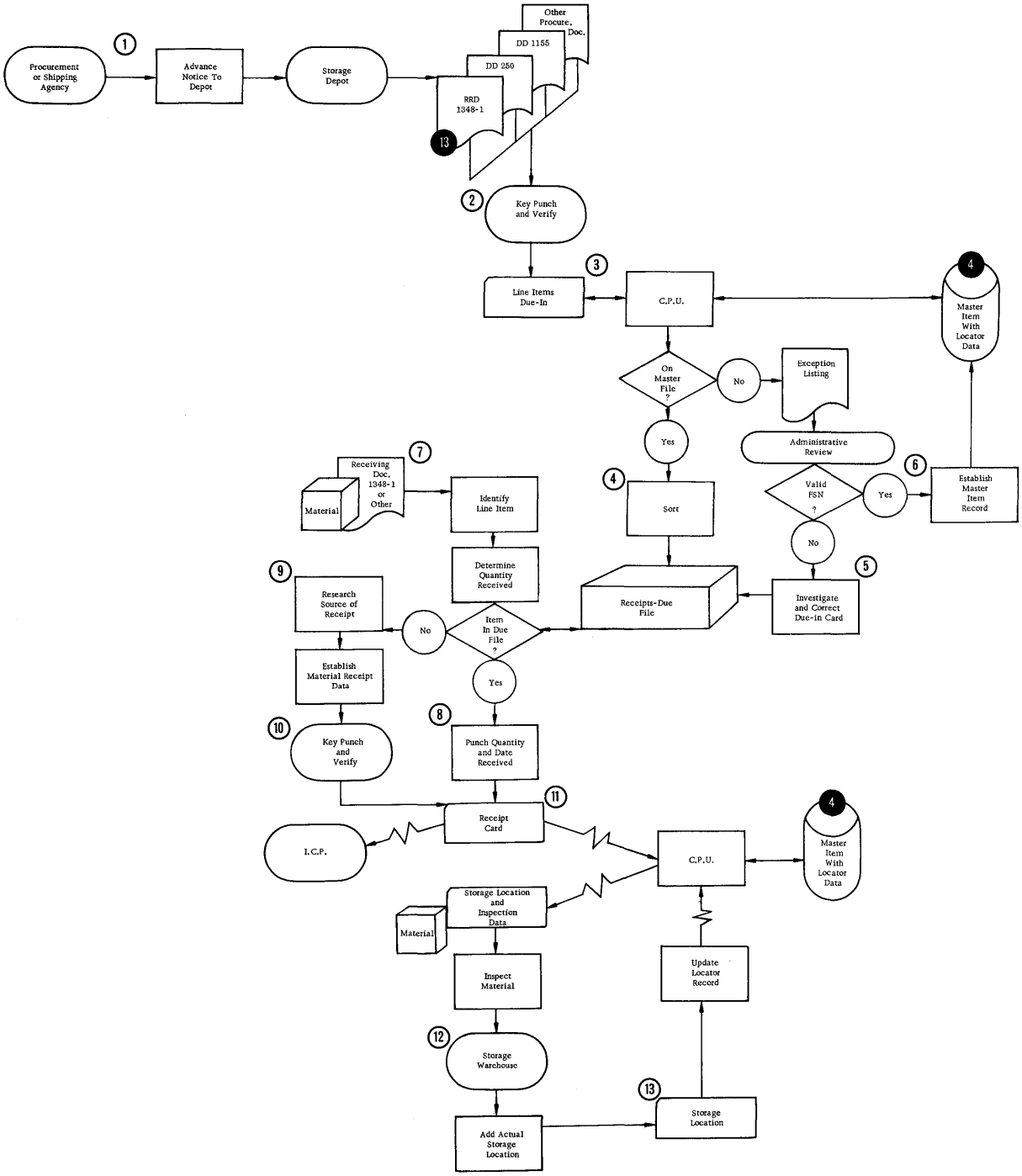
(10) The data is key punched and verified into Material Receipt Card format.

(11) The Material Receipt Card is placed in a terminal at the receiving area and the Master Item and Locator Record is assessed to obtain current location data and inspection requirements. These are punched, at the terminal, into a card which accompanies the material to the detailed inspection operations and to storage. The Material Receipt Card is transmitted to the ICP having control over the item.

(12) When the material is placed into storage, the warehouseman notes the actual storage location on the Storage Card.

(13) The Storage Card is entered into a terminal at the warehouse and the actual location is keyed in to update the Master Item and Locator Record and to serve as a proof of storage of the received item.

Depot Receiving - Line Items



Order Receipt, Scheduling and Releasing - Routine MROs

(1) MROs are received at the depot by mail, phone, teletype or transceiver in either manual or punched card format. Manual MROs are converted to punched card (1348m) for internal depot processing.

(2) High priority MROs (IPG 1 or 2) are separated for periodic processing during the day (e.g. every 2-3 hours).

(3) Routine MROs (IPG 3 or 4) are held for processing during a daily run. During the daily run, the date received (normally today's date) is entered into the system and the MRO is scheduled through the depot; the date received and the IPG of the MRO determine the required shipping date (RSD) and, knowing the RSD, the required processing date (RPD) and ready-by-date (RBD) can be calculated. The quantity to be picked from bulk and/or bin storage is calculated from the ordered quantity and data on the Master Item record; the warehouse section in which the picking is to be accomplished is also included in the Pending Workload record. If one MRO requires picking from both bulk and bin storage, two records are created for the pending file. The MRO is edited for validity and completeness and a check is made to insure that the item ordered has a storage location assigned in the Master Item file. MROs with additional remarks (E or 5 in col.3), while included in the Pending MRO file, are also forwarded to the document distribution section so that the additional remarks will be available to Warehousing and/or Transportation, as appropriate. Invalid, incomplete or rejected MROs, along with a machine listing showing the reason for their refusal, are forwarded to an administrative review section for action and follow-up.

(4) The new pending MROs are sorted into required processing date within consignee sequence and then merged with the pending workload from previous days.

(5) Tomorrow's date (the next work day) is entered into the machine. All Pending MROs are used to accumulate workloads on the disk, by warehouse section, for the Workload Planning Report. MROs which have tomorrow's required processing date must be released today because they are tomorrow's required work for the warehouse; MROs with RPDs other than tomorrow's, are tomorrow's optional work for the warehouse. If the warehouse management elects to accept some of the optional work, it is desirable, from a transportation standpoint, that the optional work be taken from those consignees who are already included in tomorrow's required work. This data is accumulated on the disk. After all MROs have been used to update the disk, a Workload Planning Report, with Workload cards for each warehouse section is produced. The Workload Selection Cards and Planning Document show for each warehouse section: required workload, total optional workload by day, and the desired portion of each day's optional workload.

(6) Warehouse management selects optional work by indicating on the report the number of additional line items desired for each warehouse section. This information is written on the selection cards and then punched into these cards. Warehousing management then assigns available personnel to each warehouse section according to the manpower needs indicated on the report.

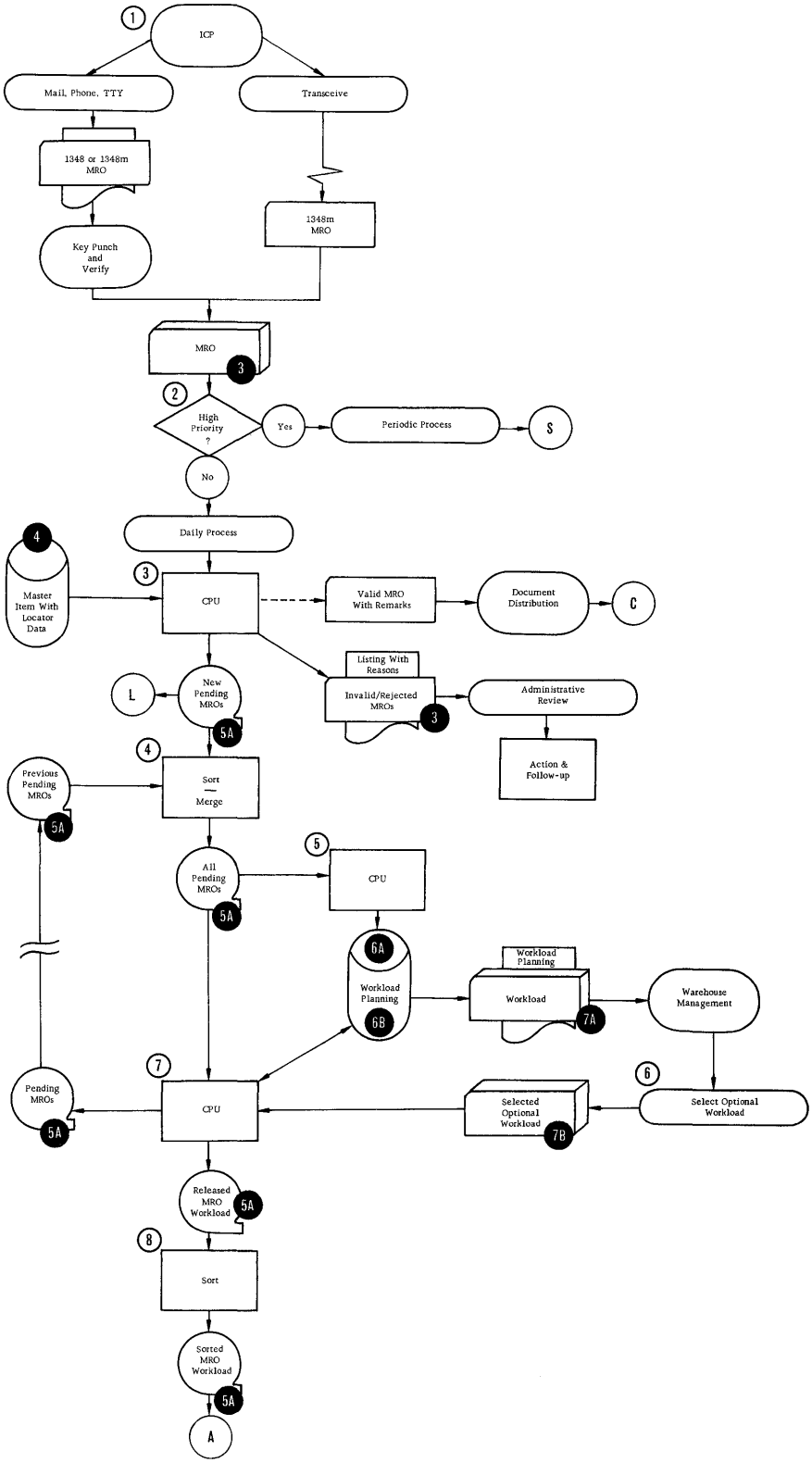
(7) The Selected Workload cards are used to reflect on the disk selected optional work in terms of line items. After the disk has been updated, all Pending MROs are processed through the machine and the following is accomplished:

a. MROs with tomorrow's RPD are written on the Released Workload file.

b. MROs with other RPDs are checked against the warehouse section disk record; if the RPD has a need for additional line items, "one" is subtracted from this figure and the MRO is released; if additional line items are not required, the MRO is written on the new Pending MRO file. NOTE: MROs that have been split into two pending records, one for bulk picking and one for bin picking are never released as optional work; both portions are always released on their RPD to insure that they are shipped together.

(8) The released workload is sorted into FSN sequence for further processing.

Order Receipt, Scheduling and Releasing - Routine MROs



Shipment Planning Documentation - Routine MROs

(1) The released MROs, in FSN sequence, are processed against the Master Item file and the following operations are performed:

a) Current location data is retrieved, b) master storage and transportation data is extracted and c) need for bin replenishment to satisfy the next workday's bin picking quantities while maintaining maximum bin stock levels is determined. If no location now exists for an item, the MRO is rejected and a machine listing and punched MROs are produced. Bin Replenishment cards are punched and sent to the bulk storage warehouse for picking and transfer to the bin storage area. Bin replenishment operations precede order selection so that adequate bin stock will be on hand, thus reducing picking delays which might be caused by bin stock-outs.

(2) The released workload with the master storage and transportation data is sorted for consolidation into shipment units (S/U). The criteria for consolidation as required by Milstamp consist of (major to minor): transportation priority group, project code, compatibility and consignee. Other criteria such as depot area, commodity manager, NMFC and less-load class rating are included in this sort, if desired by the depot.

(3) A Shipment Unit Summary File is developed, and the TCN for the S/U is assigned by taking the requisition number of the line item requiring the earliest delivery date. (If an internal order number is given to each S/U to simplify intra-depot communications it is also assigned at this time.) Estimated totals of pieces, weight and cube are accumulated.

(4) The released MROs in S/U sequence, the S/U summaries and the Consignee Master File are used to:

a. Determine if the S/U can be shipped parcel post.

b. Print Shipment Planning Work Sheets (SPWS) for each freight S/U for use by assembling, packing and transportation.

c. Punch S/U Control Cards for Warehousing and Transportation on freight S/Us. (The S/U Control Card will later be used to reflect the transfer of the S/U from Warehousing to Transportation and from Transportation to the Shipped File.)

d. Punch B/L Line Entry Cards for use by Transportation in automatically preparing B/L Continuation Sheets for freight S/Us.

e. Create a file of line item data for each freight S/U MRO.

f. Create a file of line item data for each Parcel Post S/U MRO.

Both the Freight and Parcel Post line item data files also contain consignee and transshipment address codes which will be used to obtain in-the-clear addresses from the Shipping Address Master files; the in-the-clear addresses will appear on the label stencils. Each line item in every S/U (both freight and parcel post) will be assigned a sequential line item number within its TCN for internal control.

(5) The Freight S/U MRO file and the Shipping Address Master file are used to produce label stencils for each S/U.

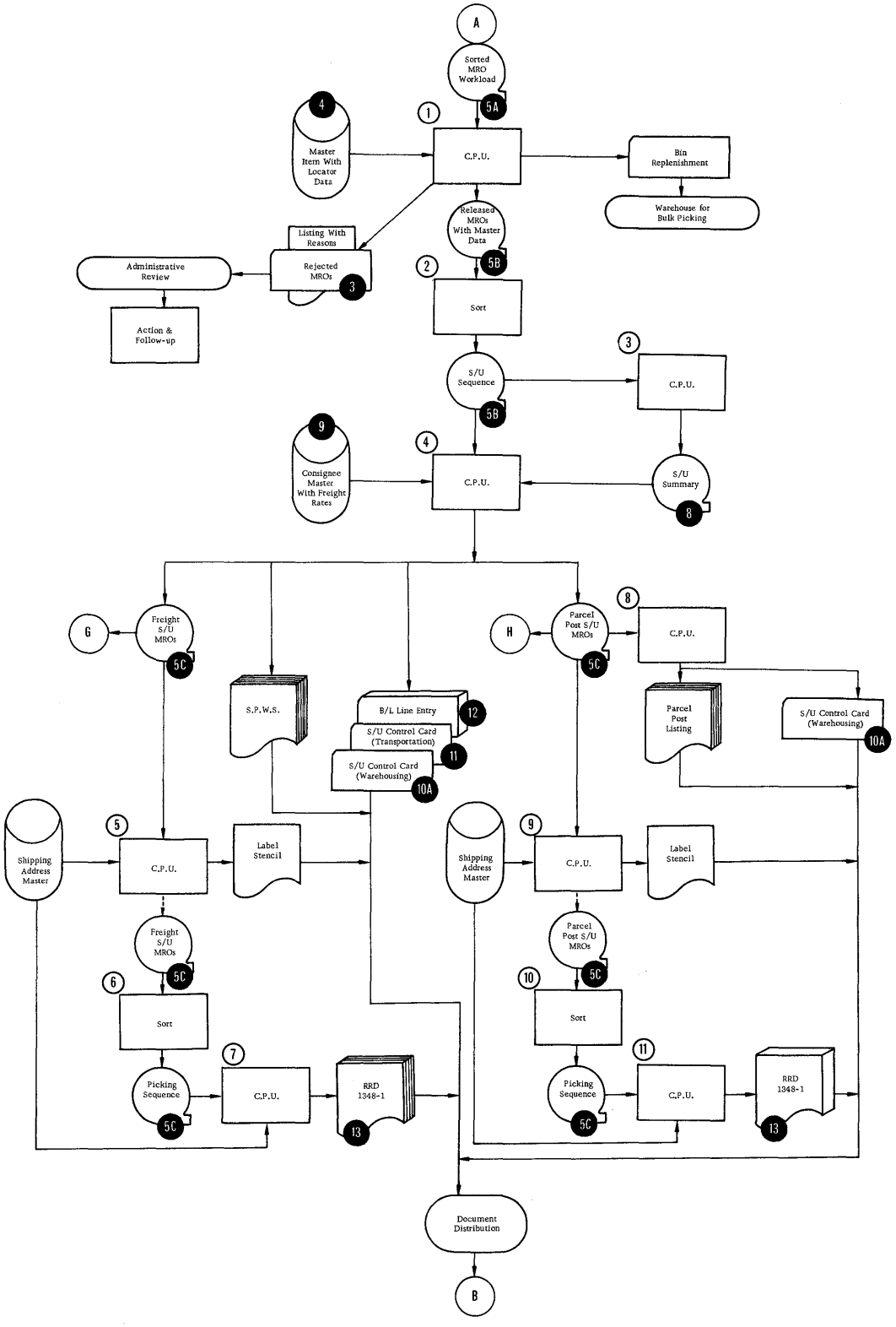
(6) The Freight S/U MRO file is sorted into warehouse picking sequence prior to preparing the picking documents; a typical picking sequence is: slot, within TCN, within section, within warehouse.

(7) Freight S/U MROs in picking sequence are used to prepare the picking document, the Release Receipt Document (RRD) 1348-1.

(8) The Parcel Post S/U MROs are used to produce a parcel post listing, grouping MROs being shipped under one TCN for use by assembly and packing, and a S/U Control Card for Warehousing on each parcel post S/U.

(9), (10), (11) For parcel post S/Us, these steps are identical to steps (5), (6) and (7) for freight S/Us.

Shipment Planning Documentation - Routine MROs



Warehousing Operations - All MROs

(1) All picking, assembly, packing, labeling, transportation and control documents are sent to a document distribution section for dissemination to the appropriate Warehouse or Transportation operational group. If one of the released RRD s has an E or 5 in column 3, the original MRO, which contains the additional remarks is retrieved and forwarded to the operational group that requires this information.

(2) On freight S/Us, an advance copy of a SPWS, a S/U control card and B/L Line Entry cards are forwarded to a transportation preplanning group for initial transportation action.

(3) Each warehouse section receives their picking documents, RRD 1348-1, in picking sequence but with freight and parcel post line items grouped separately. Warehouse picking uses the RRDs to go to the location and obtain the material; if the material is available at the indicated location in sufficient quantity, the material and the RRD are forwarded to the assembly area.

(4) If the location does not contain the item or if only part of the required quantity is stored at the location, the warehouseman must communicate with the Master Item record from a remote terminal in order to "kill" (remove) the depleted location and to receive a new location from which to fill the order. The warehouseman keys in at least the following: FSN, warehouse location, and type of action code. The response at the remote warehouse terminal prints out additional locations that the master item record has stored and the warehouseman would look for the item at the indicated locations.

(5) If the Master Item record does not contain any additional locations, a visual search for the material is initiated. If the material is found, the Master Item record is updated to include the new location, and the material and RRD are forwarded to the assembly area. If enough stock cannot be found, the RRD is annotated to show the quantity being shipped and Shipment Planning, Assembly, Packing and Transportation are notified of the refusal.

(6) If all or part of the quantity ordered is available for shipment, the material and RRD are forwarded to the assembly area.

(7) While the picking operations are being performed, Assembly and Packing can plan for the workload coming to them from the advance copies of the SPWS and the parcel post listings. Manpower requirements can be determined, personnel can be assigned, floor space can be assigned for the S/Us in the assembly area, labels can be prepared from the label stencil and boxes or crates can be made prior to the receipt of the material.

(8) All line items are received from the picking operations until the S/U is complete.

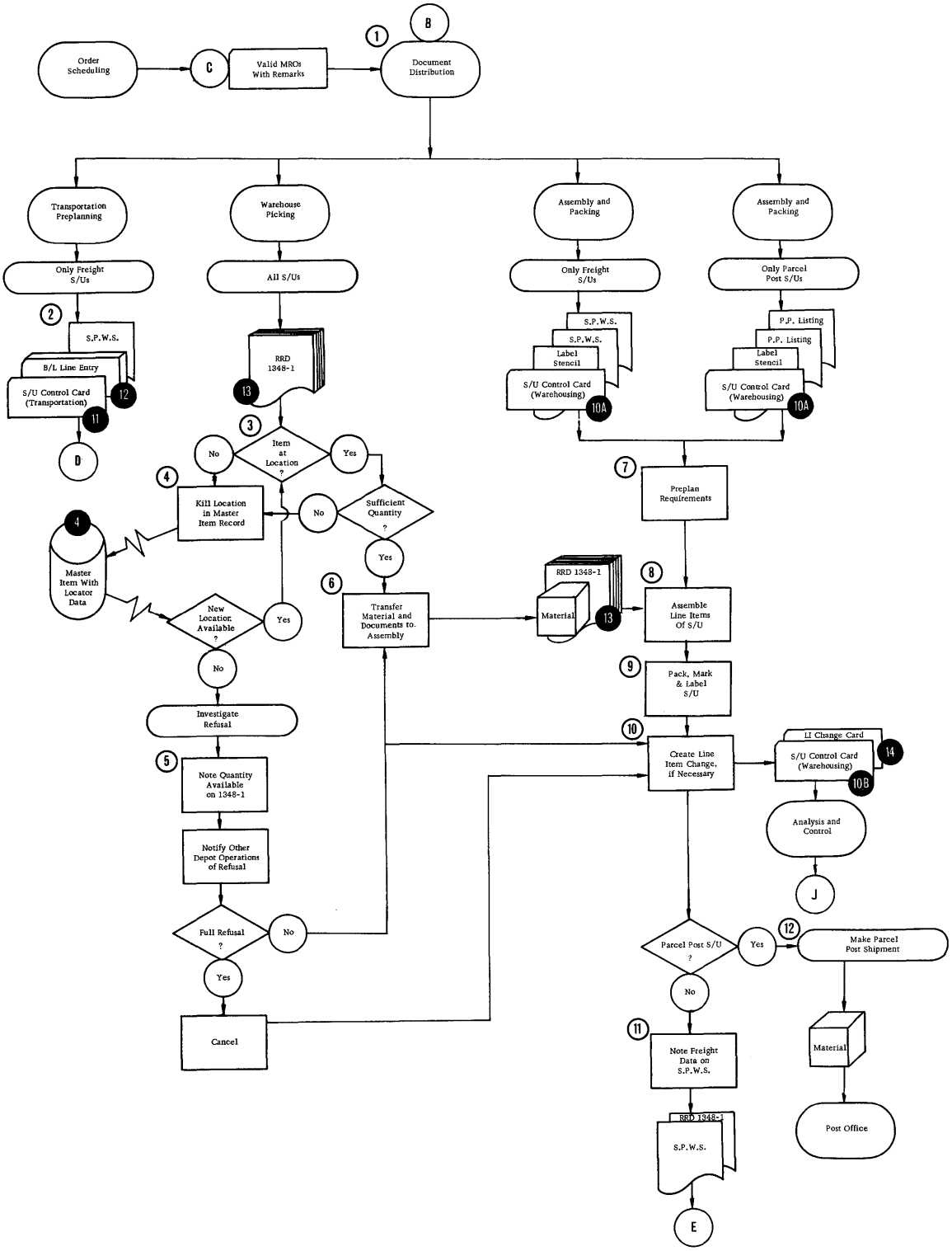
(9) When all material in the S/U has been assembled, it is packed, labeled, marked, weighted and measured. Three copies of the RRD are affixed in an envelope to the outside of the number one carton of the shipment.

(10) If the S/U contains one or more line items that have been changed during warehousing operations, (e.g. full or partial warehouse refusal) the total number of changes is put on the S/U Control card and a line item change card is created for each change.

(11) For freight S/Us packing personnel note actual pieces, weight and cube for each line item on the SPWS as well as noting any exceptions to the planned data on the SPWS. The annotated SPWS and a copy of the RRD are sent to the Transportation Department so that movement documents can be properly prepared.

(12) Parcel Post S/Us are shipped directly from the warehouse since no additional documentation is required.

Warehousing Operations - All MROs



Transportation Operations - All MROs

(1) The Transportation Department receives from Shipment Planning an advance copy of the SPWS from which transportation actions are initiated. The S/U is tentatively routed by assigning the mode(s) of transportation to be used and determining which military terminals, transshipment or break bulk points are to be used. (These actions are being performed in Transportation concurrent with warehouse picking operations.)

(2) Release units (RU) are offered to a Movement Control Authority (MCA) who determines actual routings and gets clearance from a Terminal Clearance Authority (TCA) if the RU is routed through a military air or water terminal. The routing instructions are sent to the depot from the MCA.

(3) Less-than-Release Unit (LRU) shipments that are to pass through a military air or water terminal are offered to the TCA directly from the depot. The TCA will either accept the S/U as offered or refuse it by sending a challenge to the depot while also suggesting alternate routing.

(4) The planned routing is noted on the SPWS which is filed with the S/U Control Card and B/L Line Entry Cards in TCN, within RBD, within POE, within priority group sequence. If the routing is to a terminal POE other than the one indicated on the SPWS by Shipment Planning, the assembly warehouse for the S/U must be notified so that the correct labels and markings can be applied to S/U containers.

(5) When the warehouse has completed its operations and the material is ready for shipment, copies of the SPWS for the S/U, and 1348-1 for each line item in the S/U, are forwarded to Transportation. The advance documents are pulled from the Preplanned Pending File. Although line items were consolidated into S/Us during Shipment Planning operations, it is possible that Transportation can group S/Us into Transportation Units (T/U) and make one GBL for movement from the depot in the same vehicle. This is desirable, not only because of the resulting decrease in the number of shipping documents, but also because lower freight rates (cost per hundred pounds shipped) are usually charged for larger shipments. If further consolidation is possible, the documents are returned to the Shipments Pending file until the maximum number of S/Us practical, are consolidated.

(6) When maximum consolidation is achieved and mode determination is finalized, the estimated freight charges are calculated using data contained on the SPWS and the appropriate Freight Tariff. The appropriation or fund that is to be charged for the cost of transportation on the GBL is noted on the SPWS along with the Transportation Account Code (TAC) that will be charged for movement of material through facilities of military controlled transportation systems which require reimbursement for their services. A GBL number is assigned and the desired carrier is notified to insure that he will be able to accept the shipment.

(7) The S/U Control Card and B/L Line Entry Cards are edited for correctness. B/L Summary Card entries are posted to the SPWS. When required, additional remarks to indicate excess dimensions, ammunition lot number, special handling, etc. are noted on the SPWS.

(8) Cards are key punched and verified to portray the required data indicated on the SPWS.

(9) The cards and a Freight Description File, maintained in random access storage, are inputs to a machine run that produces the necessary transportation and control documents:

a. GBL continuation sheets (the cover sheets are typed from data on the SPWS).

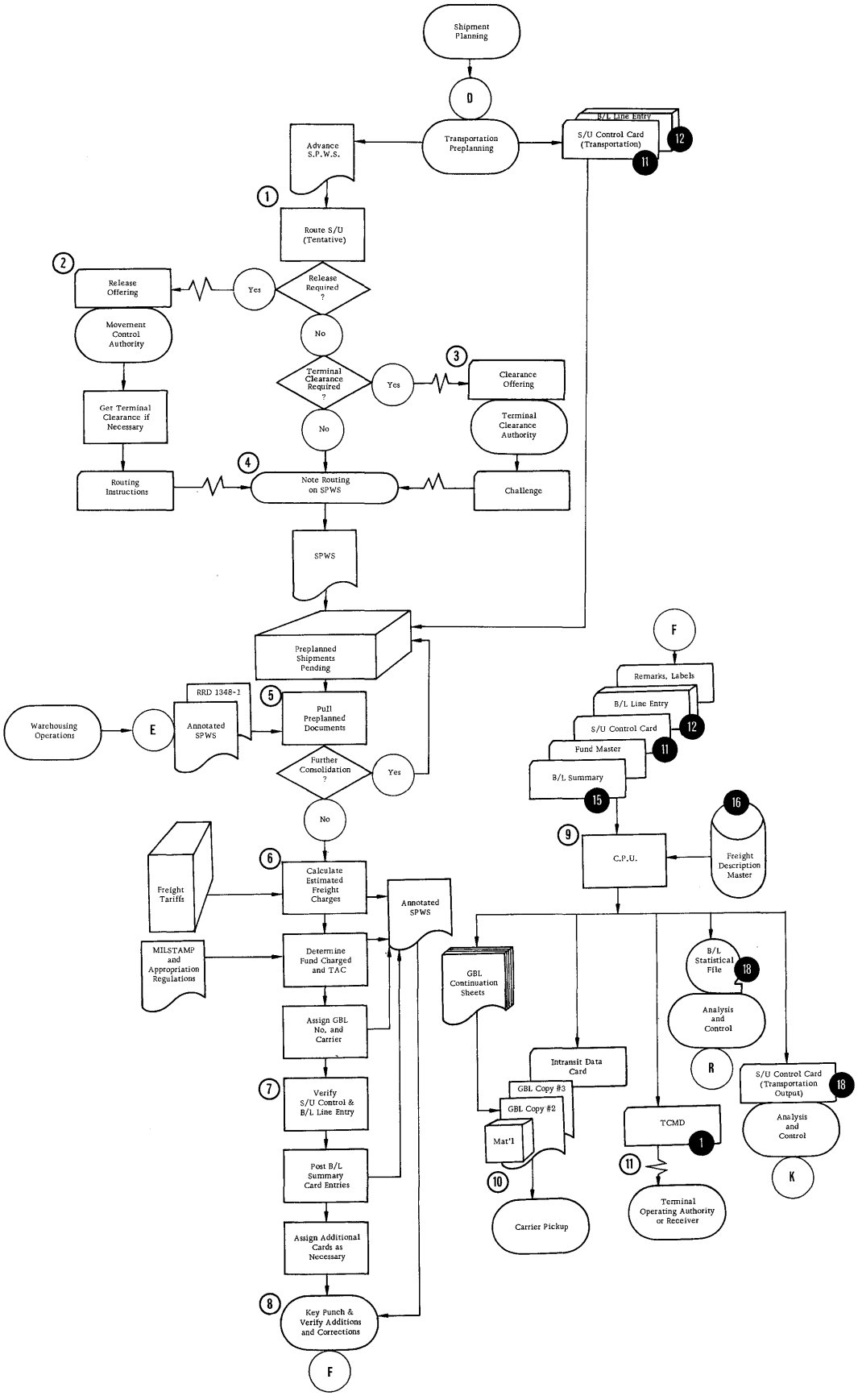
b. MILSTAMP TCMD and IDC.

c. B/L Statistical Record to be used for subsequent analysis.

d. Output S/U Control Cards that will update the In-Transportation File.

(10)(11) The #2 and #3 copies of the GBL and the IDC are held with the material awaiting carrier pickup while the TCMD is forwarded to the appropriate DoD Agency as advance notice of the shipment.

Transportation Operations - All MROs



Analysis and Control - Routine MROs

(1) Freight and Parcel Post Shipment Unit Files for routine MROs released today are merged in line item number within TCN sequence.

(2) The newly released S/Us plus the S/Us previously released to the Warehouse minus the S/Us that the Warehouse either shipped via Parcel Post or transferred to Transportation permit us to obtain files of: routine S/Us remaining in the Warehouse, routine S/Us completed by the Warehouse, and a report showing those shipment units that are late in Warehousing. If a line item change by the Warehouse requires that a material release denial (MRD) be sent to the ICP, the MRD is punched and transmitted.

(3) The routine S/Us shipped Parcel Post and those transferred to Transportation are sorted into requisition number within warehouse sequence.

(4) S/U control cards were punched during the B/L run for each freight S/U that was shipped today. These cards along with the file of S/Us completed today by the Warehouse and the file of the S/Us previously in Transportation create the following documents and files:

a. A Material Release Confirmation for each routine MRO shipped today (freight or Parcel Post MROs are included in the S/Us Completed By Warehousing File.) The MRC is transmitted to the proper ICP.

b. A file of the routine S/Us that are still in Transportation, and

c. A listing of routine S/Us that are late in Transportation, i.e. S/Us whose RSD was today but that are still in Transportation.

d. A file of all shipments made today (high priority or routine, freight or Parcel Post). This is done by scanning the High Priority in Process random file (which is explained in later charts) and removing all high priority MROs that were shipped today and including them in the file of today's shipments.

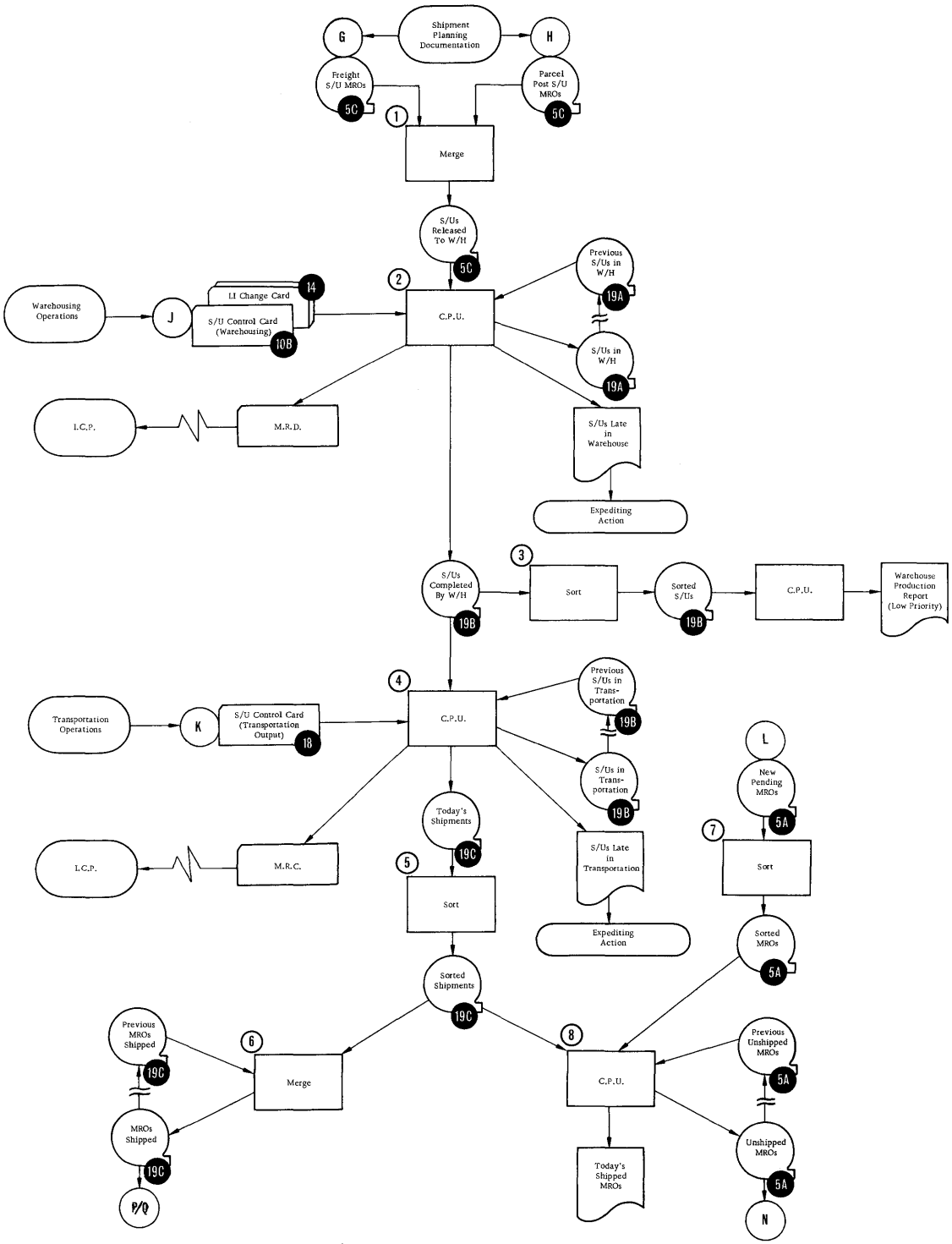
(5) Today's shipments are sorted into requisition number within priority group sequence for further processing.

(6) Today's shipments are merged with the previous shipped requisitions for the period (to be used to answer MILSTAMP status follow-up requests).

(7) All low priority MROs are sorted by requisition number on the day that they are received.

(8) New pending MROs are added to, and shipments are taken from, the Unshipped File which portrays all routine MROs in process (received but not yet shipped) within the depot.

Analysis and Control - Routine MROs



Analysis and Control - All MROs

(9) The depot receives MILSTRIP requests for status on individual line items. If the MRO has not been shipped, the status is ascertained by searching either the High Priority in Process File or the Unshipped Routine MROs File, dependent upon the IPD of the line item. The search is performed on requisition number.

(10) If the item has been shipped, a cross reference must be made between the requisition number and the TCN under which the MRO was shipped.

(11) Once the status has been determined, whether the item has been shipped or still in process within the depot, a Status Follow-up Reply is sent to the DoD agency indicated on the status request.

(12) In addition, if the item has been shipped, the depot initiates MILSTAMP transportation tracer action on the TCN by forwarding a card to the transshipment point that received the S/U from the depot.

(13) Since the "MROs shipped" file contains line item detail data, the file can be sorted into whatever sequence is required for MRO analyses (i.e. priority, late shipments, assembly warehouse, etc.).

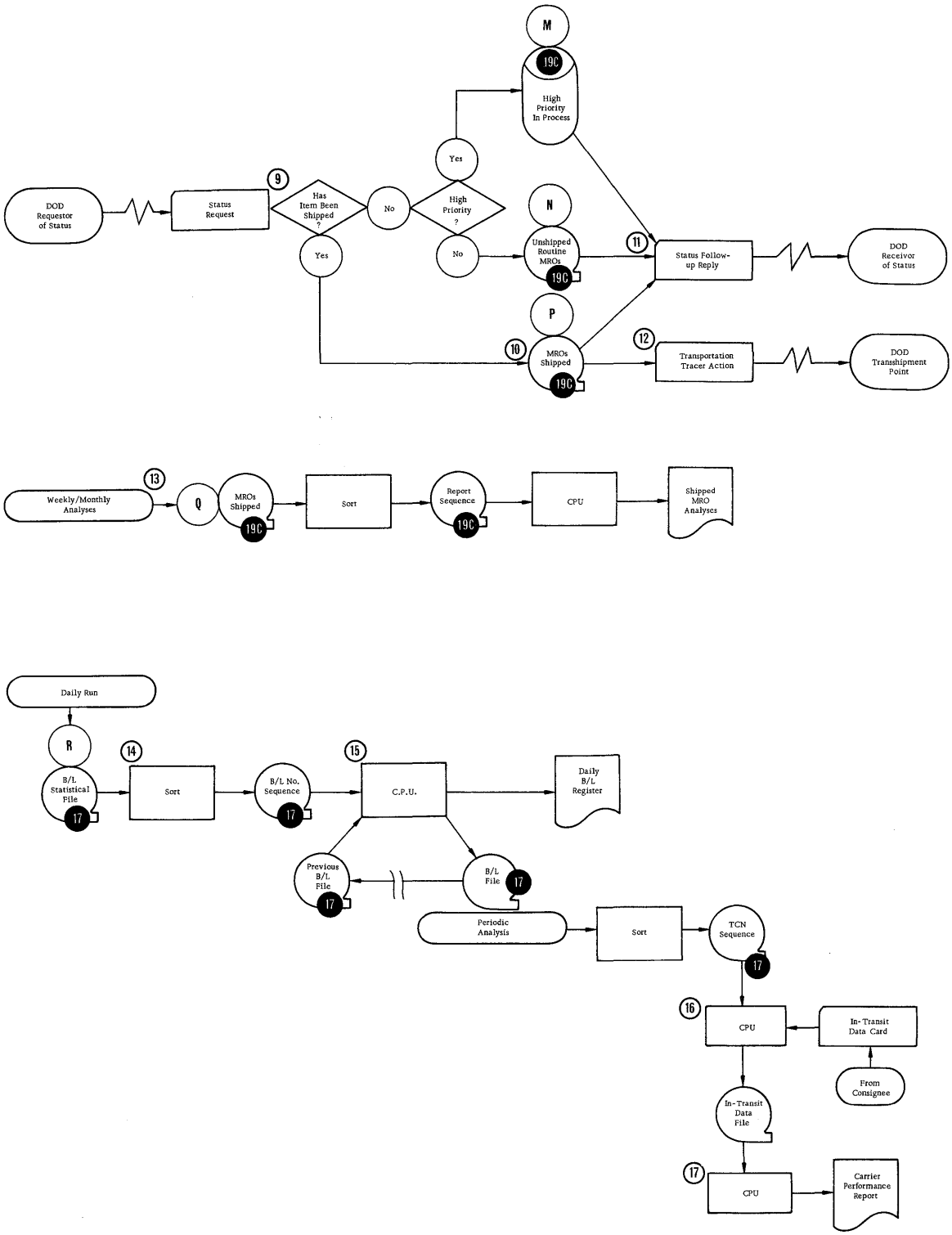
(14) Each day the B/L Statistical File is sorted into B/L number sequence.

(15) A B/L Register is produced. In addition, the period-to-date file of B/L Statistics is updated to include the new B/Ls.

(16) Periodically, the B/L File is sorted into TCN sequence and processed against batches of MILSTAMP In-transit Data Cards returned by consignees. Carrier code, extracted from the B/L records, is added to in-transit data which is recorded on an output file for each shipment unit.

(17) The In-Transit Data File is then used to prepare analysis reports. For example, a comparative study of carrier transit time in delivering shipments of each IPG to specific destinations is useful in future carrier selection and in estimating delivery dates.

Analysis and Control - All MROs



High Priority Processing

(1) High priority (IPG 1 & 2) MRO s are accumulated for periodic processing (e.g., every 2 - 3 hours).

(2) The MRO s are sorted into FSN sequence.

(3) The sorted MRO s are edited while a check is made of the availability of adequate bin stock to satisfy the high priority orders. There will usually be sufficient bin stock since maximum bin stock levels are maintained each day during the low priority bin replenishment run. If the bin is out-of-stock, a bin replenishment card is punched at the warehouse storing the bulk portion of the item so that sufficient bulk packages can be transferred to the bin area prior to the bin picking operations. Rejected MRO s are punched out and a listing, showing the reason for rejection, accompanies them to the administrative group for action, follow-up and re-entry to the shipment processing procedure.

(4) The MRO with Master Data File is sorted for consolidation (see step 10, low priority).

(5) The MRO s, in S/U sequence, are summarized by S/U and a TCN is assigned.

(6) The MRO s, S/U summary, and Consignee Master File are input to this run, which produces:

- o A High Priority In-process File in RAMAC® storage, for machine monitoring and control.
- o SPWS.
- o S/U Control Cards for Warehousing.
- o S/U Control Cards and B/L Line Entry Cards for Transportation.
- o A S/U MRO File with consignee and transshipment point data.

The High Priority In-process File retains all high priority MRO s until the end of the day on which they are shipped. Since the scheduled completion time and day for Warehousing and Shipping operations are included, a periodic automatic machine check can be made to highlight those MRO s that have exceeded their scheduled completion in Warehousing and/or Transportation.

(7) The S/U MRO s and Address Master Files are used to produce the label stencils.

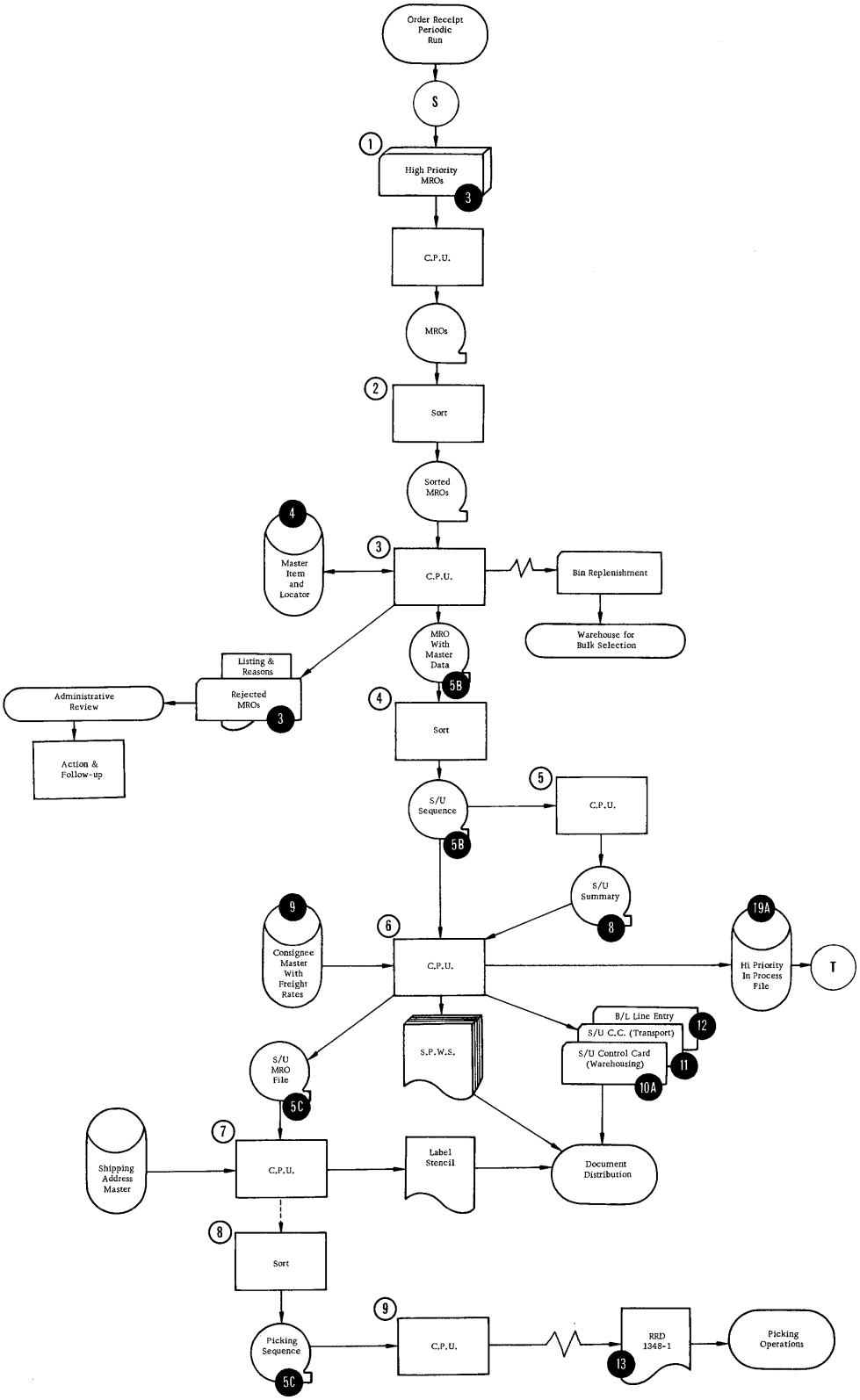
(8) The S/U MRO s are sorted into warehouse picking sequence.

(9) The picking document, RRD 1348-1, is printed remotely at the warehouse that is to pick the material.

The preceding is only practical where the volume of high priority MRO s justifies this procedure to consolidate MRO s into S/Us. When consolidation on high priority MRO s is not desired during shipment planning, consolidation is done at Transportation. The number of these runs are thereby reduced.

The operations performed by the picking, assembling, packing and transportation personnel as well as the preparation of the movement documents are identical to those previously shown except that they are handled as an acceleration of the low priority system.

High Priority Processing

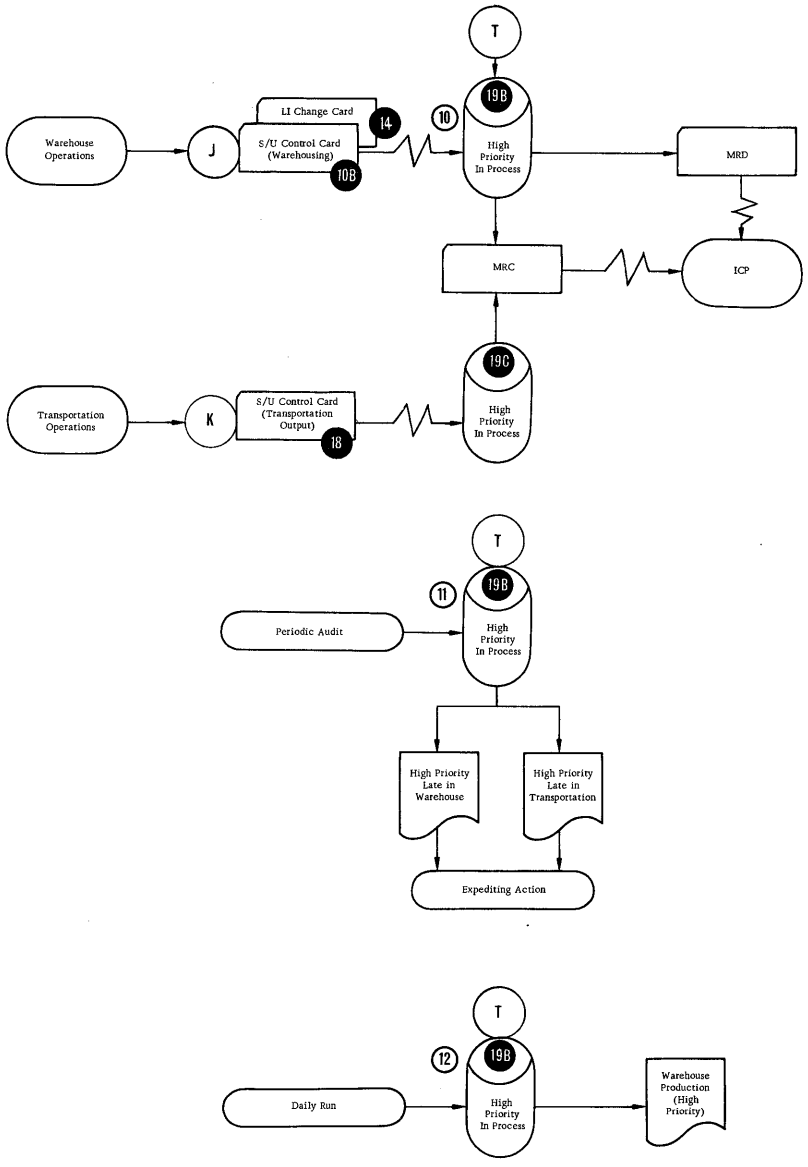


(10) The S/U Control Card and Line Item Change Cards, if necessary, are entered at the remote terminal when Warehousing has completed its operations on the S/U. The operator keys in the time and date so that the High Priority In-process File can be updated to indicate the transfer of the S/U to Transportation. When Transportation releases the S/U to the carrier, their S/U Control Card is entered at their remote terminal. The mode, GBL number, time, and date are keyed in, updating the In-process File. Material Release Denial or Confirmation Cards are punched and transmitted to the ICP as required. The record stays on the High Priority In-process File until the daily run of low priority shipments (step 4d page 56). At that time it is added to the Today's Shipments File and cleared from the High Priority In-process File.

(11) A periodic audit (perhaps each hour) is made of the High Priority In-process File and a print-out is made of all MRO s late in either Warehousing or Transportation.

(12) A daily run is made to report all high priority MRO s that were completed in Warehousing during the day.

High Priority Analysis and Control



APPENDIX

1 - BASIC TCMD CARD

Document Identifier
Trailer or container number
Shipper code
Commodity code
Air Dimension code
POE
POD
Mode
Type pack
Transportation Control Number (TCN)
Consignee
Transportation Priority
Required Delivery Date (RDD)
Project Code
Date Shipped
ETA
Transportation account code
Pieces
Weight
Cube

2 - SHIPMENT UNITS DUE RECORD

Basic TCMD (complete)
Day due at depot

3 - MATERIAL RELEASE ORDER CARD

Document Identifier
Routing Identifier (depot)
Media and Status
Federal Stock or Part number
Unit of Issue
Quantity
Document Number
Supplementary Address
Signal Code
Fund Code
Distribution Code
Project Code
Issue Priority Designator
Required Delivery Date
Routing Identifier (ICP)
Management Codes
Unit Price

4 - MASTER ITEM WITH LOCATOR DATA RECORD

Federal Stock Number
Commodity Manager
Abbreviated Item Description
Transportation Compatibility Code
NMFC Code & RAMAC® Address of Freight Description
LTL Class Rating Code
UFC Code & RAMAC Address of Freight Description
"No-Parcel-Post" Code
Special Handling Code
Special Labeling Code
Special Packaging Requirements
Other Item Characteristics
Water Commodity Code
Air Commodity Code
Air Dimension Code
Unit Length, Width, Height
Unit Weight and Cube
Unit of Issue (U/I)
Unit Price
Bin Location
Capacity (Units of Issue) of Bin Location
Bin Inventory

(For each bulk location, 2 - 3 per item)

Location
Number of U/I Per Bulk Pack
Type Bulk Pack
Condition Code
Bulk Unit Weight
Bulk Unit Cube
Manufacturer's Part Number
Overflow address of additional bulk locations

5 - MRO DATA RECORD

Original MRO (complete)
"Partial" Code (if part bulk and part bin)
Bin or Bulk Code
Picking Warehouse Section
Picking Quantity
Weight of Quantity to be Picked

5A

Date MRO Received
Required Processing Date (RPD)
Ready-by-date (RBD)
Required Shipping Date (RSD)
Priority Group (high or routine)
Commodity Manager
Type Pack
RAMAC Address of Master Item Record

Warehouse Location
Condition Code
Line Item Weight
Line Item Cube
Inspection Required prior to issue? (yes/no)
Abbreviated Item Description
Transportation Compatibility Code
NMFC + RAMAC Address of Freight Description

5B

UFC + RAMAC Address of Freight Description
LTL Class Rating Code
LCL Variation Code
Special Handling Code
Special Labeling Code
Special Packaging Requirements
Other Item Characteristics
Water Commodity Code
Air Commodity Code
Air Dimension Code
Unit Length, Width and Height
Unit Weight and Cube

TCN
Sequential Line Item Number
Ready-by-date (S/U)

5C

Required Shipping Date (S/U)
Parcel Post or Freight S/U Code
RAMAC Addresses of POE, POD and Consignee

6 WORKLOAD PLANNING (WORKING STORAGE) RECORD

Constants

Warehouse
Section
Picking rate (no. of line items/man day)

Variables

6A

Next Work Day (NWD) - required workload
a. Total line items
b. Total pieces
c. Total weight
NWD + 1, Workload - optional
a. Total
b. Preferred line items (consignees included in required workload)
NWD + 2, Workload - optional
a. Total line items
b. Preferred line items (consignees included in required workload)

Optional Workload Selected By Warehousing Management

NWD + 1
a. Preferred line items
b. "Other-than-preferred" line items

6B

NWD + 2
a. Preferred line items
b. "Other-than-preferred" line items

7 - WORKLOAD CARD

Prepunched
Warehouse number
Warehouse section
Required workload (next working day)
Optional workload (next working day + 1)
a. For consignees included in required workload
7A
b. For consignees not included in required workload

Optional Workload (next working day + 2)
a. For consignees included in required workload
b. For consignees not included in required workload

Warehousing management selects additional work:

Optional workload (next working day + 1)
a. For consignees included in required workload
7B
b. For consignees not included in required workload

Optional workload (next working day + 2)
a. For consignees included in required workload
b. For consignees not included in required workload

NOTE: All workloads are indicated by number of line items.

8 - SHIPMENT UNIT SUMMARY RECORD

TCN
RDD
Total Weight (estimated)
Total Cube (estimated)
First Line Item Requisition Number
Last Line Item Requisition Number
Total Number of Line Items in S/U
RBD (S/U)
RSD (S/U)
Assembly Warehouse
Consignee
Highest IPD in S/U
Air Dimension Code
Air Commodity Code
Water Commodity Code
Parcel Post Code (yes/no)

9 - CONSIGNEE MASTER RECORD

Consignee Code
Freight in-the-clear Address
Parcel Post in-the-clear Address
Air POE/POD & RAMAC Addresses
Water POE/POD & RAMAC Addresses
Less Truck Load Tariff Number
Rate Basis
Freight Rate at Class Rating Code 100
Minimum Truck Freight Charge
FAK Minimum Weight
FAK Freight Rate

10 - SHIPMENT UNIT CONTROL CARD - WAREHOUSING

Prepunched for Warehousing

10A
- TCN
- Ready-by-date (RBD)
- Priority
- Parcel Post (yes or no)
- Total number of line items
- Assembly warehouse number
- Commodity Manager

Added by Warehousing

10B
- Total number of line item changes
- Date to transportation (or date shipped parcel post)

11 - SHIPMENT UNIT CONTROL CARD - TRANSPORTATION INPUT

Prepunched for Transportation

- TCN
- Priority
- Required Shipping Date
- Required Delivery Date
- Project
- Commodity Manager
- Air Dimension Code
- POE (air/water)
- POD (air/water)
- Consignee Address Code

12 - BILL OF LADING LINE ENTRY CARD

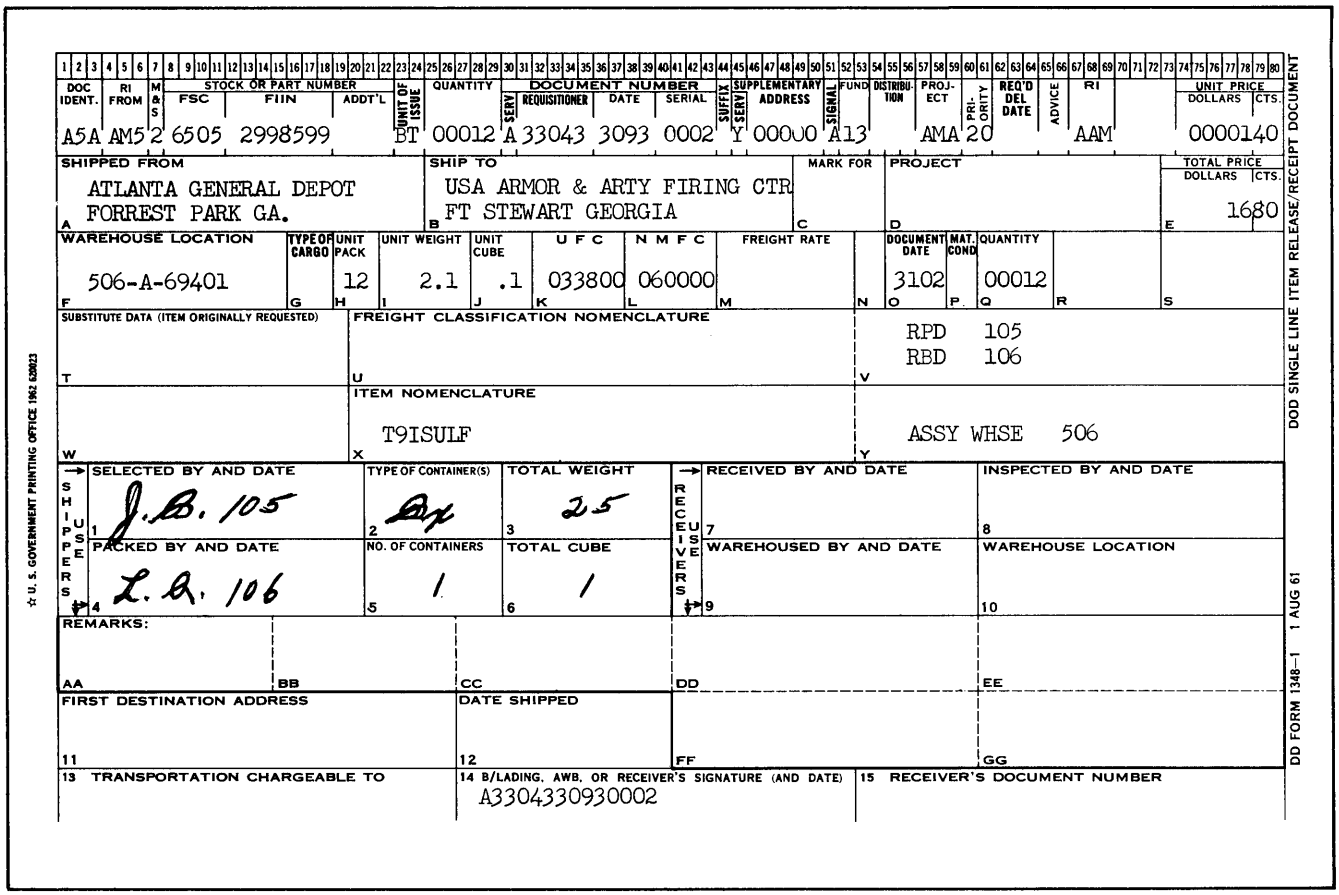
Prepunched

12A
- TCN
- SPWS Sequential Line Numbers
- NMFC & Freight Description RAMAC Address
- UFC & Freight Description RAMAC Address
- Stock or Part Number

Added by Classifier

12B
- Type Pack
- Pieces
- Weight
- Cube
- Mode

13 - RELEASE/RECEIPT DOCUMENT
1348-1



DOC IDENT. A5A | RI FROM AM5 | M&S 2 | STOCK OR PART NUMBER: FSC 6505, FIIN 2998599, ADDT'L | UNIT OF ISSUE BT | QUANTITY 00012 | DOCUMENT NUMBER: SERV A, REQUISITIONER 33043, DATE 3093, SERIAL 0002 | SUFFIX SERV Y | SUPPLEMENTARY ADDRESS 00000 | SIGNAL A13 | FUND | DISTRIBUTION | PROJECT AMA | PRIORITY 20 | REQ'D DEL DATE | ADVICE | RI AAM | UNIT PRICE DOLLARS 0000140 CTS.

A — SHIPPED FROM: ATLANTA GENERAL DEPOT, FORREST PARK GA.

B — SHIP TO: USA ARMOR & ARTY FIRING CTR, FT STEWART GEORGIA

C — MARK FOR

D — PROJECT

E — TOTAL PRICE DOLLARS 1680 CTS.

F — WAREHOUSE LOCATION: 506-A-69401

G — TYPE OF CARGO

H — UNIT PACK: 12

I — UNIT WEIGHT: 2.1

J — UNIT CUBE: .1

K — U F C: 033800

L — N M F C: 060000

M — FREIGHT RATE

N — DOCUMENT DATE: 3102

O — MAT. COND

P — QUANTITY: 00012

Q — R

S

T — SUBSTITUTE DATA (ITEM ORIGINALLY REQUESTED)

U — FREIGHT CLASSIFICATION NOMENCLATURE

V — RPD 105, RBD 106

W — ITEM NOMENCLATURE: T91SULF

X

Y — ASSY WHSE 506

SHIPPERS → 1 SELECTED BY AND DATE: J.B. 105 | 2 TYPE OF CONTAINER(S): Bx | 3 TOTAL WEIGHT: 25

4 PACKED BY AND DATE: L.R. 106 | 5 NO. OF CONTAINERS: 1 | 6 TOTAL CUBE: 1

RECEIVERS → 7 RECEIVED BY AND DATE | 8 INSPECTED BY AND DATE

9 WAREHOUSED BY AND DATE | 10 WAREHOUSE LOCATION

AA — REMARKS:

BB

CC

DD

EE

11 FIRST DESTINATION ADDRESS

12 DATE SHIPPED

FF

GG

13 TRANSPORTATION CHARGEABLE TO

14 B/LADING, AWB, OR RECEIVER'S SIGNATURE (AND DATE): A3304330930002

15 RECEIVER'S DOCUMENT NUMBER

DOD SINGLE LINE ITEM RELEASE/RECEIPT DOCUMENT

DD FORM 1348-1 1 AUG 61

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14 - LINE ITEM CHANGE CARD

TCN
Sequential Line Item Number
Type of Change Code (e.g., deletion, partial shipment)
Actual Quantity Being Shipped

15 - BILL OF LADING SUMMARY CARD

TCN
Carrier Code
B/L Number
Mode
Date Shipped
Desired Delivery Date
Estimated Cost of Transportation
Fund Charged
RU/LRU Code
Number of Carloads or Truckloads
Total Number of Line Items (MROs)

16 - FREIGHT DESCRIPTION MASTER RECORD

Code (Freight Description RAMAC Address)
Freight Description Nomenclature as required for B/L line entries

17 - BILL OF LADING STATISTICAL RECORD

Carrier Code
B/L Number
Mode
Date Shipped
Transportation Priority
Commodity Manager
Estimated Cost of Transportation
Fund Charged
Number of Packages
Weight
Cube
TCN
Consignee Coded Address
Release Unit (yes or no)
Storage-in-transit Applied (yes or no)

18 - SHIPMENT UNIT CONTROL CARD - TRANSPORTATION OUTPUT

Output of GBL Run

TCN
GBL Number
Date Shipped
ETA
Mode
Type Pack
Commodity Code (air/water)
Air Dimension Code
POE (air/water)
POD (air/water)
Transportation Account Code

19 - MRO ANALYSIS AND CONTROL RECORD (ALSO HIGH PRIORITY IN PROCESS RECORD)

Original MRO (complete)
Date Received
Required Ready-By-Date (S/U)
Required Shipping Date (S/U)
Required Shipping Date (MRO)
19A Priority (high or routine)
Commodity Manager
Number of Days Late and Reason Code
TCN
POE/POD
Warehouse Picking Section
Assembly Warehouse

19B Actual Ready-By-Date
Quantity Denied and Reason

Actual Shipping Date
Mode
19C GBL Number
ETA
Type Pack
Transportation Account Code

E50-0019

Printed in U.S.A. E50-0019

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