THE SYSTEMS HOUSE
MASTER DISTRIBUTION SYSTEM DOCUMENTATION

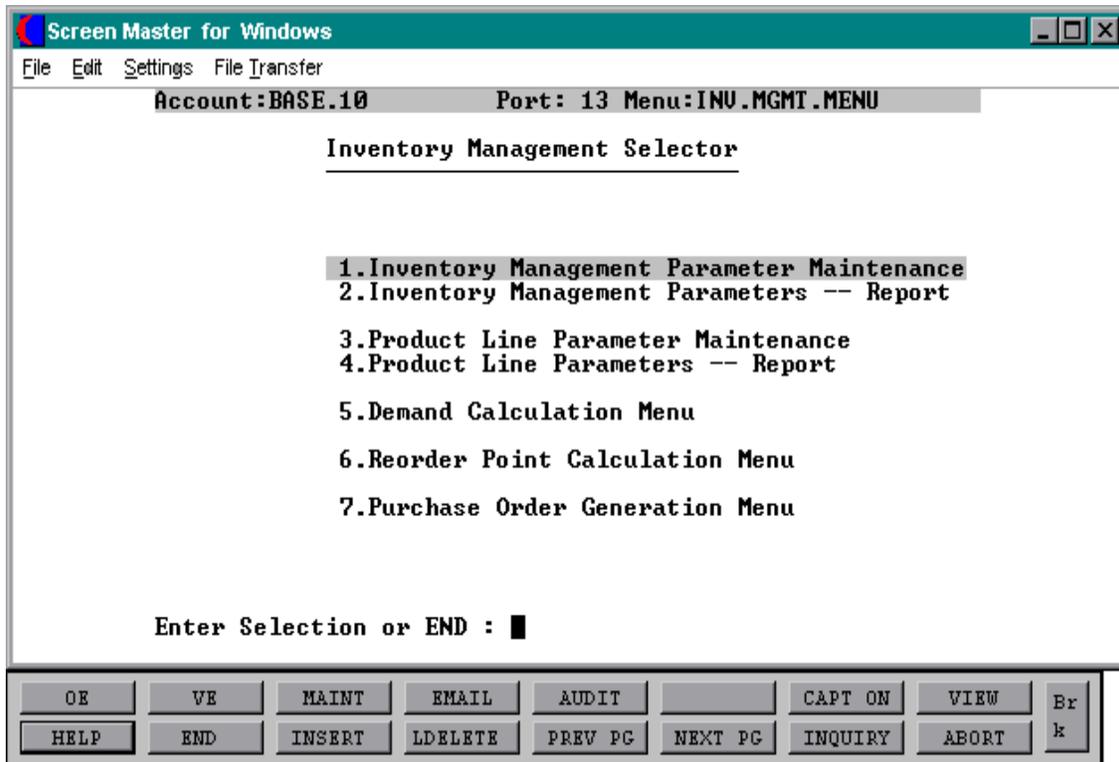# T A B L E   O F   C O N T E N T S

THE SYSTEMS HOUSE
MASTER DISTRIBUTION SYSTEM DOCUMENTATION

T A B L E   O F   C O N T E N T S

INVENTORY MANAGEMENT MAIN SELECTOR

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Screen Master for Windows                                           _ □ ✕
File  Edit  Settings  File Transfer
            Account:BASE.10              Port: 13 Menu:INV.MGMT.MENU

                    Inventory Management Selector


                    1.Inventory Management Parameter Maintenance
                    2.Inventory Management Parameters -- Report

                    3.Product Line Parameter Maintenance
                    4.Product Line Parameters -- Report

                    5.Demand Calculation Menu

                    6.Reorder Point Calculation Menu

                    7.Purchase Order Generation Menu



            Enter Selection or END : █
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OE	VE	MAINT	EMAIL	AUDIT		CAPT ON	VIEW	Br
HELP	END	INSERT	LDELETE	PREV PG	NEXT PG	INQUIRY	ABORT	k

THEORY OF AN INVENTORY MANAGEMENT SYSTEM

Inventory control is the tracking of ins and outs to inventory, and orders to vendors through their receipt.

Inventory management is the application of a set of scientifically derived rules to the purchasing and stocking of inventory, with the objectives of minimizing inventory investment and maximizing turns and customer service levels. Inventory control is straight-forward and somewhat mechanical. Inventory management, on the other hand, requires in-depth study and customization to each clients' operation, if it is to achieve the desired results.

The objective of any inventory management system is to balance two conflicting needs:

1.   Maintain sufficient inventory on hand to service customer orders, and:
2.   Minimize inventory investment and carrying costs.

For most distributors, their investment in inventory represents 60% or more of their total assets. The consensus of opinion is that inventory carrying costs are somewhere in the 22% to 30% range, with 25% being an average estimate. Thus, a reduction in the size of a distributor's inventory by $400,000 (from $1,000,000 to $600,000 for example) will improve bottom line performance by $100,000. Before the introduction of sophisticated inventory management systems, this reduction usually led to reduced levels of customer service. This need not be the case now.

To balance these two objectives, the system must perform the following functions:

1.   WHEN TO ORDER

By establishing sales forecasts (based upon past sales experience), and tracking lead time, the system alerts management when it is time to reorder. The reorder point takes into account the desired service level as well.

2.   HOW MUCH TO ORDER

The MDS system supports two approaches to the reordering process. The first is based upon the concept of economic lot sizing (EOQ). However, this approach is frequently misunderstood and does not always result in reasonable order quantities since its singular objective is to minimize overall inventory investment.

THEORY OF AN INVENTORY MANAGEMENT SYSTEM

2.   HOW MUCH TO ORDER (Continued)

The second approach supports product line purchasing ("line- buy"). The system establishes the proper order cycle for the product line based upon the sales rate for the line, compared to the vendor purchase minimums (expressed in dollars, units, or pounds).

3.   GENERATION OF THE PURCHASE ORDER

Based upon the recommended purchase quantity, MDS allows the buyer to review and adjust the suggested purchase quantities, and after approval, automatically generate the purchase order to the vendor.

4.   MONITORING INVENTORY LEVELS

A series of reports designed to alert management to exceptional situations (i.e., slow moving items) and to help establish the appropriate service level (ranking of items by profit, volume, etc.) are included as part of the system.

This module performs the actual calculation of reorder points and reorder quantities based upon information recorded as a by-product of the order entry module. This information in turn is used in the various reports included in the inventory control subsystem.

GRAPHICAL PRESENTATION
Figure 1 shows how a scientific inventory management system operates.

Starting from point 1 on the chart, inventory is reduced gradually until it reaches a level called reorder point. At this time, a purchase order (or shop order) is placed. Inventory continues to be depleted until at point 2, the ordered quantity is received.

The amount of inventory to be ordered is established by estimating how much inventory will be sold each month and taking into account the following cost factors:

1.   The cost of the item, and hence, how much it costs to carry the item in inventory.

2.   The inventory carrying costs, typically expressed as a percentage of the average inventory value. Typical values range between 22% and 29%. This cost represents the cost of money, insurance, taxes, obsolescence, and storage.

THEORY OF AN INVENTORY MANAGEMENT SYSTEM

GRAPHICAL PRESENTATION (Continued)

3.   Purchase order costs which can be calculated by dividing the total number of purchase order line items into the costs of the purchasing, accounts payable and receiving departments. Costs per incremental purchase order is not considered a factor. Typical costs vary from $3 to $10 per purchase order line item.

The size of the order has a significant impact on the average inventory level. Through control of the order size policy, management can therefore regulate the level of inventory. Control is exercised by changing either of the two cost elements that determine order size: inventory carrying costs and order costs.

The theory of economical lot sizing (EOQ) is presented in Figure 2. As the order quantity is increased, the average level of inventory rises. The carrying cost therefore increases at a constant rate. As order size increases, acquisition costs such as setup can be spread over more units, and the unit cost therefore decreases. The total cost line in Figure 2 represents the sum of two lines. The point of minimum cost indicates the most economical order quantity.

GRAPHICAL PRESENTATION

INVENTORY
LEVEL

```
 ^    (1) Review         Lead        ( For        ^
      <---Cycle--->|<------Time------>  ( Review
      .                               (
       .       Order                  <      Order
        .      Point                  (     Quantity
         .                            (
      --------..-------------------------------------------- ------      ---
              . .                     (                            ^
               .   .                  ( For
                .    .                ( Lead
                 .     .              < Time
       .           .      .           (
        .            .      .          (
         .             .      .        .              . .
Average
           .              .      . (2) (      .              Inventory
              .              .      (     .
                 .              .  (
                    .              (
                       .        Safety
                    (3)          Stock
```

```
(A)          (B)              (C)
```

FIGURE 1
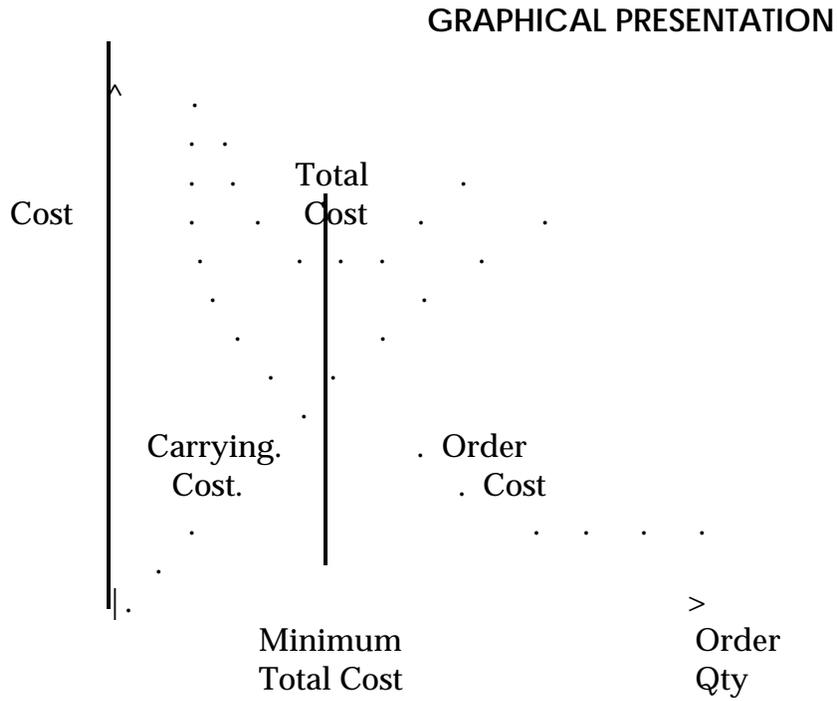
GRAPHICAL PRESENTATION

FIGURE 2:   Analysis of the two major cost elements, order and carrying costs, determines
the order quantity that will result in the lowest total cost.

SERVICE LEVELS AND SAFETY STOCK

As previously mentioned, the objective of an inventory management system is to balance the requirement to properly service customers with the need to minimize inventory investment.

As Figure 1- graphically illustrates, if inventory is depleted at a higher than normal rate, a stock out would result. To protect against this happening, a safety stock is established to cover higher than anticipated depletions against inventory.

The calculation of safety stock is the heart of the system, since it is in this calculation that the choice must be made between lower inventory carrying costs, or lower stock outs, and a higher service level.

VELOCITY CODES AND SAFETY STOCK
Most distributors agree that it is most important in terms of customer service, sales, inventory investment, etc., to place the major portion of their attention and inventory investment behind those items which contribute most to their sales dollars. The system encourages the use of this concept as described on the following page.

SAFETY STOCK AND SERVICE LEVEL PARAMETERS

1.   SAFETY STOCK, SERVICE LEVELS, AND VELOCITY CODES

Safety stock is the heart of the inventory system since it is the "FUDGE" factor which determines the level of additional stock to be inventoried to insure against stock outs caused by higher than usual usage, or longer than expected vendor lead time.

The system will take all the items in a distributor's inventory and rank them based on their sales dollars during the last 12 month period. A velocity code, based on actual sales ranking from high to low sales usage (A, B, C, or D) is assigned to each item automatically. At the same time, a velocity code report is produced for each buyer's review. Wherever there are reasons why the computer assignment of velocity code is misleading (e.g., recently added items, "must be in stock" items, items to be phased out, etc), the buyer can go directly into the item file and change the velocity code.

The purpose of this assignment of velocity code is two-fold:

1.   It helps the buyer and management make such merchandising decisions as:

      a.   which items to discontinue
      b.   which items to promote more
      c.   where to change prices

2.   It is used by the inventory management system to set safety stock levels.

As service level objectives go up, the system must account for and provide for a higher percentage of the possible deviation in demand from that forecast by statistical formula. Several factors work together to help keep control over the amount of money invested in safety stock to account for these deviations. These include:

1.   The higher velocity items tend to have a "smoother" history of sales, and therefore, there is less probability of sharp deviations from forecast. The additional inventory required to meet a specified service level objective varies based upon the variability of demand of the item, i.e., how much do sales vary from one month to the next. The statistical measure of variability used by the MDS system is the standard deviation.

SAFETY STOCK AND SERVICE LEVEL PARAMETERS

1.   SAFETY STOCK, SERVICE LEVELS, AND VELOCITY CODES (Continued)

> 2.   Management is more concerned that there be higher service levels on the better selling items.
>
> 3.   The system permits the setting of service level objectives by velocity code. Each user sets his own criteria. One typical set of goals might be:

Velocity Code	Service Level Objective	Additional Stock Required (SD)
A	93%	148%
B	85%	104%
C	75%	64%
D	50%	0%

The MDS system allows this ranking to be assigned based upon:

    1.   Unit Volume
    2.   Sales Volume
    3.   Gross Profit
    4.   Sales Volume at Cost
    5.   Number of Times Ordered

Note that a 50% service level objective means that no safety stock will be added to the recommended buy. Since D items, at their best, contribute only 5% of the sales dollars, they do not justify any safety stock investment. Also note that a service level of 85% requires a quantity equal to slightly more than 1 standard deviation unit of the item, a significant increase in the amount of inventory required. Since average inventory on hand is one-half the order quantity plus safety stock, this inventory excess must be reserved for only a selected portion of the total inventory.

The following table directly translates service level goals to percentages. At a more technical level, order rates are generally assumed to follow a Poisson distribution, which can be approximated by the normal distribution in large numbers. The table shown is actually various values for the normal distribution ("bell shaped") curve.

SAFETY STOCK AND SERVICE LEVEL PARAMETERS

1.   SAFETY STOCK, SERVICE LEVELS, AND VELOCITY CODES (Continued)

The inventory management system can dictate the buying of items where there is not enough stock much more rapidly than it can tell a distributor how to get rid of excess inventory. Therefore, one must be careful not to make the service level objectives too high to avoid an unreasonable build-up of inventory. The objectives can be changed at any time and gradually massaged to the levels management wants to support.

Service Level Goal	Number of Standard Deviations
50%	0.00
60%	.25
70%	.52
75%	.68
80%	.84
85%	1.04
90%	1.28
91%	1.34
92%	1.41
93%	1.48
94%	1.56
95%	1.65
96%	1.76
97%	1.88
98%	2.06
99%	2.33

2.   GORDON GRAHAM'S APPROACH TO SERVICE LEVELS

Gordon Graham disagrees with the A, B, C, D approach to safety stock. Quoting from his book:

"I must digress here just a moment to sound a warning. There's a popular school of thought circulating through distribution today that is dangerous. The logic sounds plausible but is unsound. The concept:

SAFETY STOCK AND SERVICE LEVEL PARAMETERS

2.   GORDON GRAHAM'S APPROACH TO SERVICE LEVELS (Continued)

Some items are more important to us than others. Some sell very well; others quite slowly. It's much more critical to provide excellent levels of service on the good items than on the little chaff. Be satisfied with 70 percent or 80 percent service on low-class items, but shoot for 90 percent on the top items!

The safety allowance percentage is reduced on the slower- moving products. . . . DON'T FALL VICTIM TO THIS LOGIC! How would a customer react if you told him:

> Yes, Harry, we're out of this item you need . . . but heck, it's a real slow-mover for us. We strive for a 70 percent service level on it. Now, if you'll buy one of THESE, they sell real well and we keep plenty on hand!

What category is the item the customer wanted . . . to HIM? Boy, its Class 1, "A" Class, always! It's the most important item on his mind right now, and you said you stocked it. He depended on you and you've let him down. If an item isn't important enough to justify a 50 percent safety allowance . . . striving for the 90 percent service level which it will generate, then DON'T STOCK IT! Don't put it on the shelf, tell customers to get it from you, and then lower the safety percentage. That's a self-fulfilling prophecy: You'll do a lousy job of service on the item because you intend to! Good items get better because you set them up to perform well; bad items do worse because you've crippled them from the start."

Gordon further objects to "sophisticated" calculation methods, and continues with the following recommendation:

"The Exotic S.A. Formulas Yield Similar Answers"

> Consider this: No matter which of some 15 involved safety allowance formulas you could select, 95 percent of the time the safety added is between 25 percent and 75 percent of the basic order point formula (usage rate x lead time). With sales of 100 per month and an expected lead time of 1 month, the high-math formulas add between 25 and 75 to the basic calculation (100 x 1.0) to set the order point between 125 and 175 . . . and that percentage range results on 95 percent of the items in stock for most distributors.

SAFETY STOCK AND SERVICE LEVEL PARAMETERS

2.   GORDON GRAHAM'S APPROACH TO SERVICE LEVELS (Continued)

A Simplified Approach: Use a 50 Percent Safety Factor.

Since that's true, why not forget the high math and set the opening safety allowances right in the middle of this range? In other words, start you new control system with this order point formula on all items:

Order Point   = (Usage rate x Lead time) + 50% Safety
Example OP = (100 x 1) + 50
OP   = "150"

MDS, therefore, provides for a single safety level factor, which if input will be used to compute the safety level. This factor may be input at the:

A.   Product Detail Level   PD55
B.   Product Line   PLINE29
C.   Parameter Record   PL.PARAM34

3.   SAFETY STOCK ON TRANSFERS

This parameter indicates whether or not safety stock should be maintained for branches re-supplied via transfers. The logic is because safety stock has been provided for in the supplying branch on usage including both branches.

ECONOMIC ORDER QUANTITY (EOQ) FORMULA PARAMETERS

1.   PURCHASING COST

The purchasing cost is one of the EOQ formula components and represents the costs of issuing a purchase order line. Gordon calls it "ordering cost". Gordon recommends $5.00 as a realistic figure. It should be calculated by the total cost of the purchasing function (including overhead) divided by the number of purchase order lines issued.

2.   INVENTORY CARRYING COSTS

The inventory carrying costs is that part of the EOQ formula representing the cost of carrying inventory. Gordon Graham recommends 31%, but it should be calculated for each company. The number should include:

A.   The cost of warehousing; i.e., warehouse space, personnel, rent, insurance, etc., expressed as a percent.

B.   The cost of borrowing money.

C.   A reserve for obsolescence, expressed as a percentage.

Gordon Graham's rule of thumb is that the carrying cost (K factor) should be equal to the prime rate plus 20%.

3.   PO COST SOURCE

This component of the EOQ formula determines which cost in the Product file should be used in the calculation. Normally, the last cost paid (or replacement cost) should be used.

4.   EOQ MINIMUM AND MAXIMUM USAGE PERCENT

The economic order quantity (EOQ) concept is more fully described later in this document. The theoretical value of EOQ is the minimum quantity to buy at the point when the cost of carrying inventory is equal to the cost of ordering.

ECONOMIC ORDER QUANTITY (EOQ) FORMULA PARAMETERS

4.   EOQ MINIMUM AND MAXIMUM USAGE PERCENT (Continued)

Problems with EOQs surface at either end of the stock item profile - the fast moving and/or high cost items. Unreasonably low order quantities might result from the strict application of the EOQ formula.

The use of these values:

        MIN   USAGE   % - 25
        MAX   USAGE   % - 300 (seasonal)
                            1,200 (non-seasonal)

With these values, you would be guaranteed that no EOQ would be less than 25% of average monthly usage, or greater than 200% of average monthly usage. In other words, no product in your inventory would have an EOQ of less than 1 week's worth of average sales, or greater than 3 months worth of average sales.

Separate maximum parameters are available for seasonal and non- seasonal items. Gordon Graham recommends that in no event should more than one (1) year's supply for non-seasonal items nor three (3) months' supply for seasonal items be purchased.

5.   PURCHASE ORDER LARGE USAGE MULTIPLE

The purchase order large usage multiple specifies at which point to flag a purchase order as ordering too much.

For example, if the large usage multiple was "10" any item purchased with a quantity greater than 10 times average monthly usage would be flagged as greater than the large usage multiple. An alert would occur during the purchase order entry procedure, as well as during the recommended procurement program.

6.   TRANSFER LARGE USAGE MULTIPLE

This fills the same purpose as purchase order usage multiple only it relates to branch transfers instead of purchase orders.

LINE BUY CONTROL PARAMETERS

1.   METHOD TO REACH VENDOR MINIMUM

Two methods are provided by MDS in the event the vendor's minimums are not reached in the purchase order generation module:

O = Increase Order Cycle of All Items

P = Increase Selected Items Proportionately to Reach Minimum

2.   MAXIMUM ORDER CYCLE DAYS AND MINIMUM ORDER CYCLE DAYS

Order cycle days are integral to line buy calculations. They represent the relationship between the vendor's terms and your sales of that product line.

Assume the vendor's terms are 360 pieces for a freight prepaid shipment and your average monthly usage quantity for all items in that line is 180. You can afford to buy the line every 60 days. If the vendor freight prepaid requirement was 10,000 lbs. and your sales people are selling 10,000 lbs. per month, then order cycle days for the line would be 30 days.

If the vendor minimum was $5,000.00 per month and the sales people are selling $10,000.00 per month (based on replacement cost), then your order cycle is 14 days.

Gordon Graham feels that no order cycle should be longer than 1 month or less than 1 week, although longer order cycles may qualify you for a discount. He feels your turnover rate will be down and your carrying costs higher, so you should generally forgo the discount and opt for the higher turns and lower carrying costs.

Maximum order cycle days on the inventory control parameter screen will take precedence over the order cycle days calculated by product line.

Minimum order cycle days on the inventory control parameters screen will help prevent ridiculously low order cycle days like 1 or 2 days that occur when vendor minimums are small or non-existent.

A good idea for a minimum order cycle day amount might be 0.25 (one week) unless you subscribe to the 7/11 approach - to pick it up when you need it if the price is right.

INVENTORY MANAGEMENT PARAMETER MAINTENANCE

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Screen Master for Windows                                          _ □ ×

File  Edit  Settings  File Transfer

INVENTORY MANAGEMENT PARAMETER FILE INPUT   PARAMETER IM.PARAM

 1. M.CALC.NS          1   20. SS.OVRD       0.00   31. VEND.MIN     0
 2. M.CALC             3   21. SS.TRANSFERS          32. MAX.CYCLE    3.00
 3. DMD.HIGH      250.00   22. SS.MONTHS        6    33. MIN.CYCLE    0.25
 4. DMD.MIN.UNITS      3   23. PO.COST       5.00   34. EOM UPDATE      N
 5. SO.DAYS           14   24. INV.COST     29.00   35. PO FRAMES    1000
 6. LST.SALE           2   25. PO.COST.SRC      2    36. SS FLAT%       12
 7. MIN.SALES          8   26. EOQ.MIN      25.00
 8. MIN.VAL         1.00   27. EOQ.MAX     300.00
 9. TREND.PCT       0.00   28. PO.MULT         10
10. TREND.SOURCE      I    29. TRN.MULT        10
11. ALT             0.5    30. EOQ.MAX.S    10.00
12. PLT             2.0
13. ALPHA           0.3
14. MAX.PLT      200.00
15. MIN.PLT       25.00
16. A.SL         148.00    1
17. B.SL         104.00    2
18. C.SL          68.00    3
19. D.SL           0.00    4

ENTER LINE # TO CHANGE,DELETE TO DELETE,0 TO ACCEPT  :

                                                                   Br
  HELP      END    INSERT   LDELETE   PREV PG   NEXT PG   INQUIRY   ABORT   k
```

INVENTORY MANAGEMENT PARAMETER MAINTENANCE

INVENTORY MANAGEMENT FACTORS

PROGRAM NAME   SSS.BP GEN.MASTER
                            IM.PARAM
SELECTION   MENU-10
SELECTION NUMBER   1
FILES ACCESSED   PARAMETER

OVERVIEW
This procedure is used to input the factors relating to the inventory management system.
The information is stored in the Im.Param file.

INVENTORY MANAGEMENT PARAMETER MAINTENANCE

Following are the fields used, together with their default values.

Screen Field	Name	AMC	Description	Default Value

Usage Calculation Parameters

1	M.CALC.NS	10	Months in ROP calculation or non-seasonal items.	6
2	M.CALC	11	Months in ROP Calc (1-12) for - seasonal items	6
3	DMD.HIGH	12	This parameter is defined to be: disqualify this item if the usage for the month is equal to to the sum of the previous X months of usage	5.00
4	DMD.MIN.UNITS	13	and total units greater than Y.	5
5	SO.DAYS	14	Disqualify this item if it was out of stock more than X	14
6	LST.SALE	15	days, and the last sale was not more than Y times the order cycle.	2
7	MIN.SALES	16	Minimum sales units to allow the system to calculate usage.	5
8	MIN.VAL	17	Item will not be disqualified for low sales if the unit cost is less than or equal to this value.	$1.00
9	TREND.PCT	18	This figure represents the overall company sales trend percentage and and is used in the computation of usage for seasonal items.	110.00
10	TREND.SOURCE	19	Should the trend on seasonal items be computed from the usage data on the item (I), or from the aggregate trend percentages in the Product Line/Inventory Management records (P).	P

INVENTORY MANAGEMENT PARAMETER MAINTENANCE

Reorder Point Parameters

11	ALT	20	Administrative lead time in months.	1.0
12	PLT	21	Default purchasing lead time in months.	1.1
13	ALPHA	22	Alpha constant to weight most recent receipt in averaging purchasing lead time (00-1.0)	.3
14	MAXIPLT	23	Disqualify this purchase lead time if it is more than X%	50mo
15	MINPLT	24	Default purchasing lead time.	2.00

Safety Stock and Service Level Parameters

16	A.SL	30	A Items - Service level factor	93.00
17	B.SL	31	B Items - Service level factor	85.00
18	C.SL	32	C Items - Service level factor	75.00
19	D.SL	33	D Items - Service level factor	50.00
20	SS.OVRD	34	Single safety stock method. If this field contains a value, then it is used in the calculation of the ROP rather than A, B, C, D's.	NNN.NN
21	SS.TRANSFERS	35	Should safety stock be maintained for branches re-supplied by branch transfers.	Y
22	SS.MONTHS	36	This represents the number of months to be used for STD deviation calculation for safety stock. The maximum is 12.	6

Economic Order Quantity (EOQ) Formula Parameters

23	PO.COST	40	Purchase order cost ($)	$5.00
24	INV.COST	41	Inventory carrying cost (%) "K" factor	31.00

INVENTORY MANAGEMENT PARAMETER MAINTENANCE

25	PO.COST.SRC	42	Purchase cost Source	2
			1-Standard cost PM(5)	
			2-Last PM(6)	
			3-Average cost PM(55)	
26	EOQ.MIN	43	EOQ to be the minimum of X% of average monthly usage.	25.00
27	EOQ.MAX	44	EOQ to be a maximum of Y% of average monthly usage.	600.00
28	PO.MULT	45	Flag this PO if quantity ordered is more than X times average monthly usage.	10
29	TRN.MULT	46	Flag this transfer if the quantity ordered is more than X times the average monthly usage.	0
30	EOQ.MAX.5	47	EOQ max. for seasonal items.	300.00

Line Buy Parameters

31	VEND.MIN	48	Methodology used to reach vendor minimum in the purchase order generation module:
			  O = Increase order cycle
			  P = Proportionate
				0

32	MAX.CYCLE	50	Maximum length of an order cycle (in months)	1.00
33	MIN.CYCLE	51	Minimum length of an order cycle (in months)	.25
34	EOM.UPDATE	53	Should the inventory management sales update run automatically at the end of month.	N
35	PO.FRAMES	54	Enter the total number of frames that the PO generation system can use for temporary work files.	1000

INVENTORY MANAGEMENT PARAMETER MAINTENANCE

36	BRANCH SEQUENCE	52	Sequence in which to process branches in the multi branch vendor replenishment environment. This field is multi-valued. Each line will be a sequence of warehouses separated by commas and will constitute one distribution sequence or path. A single warehouse may appear in only one replenishment path. Use this field to set up a company wide branch sequence for PO generation. Will be used if PLINE branch sequence is null.

USAGE CALCULATION PARAMETERS

The system uses past history to estimate future usage. Several parameters are utilized which will be more fully explained in the usage calculation section.

1.   MONTHS IN CALCULATIONS

Two parameters are established to determine the number of months to be used in the usage calculation.

Seasonal: Previous "X" months last year versus this year to determine trend and new establish.

Non-seasonal: Number of past months to average to estimate usage.

2.   EXCLUSION FACTORS

A.   <u>Unusual Usage</u>

Parameters are built in to flag items where any month is greater than X% (say 250%) of the calculated average, and where the number of units sold is greater than a minimum number of pieces.

B.   <u>Excessive Stockout</u>

Flag this item if it is out of stock for more than a certain number of days (say 14) and there was a sale within the past (say 2) order cycles.

3.   MINIMUM SALES

If the total sales of an item during the review cycle is less than "X" units, then the item is flagged for manual review.

4.   MINIMUM VALUE

This disqualification will not occur if the unit cost of the item is $1.00 or less.

5.   TREND PERCENT

This figure represents the overall company sales trend percentage, and is used in the computation of usage for seasonal items.

REORDER POINT PARAMETERS

1.   ADMINISTRATIVE LEAD TIME

The administrative lead time is a constant factor reflecting the time it takes to issue a purchase order to the vendor from the point in time a reorder notice is given. This lead time is stored in months to one decimal place. Per Gordon Graham, this value should be set to zero.

2.   PURCHASE LEAD TIME

Purchase lead time (PLT) is input into the Product Master record (PM49) and updated through the purchase order module, to both the Product Master and Product Detail records (PD104). Default lead times are available at several levels:

> Product Detail   (PD109)
> Product Line   (PLINE27)
> Parameter   [IM.PARAM(21)]

These overrides are used only if a lead time is not available in the Product record. All lead times are stored to one decimal place in months.

3.   ALPHA CONSTANT

An exponential smoothing technique is used to calculate the new lead time. "ALPHA", the smoothing constant is stored in the Parameter file (22). It defines how much weight is to be given to the most recent receipt. It is suggested that this value be in the range of .3-.5.

4.   MAXIMUM AND MINIMUM DISQUALIFYING LEAD TIME PERCENT

These fields are used to eliminate unusually long or short lead times from being used in the lead time average.

> i.e.,   Minimum 25%
>   Maximum 200%

Use this lead time only if it is greater than 25% of the old average, and less than 200% of the old average.

INVENTORY MANAGEMENT PARAMETERS - - REPORT

PROK NAME   PROK INV.MGMT.PARAM
PROGRAM NAME   MDS.BP PARAM.LIST008
SELECTION   MENU-10
SELECTION NUMBER   2
FILES ACCESSED   PARAMETER
                                   DICT PARAMETER

OVERVIEW
This program lists the parameters stored in the Inventory Management Parameter file
(Im.Param).

The inventory management parameter listing, lists all the factors used in the inventory
management module, and presents the current value stored on file. The source of this
report is the Im.Param file.

INVENTORY MANAGEMENT PARAMETER - - REPORT

DATE 19 DEC 1997   ***** PARAMETER FILE LIST ***** PAGE 1

NAME	AMC	DESCRIPTION	JUST	LEN	VALUE
M.CALC.NS	10	Enter the months in the ROP calculation for non seasonal items	R	3	6
M.CALC	11	Enter the months in the ROP calculation for seasonal items (1-12)	R	2	6
DMD.HIGH	12	Disqualify that month's demand when it is greater than X % of the average demand and it is greater than the minimum units defined by field : DMD.MIN.UNITS	R	7	500
DMD.MIN.UNITS	13	Disqualify that month's demand if its total units are greater than X % of the average (as defined in field: DMD.HIGH) and its total units are greater than the minimum that is entered in this field	R	6	5
SO.DAYS	14	Disqualify this item if it was out of stock more than 'X' days and it satisfies the minimum sales as defined by the field: LST.SALE	R	4	14
LST.SALE	15	Disqualify this item if it is out of stock more than X days as defined inthe field : SO.DAYS and the last sale was not more than 'Y' times the order cycle as defined by this field	R	2	2
MIN.SALES	16	Minimum sales units to allow the system to calculate demand	R	6	5
MIN.VAL	17	Item will not be disqualified for low sales if the unit cost is less than or equal to this value	R	6	100

INVENTORY MANAGEMENT PARAMETER - - REPORT

DATE 19 DEC 1997   ***** PARAMETER FILE LIST ***** PAGE 2

NAME	AMC	DESCRIPTION	JUST	LEN	VALUE
TREND.PCT	18	This figure represents the overall company sales trend percentage and is used in the computation of usage for seasonal items.	R	6	11000
TREND.SOURCE	19	Method of computing the trend on seasonal items (I) - use usage data at the item level (p) - use the aggregate trend percentage from Product Line file, Pline(25) or if Pline(25) is null use the company trend percentage from the previous entry on this screen Im.Param(18)	L	1	I
ALT	20	Administrative lead time in months	R	4	10
PLT	21	Default purchasing lead time in months	R	4	11
ALPHA	22	Alpha constant to weight most recent receipt in averaging purchasing lead time (0.0 - 1.0)	R	3	3
MAX.PLT	23	Disqualify this purchase lead time if it is more than X % greater than the old average lead time	R	6	50
MIN.PLT	24	Disqualify this purchase lead time if it is less than X % of the old average lead time	R	6	200
A.SL	30	A items - service level factor	R	6	9300
B.SL	31	B items - service level factor	R	6	8500

INVENTORY MANAGEMENT PARAMETER - - REPORT

DATE 19 DEC 1997   ***** PARAMETER FILE LIST ***** PAGE 3

NAME	AMC	DESCRIPTION	JUST	LEN	VALUE
C.SL	32	C items - service level factor	R	6	750
D.SL	33	D items - service level factor	R	6	5000
SS.OVRD	34	Safety stock percent override - enter this value if you want to use the single safety stock method this value will override the use of the A,B,C,D service percentage	R	6	
SS.TRANSFERS	35	Should safety stock be maintained for branches re-supplied by branch transfers	L	L	1
SS.MONTHS	36	Enter the number of months of sales data to use in the standard deviation calculation for safety stock	L	1	6
PO.COST	40	Purchase order cost ($)	R	6	500
INV.COST	41	Inventory carrying cost (%)	R	6	3100
PO.COST.SRC	42	Purchase cost source 1 = Standard cost PM(5) 2 = Last cost PM(6) 3 = Average cost PM(55)	R	1	2
EOQ.MIN	43	EOQ to be the minimum of X % of average monthly demand	R	6	2500
EOQ.MAX	44	EOQ to be a maximum of Y % of average monthly demand	R	6	60000
PO.MULT	45	Flag this PO if quantity ordered is more than X times average monthly demand	R	3	10

INVENTORY MANAGEMENT PARAMETER - - REPORT

DATE 19 DEC 1997   ***** PARAMETER FILE LIST ***** PAGE 4

NAME	AMC	DESCRIPTION	JUST	LEN	VALUE
TRN.MULT	46	Flag this transfer if the quantity ordered is more than X times the average monthly demand	R	3	10
EOQ.MAX.5	47	EOQ to be a maximum of Y % of average monthly demand for seasonal items	R	6	1000
VEND.MIN	48	Methodology used to reach vendor minimum in the purchase order generation on module: O = increase order cycle P = proportionate	L	1	O
MAX.CYCLE	50	Maximum length of an order cycle (in months)	R	6	100
MIN.CYCLE	51	Minimum length of an order cycle (in months)	R	6	25
BRANCH.SEQ	52	Enter the branch replacement path to be used by the recommended PO generator i.e., 004,003,001 as many path combinations as needed can be entered	L	39	001
EOM.UPD	53	Should the sales update to Pmr file be run automatically during AR end of month	L	1	
PO.FRAMES	54	What is the total # of frames that can be used by the temporary purchase order work files	R	5	1000
SS.FLAT%	55	SS flat percentage	R	2	12

PRODUCT LINE PARAMETER FILE INPUT SCREEN

```
Screen Master for Windows                                          _ □ ×

File  Edit  Settings  File Transfer
                 PRODUCT LINE PARAMETER MAINTENANCE

PRODUCT LINE : ETHIC

 1. MINIMUM $                0.00        AGGREGATE TREND PERCENT :   0.00
 2. MINIMUM WEIGHT               0
 3. MINIMUM UNITS                0
 4. MINIMUM TYPE        $
 5. VENDOR             ETHIC
 6. DESCRIPTION        ETHICON SUTURES LINE
 7. PURCHASING AGENT
 8. DEFAULT PLT          2.0
 9. MIN.SALES               0
10. SS OVERRIDE          0.00
11. TREND.SOURCE
12. TRANS SHIP IND     S
13. WORK FILE SIZE     37




ENTER LINE # TO CHANGE,DELETE TO DELETE,0 TO ACCEPT   :        PAGE   1 OF  2

                                                                        Br
                                                                        k
   HELP      END     INSERT    LDELETE    PREV PG   NEXT PG   INQUIRY   ABORT
```

PRODUCT LINE PARAMETER FILE INPUT SCREEN

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│ ◖ Screen Master for Windows                                    _ □ ✕    │
├─────────────────────────────────────────────────────────────────────────┤
│ File  Edit  Settings  File Transfer                                      │
│                                                                          │
│                                                                          │
│ PRODUCT LINE : ETHIC                                                     │
│                                                                          │
│ 14.LINE 15.BRANCH 16.OVERRIDE 17.MAXIMUM  18.BUY  19.ADDITIONAL  20.ROQ  │
│                      CYCLE       CYCLE      FLOW    LEAD TIME     METHOD  │
│                                                                          │
│    1.      001       0.00        0.00       000      0.0           1     │
│                                                                          │
│                                                                          │
│  AVG SLS$/MO: 293358.70      LAST FORECAST :                            │
│   AVG UNITS :      8629      LAST PURCHASE :  06/12/94                  │
│     AVG LBS :         0       LAST CYCLE :    07/22/94                  │
│ ORDER CYCLE :      0.25                                                  │
│                                                                          │
│ 21. BRANCH SEQUENCE                      22.  TRANS SHIPPING WAREHOUSES  │
│                                                                          │
│ 1  001                                   1.                             │
│ 2  002                                   2.                             │
│ 3  003                                   3.                             │
│ 4  002,003                               4.                             │
│                                                                          │
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PRODUCT LINE PARAMETER MAINTENANCE

PROGRAM NAME   SSS.BP GEN.MASTER
                            PLINE.PARAM
SELECTION   MENU-10
SELECTION NUMBER   3
FILES ACCESSED   PLINE

OVERVIEW

This procedure is used to input the product line parameters. These factors are integral to the development of the line buy reorder quantities. This information is stored in the Pline file.

ORDER CYCLE COMPUTATION MINIMUMS

As previously discussed, order cycle days are computed based upon the product line's sales rates in comparison to the vendor minimum. The vendor minimum may be expressed in:

1.   Order Value ($)
2.   Weight
3.   Quantity

Assume the vendor's terms are 360 pieces for a freight prepaid shipment and the average monthly usage quantity for all items in that line is 180. You can purchase the line every 60 days. Similarly, if the vendor freight prepaid requirement was 10,000 lbs. and the sales rate is 10,000 lbs. per month, then the order cycle for the line would be 1 month.

If the vendor minimum is $5,000.00 per month and the sales rate is $10,000.00 per month (based on replacement cost), then the order cycle is .5 months.

The general formula is:

Order Cycle = Minimum Order Quantity
                          Any Sales/Month

Example   = $\frac{360}{180}$ = 2

Or   = $\frac{\$15,000}{\$10,000}$ = .5

PRODUCT LINE PARAMETER MAINTENANCE

Screen Field	Name	AMC	Description
	PRODUCT LINE	0	Product Line code
1	MINIMUM$	1	Vendor minimum in dollars
2	MINIMUM WEIGHT	2	Vendor minimum in weight
3	MINIMUM UNITS	3	Vendor minimum in units

4	MINIMUM TYPE	4	Type of minimum
			  W = Weight
			  $ = Dollars
			  Q = Quantity

5	VENDOR	5	Vendor purchased from. This is the vendor that the item is purchased from, used in the generation of the purchase order.
6	DESCRIPTION	6	Product line description is used for reporting.
7	PURCHASING AGENT	7	Individual purchasing agent for the product line. Each of the following fields are by warehouse. (V/M)
8	DEFAULT PLT	27	This default is used if a purchase lead time is not available in the Product Detail file. The default purchasing lead time is used if a PLT is not available in the Product Detail file, if this field is null the default PLT from Im.Param(9) will be used.
9	MIN.SALES	31	This minimum sales parameter overrides the value stored in the Im.Param(16) file. This defines the minimum unit sales quantity for the system to accept to compute order and reorder controls.

PRODUCT LINE PARAMETER MAINTENANCE

Screen Field	Name	AMC	Description
10	SS OVERRIDE	32	This percentage will override the single safety stock percentage that is in the Im.Param record, Im.Param(34). Use of this field will override the use of A,B,C,D service levels.
11	TREND SOURCE	33	Method of computing the trend on seasonal items: (I) - Use the usage data at the item level. (P) - Use the aggregate trend percentage from the Product Line file, Pline(25). (C) - Use the aggregate trend percentage from the company as stored in the Im.Param record, Im.Param(18). The aggregate trend percentages are calculated during the Inventory management sales update.
12	TRANS SHIP IND	29	This field is used in the order entry system to decide whether this product should check additional warehouses or should follow the normal substitution process: W - use next warehouse from string. S - use normal substitution process. This field can be overridden at the product level, Prod.Mast(105).

PRODUCT LINE PARAMETER MAINTENANCE

Screen Field	Name	AMC	Description
13	WORK FILE SIZE	30	Enter the size in frames of the Temporary Work files that will be created when generating PO's for this product line. Keep in mind that there are 2 files for each product line, so each product line will use twice what is entered here. Also the total number of frames used for all open product lines must not exceed the total frame usage as specified in the Im.Param record, Im.Param(55).

Parameters By Branch

Screen Field	Name	AMC	Description
14	LINE	23	Line number for following data Items
15	BRANCH	8	The remaining fields in the file are stored in a value marked fashion by branch. The operator identifies the branch to be viewed and/or updated. Certain fields can be updated, others are display only. Branch for following data items.
16	OVERRIDE CYCLE	9	Override order cycle (in months). If this field is input, then the order cycle calculation is bypassed, and this value moved to Field 19, the computed (actual) order cycle.

PRODUCT LINE PARAMETER MAINTENANCE

Screen Field	Name	AMC	Description
Parameters By Branch			
17	MAXIMUM CYCLE	10	Maximum order cycle used in purchasing program (in months to 1 decimal place). The maximum order cycle is the highest order cycle to be used in the purchasing program. In that program, the system attempts to construct a minimum order by incrementing the purchasing window by 1 until this maximum is reached.
18	BUY FLOW	11	How is this product line replenished (path of replenishment). This field defines how this branch purchases this product line: 0 = Vendor 1 = From central warehouse 2 = From another warehouse This field is used to compute the adjusted usage, on which all other system calculations are based. Obviously, if the central warehouse replenishes warehouse 2, then the usage for warehouse 2 must be considered in the calculation of ROP, ROQ, etc., of warehouse 1. (See discussion of usage calculation)

PRODUCT LINE PARAMETER MAINTENANCE

Screen Field	Name	AMC	Description
19	ADD LEAD TIME	13	Additional lead time in months if not purchased directly from the vendor. This field is used in the reorder point calculation for branches being replenished from another branch rather than directly from the vendor. Full replenishment cycle is the time for the vendor to resupply the replenishment branch, plus the time it takes to transfer the merchandise to this branch.

ex.: Branch   003
Path of replenishment   001
Additional lead time   .3
Lead time for this item in
Prod.Det for warehouse 1.5
Lead time for branch 003   1.5 + .3 = 1.8   In the case of branches resupplied via a minimum/maximum approach, Gordon Graham recommends that the lead time be set to one (1) week.

Multi-Valued Parameters

20	ROQ METHOD	15	Method of computing reorder quantity (both branch and central):

1. EOQ/line buy
2. Inventory class/ line buy
3. Minimum/maximum

PRODUCT LINE PARAMETER MAINTENANCE

Screen

Field	Name	AMC	Description
21	BRANCH SEQUENCE	16	Sequence in which to process branches in the SEQUENCE multi-branch vendor replacement environment. This field is multi-valued. Each line will be a sequence of warehouses separated by commas and will constitute one distribution sequence or path. A single warehouse may appear on only one replenishment path.
22	TRANS SHIPPING WHSE	28	Enter allowable trans-shipping warehouses for this product line. This is used in the order system when using multi- warehouse ordering to decide which warehouses to check for availability. This field can be overridden at the warehouse level, Warehouse (14) and at the product level, Prod.Mast (25)

DISPLAY ONLY

	Name	AMC	Description
	AVG UNITS	16	Computed average $/month
	AVG LBS	17	Computed average units/month
	ORDER CYCLE	18	Computed average pounds/month
	LAST FORECASE	19	Computed order cycle
	LAST PURCHASE	20	Last forecast computed
	LAST CYCLE	21	Last purchase date

PRODUCT DETAIL FILE

```
Screen Master for Windows                                    _□×
File  Edit  Settings  File Transfer
                    PRODUCT DETAIL MAINTENANCE

WAREHOUSE #: 001 NEW YORK

EX PROD #  : 101                          RED PLASTIC DESK

INVENTORY MANAGEMENT FIELDS :

          *** MANUAL OVERRIDES ***
 9.USAGE OVERRIDE                    REASON
10.ROP OVERRIDE
11.ROQ OVERRIDE                      DATE
12.SAFETY STOCK                      EXPIRATION
13.PLT OVERRIDE        0.0
14.LINE PT OVERRIDE

15.STOCKED AT WHS      Y        22.LOCATIONS  1.
16.VELOCITY            B                      2.
17.TREND SOURCE                 23.ENVIRON
18.SEASONAL                     24.RAW MAT    N
19.REPLEN METHOD
20.PO COST OVERRIDE    0.00
21.REPLENISH FLAG      000
ENTER LINE # TO CHANGE,DELETE TO DELETE,0 TO ACCEPT  :      PAGE  2 OF  2

 HELP    END    INSERT   LDELETE   PREV PG   NEXT PG   INQUIRY   ABORT   Brk
```

PRODUCT DETAIL FILE

The complete Product file documentation contains all information regarding the master file, and can be found in the master file documentation manual.

This following portion of this documentation contains the information from the Product Detail file which is relative to the inventory management system only.

The Product Detail file contains an entry for each product/warehouse in which an item is sold or stocked. This file contains basic inventory, product, and product sales movement and history.

PRODUCT DETAIL FILE

Screen Field	Name	AMC	Description
9	USAGE OVERRIDE	105	Manual usage override
10	ROP OVERRIDE	50	Manual reorder point

ROP is one of the fields used to make low stock determination. The ROP value, whether calculated by the inventory management subsystem, or manually entered is the trigger which should initiate a purchasing cycle.

11	ROQ OVERRIDE	51	Manual reorder quantity

The ROQ, whether manually entered or calculated, represents the quantity to be ordered (from the vendor) once the ROP has been reached.

12	SAFETY STOCK	55	Safety stock

Safety stock is used to control the chance that, despite the predefined i n v e n t o r y   m a n a g e m e n t determinations, the quantity on hand will reach zero before replenishment merchandise is received. The higher the safety stock level, the lower the chance an out of stock condition will arise.

13	PLT OVERRIDE	109	Manual purchase lead time

This value will override the PLT as calculated in the purchase order system. PLT can also be overridden at the Im.Param level.

PRODUCT DETAIL FILE

Screen Field	Name	AMC	Description
14	LINE PT OVERRIDE	108	Manual override at the line point
15	STOCKED AT WHS	101	Stocked at warehouse
16	VELOCITY	62	Velocity

Although it may be a manually assigned value, the velocity code is often a computed value, determined by the inventory management subsystem. The different velocity codes represent the value placed on the item usually specified as A,B,C, or D, and relate to the risk that is acceptable in determining safety stock levels

17	TREND SOURCE	101/8	Trend source

Method of computing the trend on seasonal items:

(I) - Use usage data at the item level.
(P) - Use the aggregate trend percentage from Product Line file, Pline (25).
(C) - Use the aggregate trend percentage from the company as stored in the Im.Param record, Im.Param (18).

The aggregate trend percentages are calculated during the inventory Management sales update. this field can also be set at the product line and at the company level (Im.Param).

PRODUCT DETAIL FILE

Screen Field	Name	AMC	Description
18	SEASONAL	101/7	Is this a seasonal product (Y/N) ?
			This flag can also be set at the product master level.
19	REPLEN METHOD	101/6	Replenishment method:
			1. USE EOQ/LINE POINT
			2. INVENTORY CLASS
			3. MINIMUM/MAXIMUM
20	PO COST OVERRIDE	101/5	Purchase order cost override. Enter the cost of issuing a PO for this item this value is set at the Im.Param level, Im.Param (40) only enter a value here if this product has an unusual PO cost.
21	REPLENISH FLAG	101/6	This flag is used to determine how the demand is to be adjusted. The default of 000 indicates the product will be replenished from the vendor. Otherwise the flag will be for a specific warehouse and the demand for this warehouse will be added to the demand calculated from the Product Detail record.
	REASON	101/4	Reason code
			Enter the reason for entering overrides.
	DATE	101/1	
	EXPIRATION	101/2	

PRODUCT LINE PARAMETERS -- REPORT

PROK NAME   PROK INV.MGMT.PLINE.PARAM
PROGRAM NAME   MDS.BP PLINE.PARAM.LIST008
SELECTION   MENU-10
SELECTION NUMBER   4
FILES ACCESSED   PLINE
                                 DICT PLINE

OVERVIEW
This program lists the parameters stored in the product line Parameter file (Pline).

PRODUCT LINE PARAMETERS-- LISTING
The product line parameter listing, lists all the factors stored in the Product Line Parameter file. The source of this report is the Pline file.

DATE 19 DEC 1991   ****** PRODUCT LINE PARAMETERS REPORT *****   PAGE 1

NAME	AMC	DESCRIPTION	JUST	LEN	VALUE
MIN$	1	Vendor minimum purchase in dollars	R	10	
MIN.WGT	2	Vendor minimum purchase in pounds	R	6	
MIN.UNITS	3	Vendor minimum purchase in units	R	6	
MIN.TYPE	4	Enter which minimum to use : W = Weight $ = Dollars Q = Quantity (Units)	R	1	$
VENDOR0	5	Vendor number	L	0	
DESC	6	Description of product line	L	25	
PURCH.AGENT	7	Purchasing agent	L	25	
BRANCH	8	Branch	R	3	
OVRD.ORD.CYCLE	9	Override order cycle (in months) Use this field to enter an override order cycle (will override actual order cycle)	R	5	
MAX.ORD.CYCLE	10	Maximum order cycle This is the maximum order cycle that the purchasing will use (in months)	R	5	
BUY.FLOW.CODE	11	How is this product line replenished? 000 - Vendor XXX - From Warehouse XXX	R	3	000
BKUP.WHSE	12	Backup warehouse to whom demand should be directed if vendor minimum Cannot be met	R	3	
ADD.LEAD.TIME	13	Additional lead time in months if product line purchased from backup warehouse	R	5	
ROQ.METHOD	15	Method of computing ROQ: 1. EOQ/line buy 2. Inventory class/line buy 3. Minimum/maximum	L	1	
AVG.SLS	16	Computed average dollars per month	R	9	
AVG.UNITS	17	Computed average units per month	R	6	
AVG.LBS	18	Computed average pounds per month	R	6	
ORDER.CYCLE	19	Computed order cycle (in months) if an override order cycle is entered it will override this field	R	5	
LAST.FORECAST	20	Date last forecast was computed	R	8	

DATE 19 DEC 1991   ****** PRODUCT LINE PARAMETERS REPORT *****   PAGE 2

NAME	AMC	DESCRIPTION	JUST	LEN	VALUE
LAST.PURCHASE	21	Date last purchase was made	R	8	
LAST.ORD.CYCLE	22	Date last order cycle was computed	R	8	
BRANCH.LINE	23	Branch	R	3	
SALES.TREND	25		R	6	
BRANCH.SEQ	26	Enter the branch replacement path to be used by the recommended PO generator i.e., 004,003,001. As many path combinations as needed can be entered	L	39	
D.PLT	27	The default purchasing lead time is used if a PLT is not available in the Product Detail file, if this field is null The default PLT from Im.Param (9) will be used.	R	4	
TRANS.WHSE.DESC	28	Description of transfer warehouse	L	24	
TREND.SOURCE	30	Method of computing the trend on seasonal items: (I) Use usage data at the item level (P) Use the aggregate trend percentage From the Product Line file, PLINE (25) (C) Use the aggregate trend percentage from the company as stored in the Im.Param record, Im.Param (18)	L	1	
MIN.SALES	31	This minimum sales parameter overrides the one stored in the Im.Param record, Im.Param (16)	R	5	
SS.OVRD	32	This percentage will override the single safety stock percentage that Is in the Im.Param record, Im.Param (34). Use of this field will override the use of A, B, C, D service levels.	R	6	

DEMAND CALCULATION MENU

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│ ◖                                                        _ □ ✕     │
│ File  Edit  Settings  File Transfer                                │
│        Account:BASE.10           Port: 37 Menu:INV.MGMT.CALC       │
│                                                                    │
│        Inventory Management System Demand Calculation              │
│        ─────────────────────────────────────────────              │
│                                                                    │
│         1.Update Inventory Management Sales History                │
│                                                                    │
│         2.Report Flagged Items                                     │
│                                                                    │
│         3.Product History Maintenance                              │
│         4.Clear Flags - Batch Mode                                 │
│                                                                    │
│         5.Customer Product History Adjustments                     │
│         6.Bulk Customer History Updates                            │
│         7.Compute Product Demand                                   │
│                                                                    │
│         8.Calculate Order Cycles for Product Lines                 │
│                                                                    │
│         9.Order Cycle Computation Listing                          │
│                                                                    │
│        10.Monthly Report of Frozen Items                           │
│                                                                    │
│        Enter Selection or END :                                    │
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PROCEDURE FOR RUNNING THE INVENTORY MANAGEMENT UPDATE

SELECTION   10.5

1.   The initial step in the running of the inventory management system is the computation and analysis of product sales. Entry 1 updates the current month's sales to the Product Management Record (Pmr) file. In addition, this program performs all the checks on the sales history as described later.

2.   Entry 2 prints all items with usage exceptions for review and manual modification.

3.   Entry 5 initiates the product history adjustment program. This program is used to input overrides to the raw sales data, and/or remove the exception flag. The adjusted usage is computed to attribute 6 of the Product Management record (Pmr) file.

4.   Entry 6 initiates the customer product history adjustment program. This program is used to input customer specific adjustments to the raw sales data. The adjusted usage is computed to ATTRIBUTE 6 of the Product Management Record (Pmr) file, and updated by customer to the Pmr.Cust file.

5.   Entry 7 computes the forecasted product usage, based upon the sales history, as adjusted by the inputted adjustment. Programs 5, 6, and 7 can be repeated as many times as necessary.

6.   Entry 8 computes the order cycles for each product line.

7.   Entry 9 provides a concise printout of the computed order cycles, as well as the basis of the calculation (i.e., the computed sales units, dollars, and weight by product line).

        The balance of the reorder point calculation is run from menu 10.6.

8.   Entry 10 provides an on usage report of all items whose inventory controls have been "frozen" by the purchasing department.

FIELD USAGE IN THE PRODUCT DETAIL FILE

	Computed	Manual Override
Usage	64	105
Velocity	62	
Safety Stock	54	55
Reorder Point	52	50
Reorder Quantity	53	51
EOQ	102	
Line Point	103	108
Purchase Lead Time	104	109
Stocked at this branch		101
Out of Stock Date	106	
Days Out of Stock	107	
Inventory Class	101/4	

Screen Field #	File ATTR	Description
15	101/8	TREND SOURCE
17	101/3	Reason for freeze
18	101/1	Date of freeze
19	101/2	Expiration date of freeze
20	101/7	Seasonal flag
21	101/5	Purchase order cost override
22	101/6	Replenishment method override 1. EOQ/line point 2. Inventory class 3. Minimum/maximum

FILE DESCRIPTION FOR THE PRODUCT MANAGEMENT RECORD (PMR)

ATTR	Name	Description
0	KEY	WAREHOUSE:PRODUCT CODE (Internal)
1	SALES	This is the raw sales quantity.
2	SALES.FLAG	Exception flag -- V/M
3	DAYS.OOS	Days out of stock during past month -- V/M
4	SALES.ADJ	Enter the demand for this month, will override actual demand, use customer adjustments to make +/- adjustment.
5	CUST.SALES.ADJ	Customer adjustments
6	ADJUSTED.SALES	This is the adjusted sales quantity.
7	12MO.UNITS	Total of past 12 months units. Computed by system
8	12MO.DOL	Total of past 12 months dollars. Computed by system
9	12MO.GP	Total of past 12 months profit. Computed by system
10	DEMAND	Demand forecast.
11	ADJ.DEMAND	Adjusted demand forecast adjusted to include replenishing other warehouses.
12	CUM.EXT.AMT	
19	CUST.REF	This field is a value marked string of Cust.Ref - used to xref to Prod.Mast.Cust file - for customer sales adjustments.
20	SALES.LINE	
21	SALES.PERIOD	This is the period number.
22	12MO.ORD	Number of times ordered in the last 12 months.

CUSTOMER USAGE

The customer product history adjustment procedure provides the ability to input specific customer adjustments for all 36 months of history. These values may represent contractual or other known commitments. As part of the update process, these values are used to adjust the usage calculated by the system.

Attribute 19 stores a reference to the adjustment such as customer name). The actual usage adjustments are stored in the Pmr.Cust file where the key is WHSE:PROD#: CUST.REF and are summarized in Field # 5.

19	CUST.REF	V/M String of customer reference numbers which point to Pmr.Cust file for detail on field # 5.

FILE DESCRIPTION FOR THE PMR.CUST RECORD

ATTR	Name	Description
0	KEY	Warehouse:Product#:Cust.Ref
1	CUST.SALES	Current adjustments (V/M for 36 months)
2	SALES.PERIOD	This is the period number.
3	SALES	This is the raw sales quantity.
4	SALES.ADJ	Enter the demand for this month, will override actual demand, use customer adjustments to make +/- adjustment.
5	CUST.SALES.ADJ	Current adjustments.
6	SALES.LINE	
7	ADJUSTED.SALES	This is the adjusted sales quantity.

ANALYSIS OF HISTORY

1.   HISTORY QUALIFICATION

Unusual things can occur with the history pattern on any particular item. These can be amplified when only six month's history is looked at. On the other hand, sophisticated mathematical models might tend to water down or screen out unusual occurrences that you would want your purchasing department to be alerted to.

Therefore, the approach taken in MDS is to highlight unusual situations and to bring those results to the attention of the purchasing department. The purchasing department then has a maintenance function which allows them to adjust the sales history (for inventory management purposes).

There are four basic conditions that can occur with a stocked item which will cause errors in buying if not identified:

A.   Unusual sales, transfers, etc., in a month.

B.   Stockouts that last too long.

C.   Items that only one customer buys.

D.   Items with very low sales per year.

These are the conditions that must be identified and considered apart from the normal forecasting methods. These four account for 95% of the problems in inventory control of stocked items, but affect perhaps only 20% of the items in the warehouse. If this group is controlled properly, the computer can use the six-month, rolling average usage calculation method on the other 80% of the items with very effective results. We will see how the history appears when these four problem conditions are present and discuss the suggested methodology to set effective buying controls on the items.

ANALYSIS OF HISTORY

2.   HISTORY ADJUSTMENT FOR KNOWN SALES

The history adjustment process that will be used to adjust the sales pattern discrepancies that will be identified by the system can also be used to post known future adjustments to product usage. Some examples would be:

A.   Specific customer commitments that should be added to past history computations.

B.   Lost customer situations where usage should be decreased.

C.   New products with insufficient history to allow the system to automatically calculate usage.

3.   THE NEED FOR DUPLICATE HISTORY FIELDS

It is dangerous to modify the actual sales records of a stock item's history. You might want to use the historical record for other purposes, like evaluating this supplier's total contribution to profit compared to other suppliers. But it is also wrong to let the computer use such a history to develop controls for the future. So what is the answer? Duplicate history fields.

When a month's posted activity would be misleading if used to plan future controls, a duplicate history field for that month is needed. The modified figure is entered in this duplicate field by the inventory analyst (buyer). The computer uses this field instead of the regular data in figuring usage rates and ordering controls. If that 150 sales earlier were determined to be non-recurring, the computer's files might look like this:

JULY	AUG	SEPT	OCT	NOV	DEC
37	16	9	58	30	180
				Duplicate Field:	DEC
					30

When the computer looks back at the history of this item to develop a future usage rate, it averages the 37-16-9-58-30-30. The 180 is ignored because it has been determined to be misleading.

ANALYSIS OF HISTORY

4.   SITUATIONS NOT FILTERED BY THE MDS SYSTEM

A.   EXCEPTIONAL SALES

MDS includes exceptional sales in the sales history. We agree with Gordon Graham in his belief that exceptional sales should be caught by "exception criteria formula"and reviewed by management for accuracy. Furthermore, Graham believes that a record of pure sales as well as adjusted usage should be available.

B.   LOST SALES

Lost sales are those sales which could have been made had stock been available to cover the order.

Gordon Graham feels that these sales should not be included in usage calculation, as many of these so called "lost sales" never make it to the computer anyway. They may never get written or entered into order entry, or they may get entered more than once if a customer keeps calling for the same out-of-stock item. Since it is unlikely you can prevent such occurrences and that it is impossible to capture most lost sales, Gordon feels that no lost sales should be automatically included in the usage calculation and that is the practice adopted by MDS.

ANALYSIS OF HISTORY

5.   ANALYSIS/FLAGGING OF EXCEPTIONAL SITUATIONS

The approach taken by MDS is to highlight unusual patterns of activity for review by the purchasing department.

A.   UNUSUAL SALES IN ONE MONTH

A customer comes in and buys 150 of an item when the average sales per month have been running 30. The history looks like this:

JULY	AUG	SEPT	OCT	NOV	DEC
37	16	9	58	30	180

Now what? Should the computer weight the 180 with the other figures? The real question is: Will this unusual sale recur or was it a one-time occurrence? Until that is answered, you really do not know what to do. The first thing to do, therefore, is to prevent the computer from using that history until it is approved or modified. For now, it is "disqualified". A flag is inserted by the computer itself when it finds a history like this. The flag says: "Don't make any changes on this item until a human tells you how to proceed!"

The Rule: When the last month's posted history is equal to the total of the previous five months' figures - and last month had at lease five units activity - the computer inserts the disqualification flag in that history field. Like this:

JULY	AUG	SEPT	OCT	NOV	DEC
37	16	9	58	30	180
					* - Flag

(The 5 units of activity requirement keeps the computer from flagging this history picture: 0 0 1 0 0 1.)

This calculation is controlled by the Dmd.High (5) and Dmd.Low.Units (5) parameters.

ANALYSIS OF HISTORY

5.   ANALYSIS/FLAGGING OF EXCEPTIONAL SITUATIONS (Continued)

A.   UNUSUAL SALES IN ONE MONTH (Continued)

This history is now "hung up". As long as that asterisk appears with December, the computer does not use the history to develop new usage rates and ordering controls. The flag must be removed by a human. After what? After determining whether or not the 150 sale will recur and then adjusting the history or expected usage rates depending on the answer.

If the sale is likely to recur, then the 180 history is valid by simply weighing it in with the other five months. If however, the sale is not likely to recur, then simple averaging will not yield a correct usage rate for the months ahead. The expected usage rate and the ordering controls must be set arbitrarily and then "frozen" or "locked-in". The order point and order quantity are increased and "frozen" (made off-limits to changes by the computer) until more time passes and more history is developed. Any changes must be made by a human while the controls are frozen.

B.   STOCKOUTS THAT LAST FOR TWO WEEKS OR MORE

A similar situation is present when you run out of an item and cannot resupply the stock for two weeks or more in a given month. Here's how that item's history might look:

JULY	AUG	SEPT	OCT	NOV	DEC
47	20	68	61	30	9

The problem: A stockout occurred on December 2 and lasted until December 21. Again, the history as recorded is misleading. It should not be averaged right in with the other five months to plan future controls. Sales were down because stock was unavailable not because the customers didn't want any. According to Gordon Graham, an attempt to record "usage" when it occurs; i.e., "lost" sales, etc., will open up more problems than it solves. The history shown above, therefore, is what actually was shipped and was invoiced to the customers.

ANALYSIS OF HISTORY

5.   ANALYSIS/FLAGGING OF EXCEPTIONAL SITUATIONS (Continued)

B.   STOCKOUTS THAT LAST FOR TWO WEEKS OR MORE (Continued)

The computer records the date when stock available for sales drops to zero and then the date after that when material is first received. The number of days without available stock s calculated by the system into Prod.Det (107). At end of month, the computer checks to see if the item was out of stock for as much as half the days in the month. If so, a flag is inserted in that item's history for this most recent month.

The flag serves just like the one for unusual sales: It stops the computer from doing anything with that history as it stands. All controls remain as they are until a human decides what modification to make in the item's History file.

C.   THE SINGLE CUSTOMER ITEM

A third condition that causes six-month history averaging to be invalid for future predictions: When one customer only buys the item! The item's history might look something like this:

JAN	FEB	MAR	APR	MAY	JUN
0	0	50	0	0	50

Every three months the customer orders 50 units. If the total of 100 sold in the six months were averaged, the monthly usage rate for the future would be 17 per month (100 divided by 6). Unfortunately, we sell 50 or none at all, not 17 per month! If we plug 17 into a normal order point formula, the answer might come out as 25 or so, depending on the lead time. That's just not going to work. We could have 30 pieces in stock, be above the order point, think we are in good shape on the item, and make the customer furious when he orders his usual 50 the next time.

So what should you do to prevent trouble on items like this? First, you must identify the items where only one customer buys (or perhaps dominates the sales pattern). The computer can help pick out such patterns, but the decision as to whether or not an item really has just one customer on a regular basis should be made by a knowledgeable human.

ANALYSIS OF HISTORY

C.   THE SINGLE CUSTOMER ITEM (Continued)

Next, set the order replenishment and order quantity controls to fit the customer's buying pattern . . . and then lock them in! You might decide to wait until you're at zero on hand and buy 50, or if the lead time is fairly long, get down to 50 and buy 50 . . . or 50 and 100.

D.   ITEMS WITH VERY LOW SALES PER YEAR

The fourth condition to spot in an item's history is the product that shows just one or two units sold per year, service parts, expensive merchandise held for a special account (which you have agreed to keep on the shelf regardless of the activity), or "support" type products that bring in customers for other higher volume items just because you also carry the dogs. The sales history might appear:

JAN	FEB	MAR	APR	MAY	JUN
0	0	0	0	0	0

(The only sale in the last 12 months occurred last October.)

If the total sales for the last 6 months is less than the Min.Sales parameter [Im.Param (7)], the history on this item is flagged for manual review, and the purchasing department should manually determine the order point and quantity.

An override to the value stored in Im.Param (7) is stored in Pline (9). That value is to be used if one is present.

6.   MINIMUM VALUE

To avoid unnecessary work in the purchasing department, if the unit cost of the item is less than the value stored in Im.Param (17) (i.e., $1.00), then disqualification does not occur.

UPDATE INVENTORY MANAGEMENT SALES HISTORY

PROK NAME   INV.PROK PIM.SALES.UPD008
PROGRAM NAME   INV.BP IM.SALES.UPD008
                             MDS.BP VALDIM
                             INV.BP IM.UPD.CHECK008
SELECTION   MENU-10.5
SELECTION NUMBER   1
FILES ACCESSED   SALES.2
                             COMPANY
                             WAREHOUSE
                             PARAMETER
                             PROD.MAST
                             PROD.DET
                             PLINE
                             PMR
                             DICT PMR

OVERVIEW

The initial step in the running of the inventory management system is the computation and analysis of product sales. Entry 1 off the selector performs several functions:

1.   Computes the past 12 months sales units, dollars, and profits. The source of this information is the Sales.2 file, and the result is updated to the Product Management record (Pmr) file. This information will be used in the running of the ranking process.

        UPDATE ALL SALES HISTORY OR ONLY SINCE LAST UPDATE (ALL OR CR)?

        The computation utilizes either unit sales or transfers-in based upon the status of Pline (18), if present, or Im.Param (18). In addition, used-in-production is added to the sales or transfer quantity to compute item usage.

2.   The sales units for the current year, last year, and for two years ago are updated to field number 1 of the Pmr file. Field 6 (adjusted sales) is recalculated as field # 1 plus Field # 4 plus Field # 5.

3.   This program also performs all the history analyses described below.   All exceptions are noted by the placement of an "*" in the appropriate value mark of ATT 2.

UPDATE INVENTORY MANAGEMENT SALES HISTORY

OVERVIEW (Continued)

4.   The program computes the trend percent on the total sales (in units) for the entire product line by month.

The methodology used to compute the trend is as follows:

Trend PCT = Previous "X" Months Unit Sales This Year
$$\frac{\text{Previous "X" Months Unit Sales This Year}}{\text{Corresponding "X" Months Unit Sales Last Year}}$$

"X" is a value between 1 and 12 stored in the parameter record (P11). The higher the value of "X", the less impact seasonal variation will have on the usage calculation.

The result is stored in the Product Line file Pline (25).

NOTE: Although available on the selector, this process is part of the end of month close and will run automatically once a month.

OPERATING INSTRUCTIONS

INVENTORY MANAGEMENT SALES HISTORY UPDATE

UPDATE ALL PERIODS OR ONLY SINCE LAST UPDATE (ALL,<CR>,END)

Hit 'RETURN' for all periods or 'END' to return to the selector.

REPORT FLAGGED ITEMS

PROGRAM NAME   INV.BP IM.SALES.RPT008
SELECTION   MENU-10.5
SELECTION NUMBER   2
FILES ACCESSED   PMR
                             COMPANY
                             WAREHOUSE
                             PARAMETER
                             PROD.MAST
                             PROD.DET
                             PLINE
                             VEND.MAST
                             SALES.FLAG

OVERVIEW

This report lists all items with flagged history so that purchasing can review the items and make adjustments as appropriate.

Selection Criteria:

> Only Items with Flagged History or All
> One Warehouse or All
> One Product Line or All
> Beginning Period
> Ending Period

Sort Sequence

> Product Line
> Warehouse
> Product Code

OPERATING INSTRUCTIONS

ENTER BEGINNING FISCAL MONTH (YYMM)

Enter the beginning fiscal month.

REPORT FLAGGED ITEMS

OPERATING INSTRUCTIONS (Continued)

ENTER ENDING FISCAL MONTH (YYMM)

Enter the ending fiscal month.

ENTER WAREHOUSE OR <ALL>

Enter warehouse number or 'ALL' for all warehouses.

ENTER PRODUCT LINE OR <ALL>

Enter product line or 'ALL' for all product lines.

DO YOU WANT ONLY FLAGGED ITEMS (Y/<CR>/N)

(Y - only flagged items N or <CR> all items)

Print Contents

Header: Product Line Code and Description
Vendor Purchased From - Code and Name

Detail Line:
Product Code and Description

Note: The report displays in column-wise fashion data for the specified periods.
The report displays all adjustments in a summary fashion. If the entered
range of periods extends to the future, the report will display only the
projected adjustments for those periods.

Actual Usage	PMR (10)
Adjusted Usage	PMR (11)
Exception Flag	PMR (2)
Days Out of Stock	PMR (3)
Raw Sales	PMR (1)
Manual Sales Adjustments	PMR (4)
Customer Sales Adjustments	PMR (5)
Adjusted Sales	PMR (6)

REPORT FLAGGED ITEMS

```
TIME:   2:00pm                      INVENTORY MANAGEMENT FLAGGED HISTORY REPORT                    PAGE;     1
DATE:  10/10/97                              FROM PERIOD 9710 TO 9710
PRODUCT LINE:   ETHIC ETHICON SUTURES LINE
VENDOR:         ETHIC      ETHICON
```

PRODUCT NUMBER DESCRIPTION	DEMAND	ADJUSTED DEMAND	MONTH	FLAG	DESCRIPTION	DAYS OOS	SALES UNITS	SALES OVERRIDE	SALES ADJUST	ADJUSTED SALES
5-C004D SILK BLK BRD	320	320	OCT97	00						
E-C046D SILK BLK BRD	335	335	OCT97	00						
E-C053D SILK BLD BRD	309	309	OCT97	00						
E-C066D SILK BLK BRD	423	423	OCT97	00						
TOTAL WAREHOUSE: 001 NEW YORK	1387	1387								
TOTAL PROD LINE: ETHIC	1397	1387								
GRAND TOTAL	1387	1387								

PRODUCT HISTORY MAINTENANCE

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│ File  Edit  Settings  File Transfer                                        │
│                  PRODUCT HISTORY ADJUSTMENT                                │
│                                                                            │
│ WAREHOUSE       NNN                                                        │
│ PRODUCT                                                                    │
│                                                                            │
│                 RAW                     TOTAL      ADJUSTED                 │
│  1.    PERIOD   SALES   SALES OVERRIDE  CUST ADJ    SALES        SALES FLAG │
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PRODUCT HISTORY MAINTENANCE

PROGRAM NAME   SSS.BP GEN.MASTER
                            SALES.HISTORY
                            SALES.HISTORY.OPEN
                            SALES.HISTORY.READ
                            SALES.HISTORY.EXIT
SELECTION   MENU-10.5
SELECTION NUMBER   3
FILES ACCESSED   PMR   ROP.AUDIT
                            COMPANY   DICT PMR
                            WAREHOUSE   DICT EOQ.AUDIT
                            PROD.MAST   DICT ROP.AUDIT
                            PROD.DET
                            PLINE
                            PARAMETER
                            EOQ.AUDIT

OVERVIEW
The history override process is used to override the sales pattern of products to account for:

1.   Review and modification of the usage of "flagged" items.

2.   Unusual situations when the usage needs to be adjusted or overridden.

3.   Total customer adjustments is displayed for reference purposes only. Specific customer adjustments may be input using the customer product history adjustment program (OPTION 5).

4.   The raw sales, demand and sales flag will be displayed. You can enter a line number to enter sales override. This will affect the adjusted demand. The sales flag can also be changed.

The screen will allow adjustment to 36 months of usage:

CLEAR FLAGS - BATCH MODE

PROK NAME   INV.PROK INV.C.FLAGS.B
PROGRAM NAME   INV.BP IM.FLAG.CLEAR008
                                   MDS.BP VALDIM
                                   INV.BP IM.UPD.CHECK008
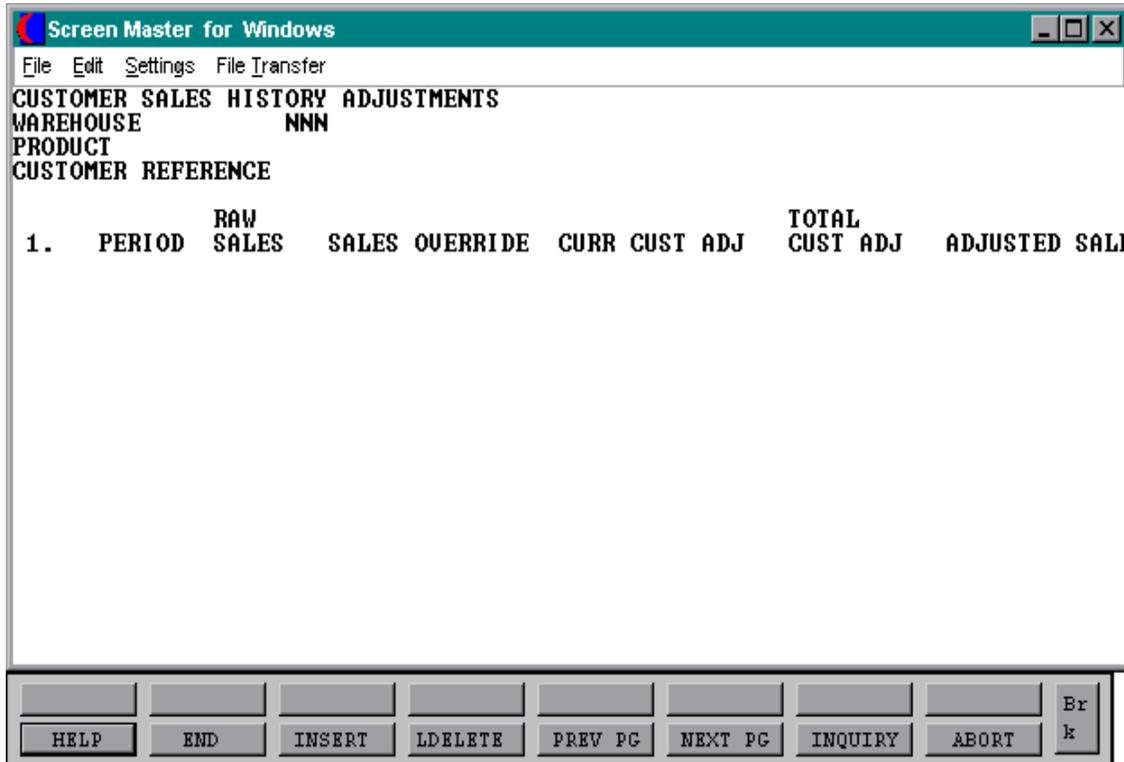SELECTION   MENU-10.5
SELECTION NUMBER   4
FILES ACCESSED   PMR
                                   COMPANY
                                   WAREHOUSE

OVERVIEW
This program is used to clear out the sales flags up to an input period.

OPERATING INSTRUCTIONS

INVENTORY MANAGEMENT SALES FLAG CLEAR - **NOW RUNNING
CLEARS ALL FLAGS UP TO AND INCLUDING ENTERED PERIOD
ENTER FISCAL PERIOD TO CLEAR (YYMM)**

Enter the fiscal period to clear.

CUSTOMER PRODUCT HISTORY ADJUSTMENTS
AND
BULK CUSTOMER HISTORY UPDATES

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│ CUSTOMER SALES HISTORY ADJUSTMENTS                                      │
│ WAREHOUSE            NNN                                                │
│ PRODUCT                                                                 │
│ CUSTOMER REFERENCE                                                      │
│                                                                        │
│                 RAW                              TOTAL                  │
│  1.    PERIOD   SALES    SALES OVERRIDE  CURR CUST ADJ  CUST ADJ   ADJUSTED SALI │
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CUSTOMER PRODUCT HISTORY ADJUSTMENTS

PROGRAM NAME	SSS.BP GEN.MASTER
	CUST.HISTORY
	CUST.HISTORY.OPEN
	CUST.HISTORY.READ
	CUST.HISTORY.WRITE
SELECTION	MENU-10.5
SELECTION NUMBER	5

FILES ACCESSED	PMR	ROP.AUDIT
	PMR.CUST	EOQ.AUDIT
	COMPANY	DICT PMR
	WAREHOUSE	DICT ROP.AUDIT
	PROD.MAST	DICT EOQ.AUDIT
	PROD.DET	
	PLINE	
	PARAMETER	

OVERVIEW
The customer product history adjustment program is used to adjust the sales pattern of products to account for specific customer commitments that are to be accounted for in the calculation of usage. Adjustments are updated to the Pmr record in summary, and to the Pmr.Cust file in detail by customer.

OPERATING INSTRUCTIONS
After entry of warehouse, product and customer, the sales and adjustment information will be displayed. You may then adjust the current adjustments.

The screen will allow adjustment to 36 months of usage:

BULK CUSTOMER HISTORY UPDATES

PROGRAM NAME   SSS.BP GEN.MASTER
                        CUST.HISTORY
SELECTION   10.5
SELECTION NUMBER   6
FILES ACCESSED   PMR   EOQ.AUDIT
                        PMR.CUST   ROP.AUDIT
                        COMPANY   DICT PMR
                        WAREHOUSE   DICT EOQ.AUDIT
                        PROD.MAST   DICT ROP.AUDIT
                        PROD.DET
                        PLINE
                        PARAMETER

OVERVIEW
The bulk customer history update program is used to adjust the sales pattern of products
to account for specific customer commitments that are to be accounted for in the calculation
of usage. Adjustments are updated to the Pmr record in summary, and to the Pmr.Cust
file in detail by customer.

OPERATING INSTRUCTIONS
After entry of warehouse, product and customer, the sales and adjustment information will
be displayed. You may then adjust the current adjustments.

The screen will allow adjustment to 36 months of usage:

COMPUTE PRODUCT DEMAND

PROK NAME	INV.PROK PIM.DEMAND.UPD008
PROGRAM NAME	INV.BP IM.DEMAND.UPD008
	MDS.BP VALDIM
	INV.BP IM.UPD.CHECK008
SELECTION	MENU-10.5
SELECTION NUMBER	7
FILES ACCESSED	PMR
	COMPANY
	WAREHOUSE
	PARAMETER
	PROD.MAST
	PROD.DET
	PLINE

OVERVIEW

Once the history has been qualified, reviewed, and adjusted, the last step in the actual calculation is the estimation of product usage. MDS uses past history to estimate future usage. Following is a discussion of the methodology used by MDS in the development of product usage.

NUMBER OF MONTHS OF SALES HISTORY USED

In keeping with Gordon Graham's first commandment to keep the system understandable to purchasing personnel, MDS applies simple averaging techniques to past sales statistics to estimate current month's usage. MDS maintains three years of item usage history. The MDS user selects the number of months to use in the averaging via the Parameter file.

In the case of nonseasonal items, the system uses the past "N" months of history. (Gordon Graham recommends using 6 months.) The philosophy being that the best predictor of usage this coming month is how much you sold in the very few past months.

DEC	JAN	FEB	MAR	APR	MAY	JUNE
12	22	19	26	24	23	?

The average is 130, which divided by 6 equals 21.67 (rounded to 22), (assuming "N" is set to 6).

COMPUTE PRODUCT DEMAND

NUMBER OF MONTHS OF SALES HISTORY USED (Continued)
For seasonal items, which are defined as items with 80% of their sales coming within a six (6) month period, the system looks at two things:

       a.   the trend on this item this year versus last year, and

       b.   the sales of this item in the coming months of last year.

The theory being that the best predictor of item usage in a seasonal item is how well it did in the corresponding months last year, adjusted by the trend of the item this year versus last year.

The computation of this trend can occur in one of two ways. If Parameter (19) is set to "I", the item's usage determines the trend as described below. If Parameter (19) is a "P", the trend percentage is obtained from Pline (25) or Parameter (18), if Pline (25) is null.

Normally, a smaller number of months is selected for the seasonal window, since otherwise the seasonal impact on sales is masked by the other months. (Gordon Graham recommends that this factor be left at 6 for industrial supply organizations.) Therefore, MDS has established a separate parameter for this purpose. In the following example, a number of months of 3 has been selected.

$$\text{Trend Pct} = \frac{\text{Previous "X" Months Units Sales This Year}}{\text{Corresponding "X" Months Units Sales Last Year}}$$

"X" Is a value between 1 and 12 months and is stored in the Parameter record (P11). The higher the value of X, the less impact seasonal variation will have on the usage calculation.

$$\text{Base Amount} = \frac{\text{next "X" months sales last year}}{X}$$

$$\text{Usage} = \text{base amount} * \text{trend percentage}$$

COMPUTE PRODUCT DEMAND

NUMBER OF MONTHS OF SALES HISTORY USED (Continued)
Thus, if three months is selected as the value of X, and the sales pattern is as follows:

	MAR	APR	MAY	JUN	JUL	AUG
1989	26	24	23	?		
1988	30	25	15	27	32	34

Trend Pct   =   (26+24+23)/(30+25+15) = 1.04

Base Amount =   (27+32+34)/3   =   31

Usage   =   1.04 * 31   =   32

Product usage can be manually set in Prod.Det (105). If overridden, the calculation is not performed. The result of the usage calculation is stored in Prod.Det (64) and Pmr (9).

ADJUSTED USAGE CALCULATION AND MULTIBRANCH PURCHASING
Once product usage has been calculated for all products, the next step is to determine adjusted usage.

The adjusted usage is the total of:

1.   the usage of the warehouse itself, plus

2.   the usage of all warehouses replenished from this warehouse.

To illustrate, in a central warehouse environment, the adjusted usage will be the total sales of the product from the central warehouse, plus the usage of all warehouses replenished from the central warehouse. (From the path of replenishment code in the Product Line file.)

Therefore, the next step in the calculation is to select the Pmr file by warehouse by product. Adjusted usage is computed as follows:

COMPUTE PRODUCT DEMAND

ADJUSTED USAGE CALCULATION AND MULTIBRANCH PURCHASING (Continued)

If the path of replenishment code equals "0", meaning the item is purchased directly from the vendor, usage is added to adjusted usage of the same record [i.e., A(9) is added to A(10)].

If the path code is not 0, then usage is added to adjusted usage of both that warehouse as well as the warehouse replenishing the warehouse being processed.

example:

WHSE	Product	Path	Action
003	ABC	0	Add to adjusted usage of warehouse 3
003	ABC	1	Add to usage of warehouse 1 (the central warehouse) and add to the adjusted usage of warehouse 3

The reason that the usage is added to the adjusted usage of both warehouses 1 and 3 in the above example is because:

1.   Warehouse 0 must consider warehouse 3's usage in developing its reorder point and quantity.

2.   Warehouse 3 must have a usage to request the replenishment of its inventory via transfer from warehouse 1 as necessary.

If the warehouse is coded not to stock this product (flag in Product Detail record), then the adjusted usage of warehouse 3 is set to 0 since it should not be ordered, and the usage added to the warehouse specified in the path of replenishment, if one is present.

It should be noted that the sum of adjusted usage will exceed the actual total usage if warehouses replenish one to another rather than purchase directly from the vendor.

In a distributive purchasing environment, each branch will purchase directly from the vendor based on what it generates in sales for the vendor's line. In this case, the path of replenishment should be set to 0 (purchase from vendor), and the adjusted usage will be exactly the same as the product usage.

COMPUTE PRODUCT DEMAND

SINGLE BRANCH AND MULTIBRANCH PURCHASING

MDS is designed to operate in a multibranch environment. As was explained in the previous section, the adjusted usage, upon which all the remaining system calculations will be based, is sensitive as to whom that branch is servicing, i.e., only its customers only, or another branch's usage as well.

These usage numbers will be converted into reorder point and reorder quantities (as will be explained in following sections). Therefore, the reorder mechanism will match how the purchase must occur enough to satisfy the 1 branch, or to satisfy the group of branches serviced from this warehouse.

CALCULATE ORDER CYCLES FOR PRODUCT LINES

PROK NAME   INV.PROK PIM.CYCLE.UPD008
PROGRAM NAME   INV.BP IM.CYCLE.UPD008
                                 MDS.BP VALDIM
                                 INV.BP IM.UPD.CHECK008
SELECTION   10.5
SELECTION NUMBER   8
FILES ACCESSED   PMR
                                 COMPANY
                                 PARAMETER
                                 PROD.MAST
                                 PROD.DET
                                 PLINE
                                 WAREHOUSE

OVERVIEW
Once product usage has been calculated, the appropriate review cycle for each product line can be calculated.

1.   **COMPUTED ORDER CYCLE**

As previously discussed, the order cycle is computed based upon the product's total sales compared to the vendor minimum expressed in units, dollars, or weight.

In a central warehousing environment, the order cycle will be calculated based on the total sales for a line from the central warehouse, plus the usage of all warehouses replenished from the central warehouse. (From the path of replenishment code in the Product Line file.)

The system has computed the total of sales usage and has stored the result in the adjusted usage field of the Pmr.

2.   **ORDER CYCLE COMPUTATION**

The next step in the computation is the computation of the order cycle. This is done by warehouse and product line. The Pmr file is retrieved by warehouse and product.

Based upon the type of minimum specified in the Product Line file [Pline(6)], the minimum is calculated.

CALCULATE ORDER CYCLES FOR PRODUCT LINES

OVERVIEW (Continued)

2.   ORDER CYCLE COMPUTATION (Continued)

The general rule is:

Order Cycle (in months) =   Vendor Minimum
                                 Avg Sales/Month

Where the minimum is expressed in units (as stored in file), dollars (units times purchase cost), or weight (units times product weight stored in the Product Master file).

Assuming the minimum is $300 and the average sales per month is $150.

Order Cycle = 300 = 2 Months
              150

Similarly, if an average of 180 pieces are sold per month of a line and the vendor minimum is 360, it will take 2 months of selling to be in a position to buy without having to pay for freight.

If 10,000 lbs. of a line are sold per month and the vendor terms are 10,000 lbs. per purchase order for prepaid freight, it will take 1 month of selling to achieve a freight paid status. Lastly, if $10,000 at cost per month is sold for a line and the vendor's terms are $5,000 for prepaid freight, your order cycle would calculate to .5 months.

3.   MINIMUM/MAXIMUM

On the inventory management parameters screen, items 32, "Max.Cycle", and item 33, "Min.Cycle", set specific constraints for order cycle calculation.

Why do we need constraints on the order cycle calculation? Perhaps some examples would help to answer the question. If a vendor minimum was only $100 and your sales people sold that in a day, your order cycle would calculate out to .03 months. Unless you want to place a purchase order every day, it makes sense to have a minimum order cycle day parameter of .25 months. On the other end of the spectrum, why have a maximum order cycle parameter?

CALCULATE ORDER CYCLES FOR PRODUCT LINES

OVERVIEW (Continued)

3.   MINIMUM/MAXIMUM (Continued)

Lets say your vendor terms were 500 pieces to get freight prepaid and all the extra 5s, and your sales people were selling 100 per month. This would calculate out to a 5 month order cycle which would significantly lower your turnover due to the very high line point that would result. Setting an upper limit on your order cycle keeps the line point in line relative to your turnover goals; however, the unit cost would go up since you would not be reaching your vendor terms for maximum discount.

Perhaps it would be a good idea to run a report off the Pline file of all product lines at the maximum order cycle to let the sales people know where their efforts are lacking in sales. If they can't increase sales, they will stay noncompetitive due to the high unit cost. The hard but unavoidable choice is should we be stocking these products? In any case, an example of a maximum order cycle parameter might be 2 months.

4.   UPDATE TO THE PLINE FILE

The results of the calculations are updated to the Pline file, stored in months to 2 decimal places. If an override order cycle is stored in the record, it will be used instead of the computed result. It should be noted that the file is value marked by warehouse.

ORDER CYCLE COMPUTATION LISTING

PROK NAME   INV.PROK PIM.CYCLE.RPT008
SELECTION   MENU-10.5
SELECTION NUMBER   9
FILES ACCESSED   PLINE

OVERVIEW

Entry 9 provides a concise printout of the computed order cycles, as well as the basis of the calculation (i.e., the computed sales units, dollars, and weight by product line).

PRODUCT LINE ORDER CYCLE LISTING

This report will print in vendor product line sequence.

The data elements to appear on this report will be:

> Vendor Code and Name
>
> Product Line Code and Description
>
> Average Monthly Sales in Units
>
> Average Monthly Sales in Cost Dollars
> (based on last purchase cost)
>
> Average Monthly Sales in Pounds
> (based on the weight in the Product file)
>
> Vendor Minimum Type and Amount
>
> Percent of Minimum Sold in a Month
>
> Computed Order Cycle
>
> Override Order Cycle if present in the PLINE file

ORDER CYCLE COMPUTATION LISTING

OPERATING INSTRUCTIONS

PRODUCT LINE ORDER CYCLE LISTING
HIT <RETURN> TO CONTINUE OR END

SORT OPTIONS:

1.   BY VENDOR BY PRODUCT LINE
2.   BY VENDOR BY WAREHOUSE BY PRODUCT LINE
3.   BY VENDOR BY WAREHOUSE BY PRODUCT LINE FOR A SPECIFIC
**   WHSE**

If you select options 1 and 2 the listing will print. If you select option 3 you will be prompted:

ENTER WAREHOUSE # OR END

Enter 3 digit warehouse number.

ORDER CYCLE COMPUTATION LISTING

VENDOR: A4000 AIRWICK MFG CO.

PRODUCT LINE	DESCRIPTION	MIN.TYPE	MIN.AMT	BRANCH	AVG SLS$/MO	AVG UNITS	AVG LBS	MIN.PCT	ORDER CYCLE	OVERRIDE ORDER CYCLE
A40001	ROOM DEODORIZER	$	1400000	001	31562.12	741	2964	0.21	0.44	0.00
				002					0.25	0.00
				003					0.25	0.00
A40002	CARPET FRESHENERS	$	500000	001	44776.80	583	9328	1.86	0.25	0.00
				002					0.25	0.00
				003					0.25	0.00

***

MONTHLY REPORT OF FROZEN ITEMS

PROK NAME   INV.PROK PIM.FRZ.ITEM.RPT008
PROGRAM NAME   INV.BP IN.FRZ.ITEM.RPT008
SELECTION   MENU-10.5
SELECTION NUMBER   10
FILES ACCESSED   PROD.DET
                                  SALES.FLAG
                                  COMPANY
                                  PMR
                                  PROD.MAST
                                  SALES.2
                                  PLINE

OVERVIEW

When an item's usage history is disqualified because of an unusual pattern, the reason for as well as the date of disqualification are written to the Product Detail file.

If the disqualification is removed via the maintenance program, the corresponding data is deleted from the Product Detail file.

The buyer has the option of inserting manual controls and a freeze date in the product detail file via maintenance. Frozen items will not have their reorder points and/or reorder quantities computed. Monthly, the following report of items with frozen controls will be provided.

FROZEN ITEM LISTING

Sorted by:

  Buyer
  Item Number and Description
  Product Line
  Why Item Was Frozen
  Date of Freeze
  Date Freeze Will Expire
  Why History Disqualified
  Date of Disqualification
  Last Six Months of Actual Usage History

MONTHLY REPORT OF FROZEN ITEMS

OPERATING INSTRUCTIONS

REPORT OF FROZEN ITEMS
HIT <RETURN> TO CONTINUE OR END

Hit 'RETURN' to continue or 'END' to return to the selector.

ENTER BEGINNING DATE FOR FROZEN ITEM LISTING (MM/DD/YR):
ENTER ENDING DATE FOR FROZEN ITEM LISTING (MM/DD/YR):

Enter the beginning and ending dates for the frozen item listing.

MONTHLY REPORT OF FROZEN ITEMS

01:51:50pm   26 OCT 1997   FROZEN ITEM LISTING   PAGE   1

ITEM#	DESCRIPTION	BUYER	PLINE	WHY FROZEN	FRZ DATE	EXP DATE	WHY HIST DISQUALFD	6 MO USG
401	WHEEL 24" SPOKED		D10001	SADF	07/21/97	12/31/97		0
402	WHEEL 26" SPOKED		D10002	SADF	07/21/97	13/31/97		0

REORDER POINT CALCULATION MENU

```
┌──────────────────────────────────────────────────────────────────────┐
│ ◖                                                         _ □ ✕        │
├──────────────────────────────────────────────────────────────────────┤
│ File  Edit  Settings  File Transfer                                    │
│         Account:BASE.10          Port: 37 Menu:INV.MGMT.RP.CALC         │
│                     Inventory Management System                         │
│                     Reorder Point Calculation                           │
│                     ─────────────────────────                           │
│                                                                         │
│                                                                         │
│               1.ABC Ranking Reports                                     │
│                                                                         │
│               2.Assign ABC Rankings to Products                         │
│                                                                         │
│               3.Compute Reorder Points, Line Points                     │
│                    and Reorder Quantities (EOQ)                         │
│                                                                         │
│               4.ROP and ROQ Proof Listing                               │
│                                                                         │
│               5.Copy Manual ROP and ROQ to Actual Fields                │
│                                                                         │
│                                                                         │
│                                                                         │
│               Enter Selection or END :                                  │
│                                                                         │
├──────────────────────────────────────────────────────────────────────┤
│ │ OE │  │ VE │  │ MAINT │ │ EMAIL │ │ AUDIT │      │ CAPT ON │ │ VIEW │ Br │
│ │ HELP │ │ END │ │ INSERT │ │ LDELETE │ │ PREV PG │ │ NEXT PG │ │ INQUIRY │ │ ABORT │ k │
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PROCEDURE FOR RUNNING THE INVENTORY MANAGEMENT UPDATE

SELECTION   10.6

1.   Entry 1, the reorder point calculation phase is initiated by the ABC reports These reports are run to determine where the cutoff for A B and C items should occur. The ranking can be based on sales units, sales dollars, gross profit extended cost, or number of times ordered.

2.   Based upon the results of the ranking reports, a decision is reached as to where the cutoffs should be. Entry 2 allows the user to specify where the cutoffs should occur, and update the computed inventory movement code to the Product file.

   The program can assign the cutoffs based on any of the ranking criteria. The operator can specify if the four grouping A, B, C, D scheme is to be used, or the 13 group classification system advocated by Gordon Graham.

   If you plan on using both EOQ and inventory class ROQ methods, then you must perform both ABC and 13 inventory class updates.

3.   Entry 3 is the next step is the actual computation of the reorder points and reorder quantities, the results are updated to the Product file for use in the inventory control module.

4.   Entry 4 the proof listing can then be run to review the results of the computer calculation. If desired, these results can be manually overridden using product file maintenance. However, the update must once again be run, to move the manual overrides to the system's "LIVE" fields.

5.   Entry 5 on the selector is provided for those customers not wishing to make use of the automated inventory management system. This program simply moves the manual override data into the system live fields. It should not be used if the computer generated system is in use.

ABC RANKING REPORTS

PROK NAME   INV.PROK PABC.RANK.RPT
SELECTION   MENU-10.6
SELECTION NUMBER   1
FILES ACCESSED   PROD.DET

OVERVIEW

Since inventory is expensive to carry, the more important the item, the higher the safety stock to be maintained. Normally, items are categorized into A, B, C, and D items and a service level goal (percent of time inventory is in stock) established. Obviously, "A" items should be assigned a higher service level than "B" items, etc. This code is referred to as the velocity code.

Ranking reports on items can be obtained based upon sales units, sales dollars, sales value (units * cost), number of hits (times ordered) or gross profit. These reports are then used to determine where the cutoff for the A, B, and C items should occur.

OPERATING INSTRUCTIONS

ABC RANKING REPORT
----

1. **UNIT VOLUME**
2. **SALES VOLUME**
3. **GROSS PROFIT**
4. **SALES AT COST**
5. **NO OF TIME ORDERED**
6. **13 CLASS METHOD**

ENTER RANKING SELECTION OR 'END:

Enter ranking selection or 'END' to return to the selector.

ABC RANKING REPORTS

WHSE	ITEM NO	ITEM DESC	CNT	VEL	QTY SOLD 12 MONTHS
001	LEUKOFLEX	SURGICAL TAPE	1	A	12470
001	E-C570D	NYLON BLD BRD	2	A	11313
001	E-C572D	NYLON BLD BRD	3	A	9597
001	E-Y110G	MONOCRYL	4	A	7710
001	E-C063D	SILK BLK BRD	5	A	6750
001	E-TPW52	TEMP CARDIAC PACING WIRE	6	A	6703
001	AURGITAPE	SURGICAL TAPE	7	B	5500
001	AQUASONICE	ULTRASOUND TRANS GEL	8	B	5480
001	AQUA-0108	0.25 LITER ULTRASND GEL	9	B	5367
001	ARWKSU-RE	AQUASONIC 60G DOPPLER GEL	10	B	5287

ASSIGN ABC RANKINGS TO PRODUCTS

PROK NAME   INV.PROK PRANK.UPD
PROGRAM NAME   INV.BP RANK.UPD
                         MDS.BP VALDIM
                         INV.BP IM.UPD.CHECK008
                         INV.BP RANK.UPD.SETUP
                         INV.BP INV.CLASS.RANK008
SELECTION   MENU-10.6
SELECTION NUMBER   2
FILES ACCESSED   PROD.DET
                         PROD.MAST
                         PARMETER

OVERVIEW
Based upon the results of the ranking reports, a decision is reached as to where the cutoffs should occur. This program allows the user to specify where the cutoff should occur, and updates the computed inventory movement code to the Product file.

The cutoffs may be specified in terms of any of the six criteria:

1.   Sales Units
2.   Sales Dollars
3.   Gross Profit
4.   Extended Cost Value (Unit Sales * Unit Cost)
5.   Number of Hits (Number Of Times Ordered)
6.   13 Class Method

OPERATING INSTRUCTIONS
The first screen that appears asks on what basis the ranking is to be determined. The program excludes from consideration any item which has not sold $10.00 based upon extended cost. After the sort, the program asks on which basis the inventory movement codes should be assigned. The program prompts for the cutoffs for A items, B items, etc. For example, if it is determined that "A" item will be the first 500 products, "B" the next 500, "C" the next 1000, and the remaining items to be assigned a code of "D", the following responses should be given:

1.   Enter 'A' item cutoff number 500
2.   Enter 'B' item cutoff number 1000
3.   Enter 'C' item cutoff number 2000

ASSIGN ABC RANKINGS TO PRODUCTS

OPERATING INSTRUCTIONS (Continued)
The program proceeds by branch by product to assign the velocity codes.

If the 13 class method is in use enter the following:

ENTER COST SOURCE:

1.   Standard Cost
2.   Current Cost
3.   Average Cost

ENTER THE DEAD ITEM CUTOFF IN DOLLARS

ASSIGN ABC RANKING INPUT SCREEN

13 CLASS METHOD

1.   Separately for all stock items in each branch, multiply the annual usage in units by
        the selected ranking criteria, i.e., unit cost, to determine the annual dollar amount
        moving through the inventory for each item.

                100 Units Sold in a Year x 4.20 Cost = $420

2.   Sequence all items according to the dollar-movement answers. The best items with
        most dollars moving through the inventory are at the top of the list. Zeros are all
        at the bottom.

3.   Decide where the "Dead" item breakpoint is to be. Suggestion: Any item that sells
        less than $10 at cost for a whole year is considered "D" class (dead, defunct, dog,
        etc.).

4.   Assign each item remaining on the list (after the D's are removed from the bottom)
        an inventory class as follows:

        Top   7-1/2% of the items   - Class 1
        Next   7-1/2%   - Class 2
        Next   10%   - Class 3
        Next   10%   - Class 4
        Next   8%   - Class 5
                         8%   - Class 6
                         8%   - Class 7
                         8%   - Class 8
                         8%   - Class 9
                         8%   - Class 10
                         8%   - Class 11
        Last   9%   - Class 12

                        100%

        The percentages are of the total number of items on the list. If, for example, you
        had 5,000 items remaining in the study after taking out the D's, class 1 would have
        7-1/2% of 5,000 or 375 items. Class 2 would also have 375. Class 3 would have 500
        items, etc. The result is updated to the Product Detail file, PD101 MV9. This field
        will have a value of 1-13.

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

PROK NAME   INV.PROK PIM.ROP.UPD008
PROGRAM NAME   INV.BP IM.ROP.UPD008
                                   MDS.BP VALDIM
                                   INV.BP IM.UPD.CHECK008
SELECTION   MENU-10.6
SELECTION NUMBER   3
FILES ACCESSED   PMR
                                   COMPANY
                                   WAREHOUSE
                                   PARAMETER
                                   PROD.MAST
                                   PROD.DET
                                   PLINE

OVERVIEW
This is the procedure that actually computes the reorder point, line point, EOQ and reorder quantity for each item.

ESTABLISHING THE REORDER POINT
The reorder point is the quantity at which time an order for new merchandise should be placed.

As previously discussed, each branch may be purchasing from the vendor directly (by flow code 0), or may be resupplied from another branch via a transfer. This is indicated by a flow code unequal to 0. The following discussion is for branches supplied directly from the vendor. At the end of the section, the transfer process will be reviewed.

The formula used is:

                       [Administrative + Purchase] * Usage + Safety
        Reorder Point=   [Lead Time   Lead Time]   Stock

This formula is designed to maintain enough on hand stock to cover the sales during the period of replenishment. This period is the time it takes to administer the inventory, review the reports and issue a purchase order. In addition, the time it takes the vendor to receive the PO and deliver goods to your warehouse is taken into account.

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

ESTABLISHING THE REORDER POINT (Continued)

The safety stock is an extra "FUDGE" factor to cover greater than anticipated usage for an item. Obviously, the higher the safety stock, the less chance that a stock out will occur, but of course, the greater your investment in inventory. Either the ROP or safety stock may be manually set in the Product file and, if so, the respective calculations are bypassed.

1.   OVERRIDE

The reorder point, reorder quantity and safety stock may be manually loaded through product detail maintenance. If manually inputted, the system copies the input reorder point to the "LIVE" corresponding fields.

2.   ADMINISTRATIVE LEAD TIME

Administrative lead time (ALT) is a constant stored in the Parameter record. [Im.Param(8)]

3.   PURCHASE LEAD TIME

Purchase lead time (PLT) is input into the Product Detail record (PD104) and updated through the purchase order receiving module. An override PLT may also be stored in Prod.Det 109. A default lead time is stored in the Parameter record [Im.Param(9)], which is used only if a lead time is not available in the Product record. All lead times are stored to one decimal place in months.

New lead times are filtered to include only those lead times within reasonable limits (minimum and maximum disqualifying percentages).

An exponential smoothing technique is used to calculate the new lead time. "ALPHA", the smoothing constant, is stored in the Parameter file (Im.Param 10). It defines how much weight is to be given to the most recent receipt. It is suggested that this value be in the range of .3-.5.

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

ESTABLISHING THE REORDER POINT (Continued)

4.   SAFETY STOCK

Safety stock is the heart of the inventory system since it is the "FUDGE" factor which determines the level of additional stock to be inventoried to insure against stock outs. Since inventory is expensive to carry, the more important the item, the higher the safety stock to be maintained. Normally, items are categorized into A, B, C, and D items and a service level goal (percent of time inventory is in stock) established.

Obviously, "A" items should be assigned a higher service level than "B" items, etc. this code is referred to as the velocity code. These factors are stored in the Im.Param file, ATTR 30-33.

Alternately, in accordance with Gordon Graham's approach, a single safety factor may be established (he suggests 50%). These are stored at:

        Product Detail   PD55
        Product Line   PLINE29
        Parameter   P34

If a value is stored in any of the above fields, it supersedes the ABC calculation. If the 1-13 inventory classification method is in effect, then the single safety factor must be used.

5.   SERVICE LEVELS AND SAFETY STOCK

The system permits the setting of service level objectives by velocity code. Each user establishes his own criteria. One typical set of goals might be:

Velocity Code	Service Level Objective	Stock Required %
A	93%	74%
B	85%	52%
C	75%	34%
D	50%	0%

These values are stored in the Inventory Management Parameter record as well.

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

ESTABLISHING THE REORDER POINT (Continued)

6.   ROP COMPUTATION

To complete our example:

PLT	= 1.0
Alt	= 0.5
Velocity	= B
Service Level	= 85% or 52% add-on
Usage	= 32 units/month

$$ROP = (ALT + PLT) * Usage + Safety\ Stock$$

$$= (.5 + 1) * 32 + 52\%$$
$$= 48 + 25$$
$$= 73$$

7.   PARAMETER OVERRIDE

The components of the ROP calculation may be overridden, with values stored in the Product file as listed below. Also, the results of the calculation are updated to the Product Detail file as below:

	Updated To	Override
Velocity	62	
PLT	104	109
Usage	64	105
ROP	52	50
Safety Stock	54	55

REORDER POINT ON TRANSFERS (MINIMUM/MAXIMUM APPROACH)

Branches re-supplied via transfers are so indicated by a path of replenishment code equal to a branch number. The issues to be considered are:

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

REORDER POINT ON TRANSFERS (MINIMUM/MAXIMUM APPROACH) (Continued)

1.   USAGE

The adjusted usage reflects the branch usage and can be usage in the usual manner.

2.   LEAD TIME

Branch replenishment works on the theory that the central warehouse has a solid supply of stock with its order controls set to include the usage of this branch. Therefore, the lead time need be only the time to transfer goods from the central warehouse. It is taken from the lead time additional days in the Pline file. If this field is null, a default value of .3 (one week) is used.

3.   SAFETY STOCK

One school of thought says that safety stock should be maintained at the receiving branch, to cover unanticipated end user usage.

However, this will lead to duplicate safety stock since the end user usage at the remote branch say 003) is included in the computation of usage at both warehouse 003 as well as 001.

Gordon Graham does suggest that a safety stock be maintained, and that is the approach we endorse. However, we have provided parameter 35 which allows the user to specify whether or not safety stock is required.

Remember, since resupply times are short, the amount of inventory tied up in safety stock will not be outrageous. If the parameter indicates that safety stock is to be maintained (Param 35 - "Y"), then the safety stock rules defined above fully apply.

4.   AN EXAMPLE

Additional Lead Time	- Null	PLINE(13)
Safety Stock	- "Y"	PARAM(35)
Single Safety Stock	- 50%	PARAM(34)
Usage	- 20 Units/Month	

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

4.   AN EXAMPLE (Continued)

ROP = (LT * Usage) + Safety Stock
ROP = (.3 * 20)   + 50%
ROP =   6   + 3
ROP =   9

REORDER QUANTITY COMPUTATION
The MDS system supports several approaches to the reordering process. Which method is used is specified in the Product Line file (ATTR15) by branch. Thus, within a single warehouse, different product can be serviced by different methodologies and similarly, a single product line can be ordered differently at each warehouse.

The methodologies allowed include:

1.   EOQ/Line Buy
2.   Inventory Class/Line Buy
3.   Minimum/Maximum

A short description of each methodology follows:

1.   EOQ - This method is based upon the concept of economic lot sizing (EOQ). However, this approach is frequently misunderstood and does not always result in reasonable order quantities since its singular objective is to minimize overall inventory investment.

2.   INVENTORY CLASS - This offshoot of the EOQ method is based upon the inventory classification procedure. It approximates EOQ's, but is simpler to understand and is offered as an option.

3.   LINE-BUY - This approach supports product line purchasing ("line-buy"). The system establishes the proper order cycle for the product line based upon the sales rate for the line, compared to the vendor purchase minimums (expressed in dollars, units, or pounds).

Options 1 and 2 above combine either the EOQ or inventory class approach with the line-buy computation. Both are calculated and updated to the Product file. Purchasing then can review the results. The purchase order generation module will utilize the maximum of the two order quantities computed.

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

REORDER QUANTITY COMPUTATION (Continued)

4.   **MINIMUM/MAXIMUM** - This method, which is most suitable to branch replenishment, utilizes a somewhat different approach as discussed below.

EOQ CALCULATION

A.   **EOQ Theory**

The EOQ formula, which can be found in any economics textbook, tries to find the "happy medium" between two extremes. Wholesalers traditionally want to maximize turns and minimize overhead. You can produce a larger turnover rate by buying small quantities frequently during the year. You can reduce overhead by buying large quantities a few times a year. The EOQ formula gives an order quantity which balances the two extremes and "leans" towards whichever extreme, high turns or low overhead, is appropriate for a given product.

The true theoretical value of the EOQ is the minimum quantity to buy at the point when the cost of carrying inventory is equal to the cost of ordering. Rather than deal with straight theory, however, let's give some practical examples on how the formula works.

For example, assume two products have identical costs of ordering ($5.00), costs of carrying inventory (30%) and usage rates (1,000). However, product A costs $1.00 and product B costs $100.00. Using the formula, the EOQ for product A would be 632 and the EOQ for product B would be 63 It makes sense the product A should be bought in large quantities infrequently during the year. Since the cost is low, low overhead is a primary concern, so the EOQ favors that extreme. By the same token, product B should be purchased in smaller quantities frequently during the year. Its higher cost means a higher inventory investment, so high turns is the primary concern. The EOQ, therefore, "leans" to that extreme.

Problems with EOQs surface at either end of the stock item profile - the fast moving and/or high cost items. Unreasonably low order quantities might result from the strict application of the EOQ formula.

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

EOQ CALCULATION (Continued)

A.   EOQ Theory (Continued)

The use of EOQ minimum and maximum percent parameters insures that reasonable value are obtained. i.e.,

MIN USAGE % -   25   PL.PARAM43
MAX USAGE % - 300 Seasonal   PL.PARAM47
                  % - 600 Nonseasonal   PL.PARAM44

With these values, you would be guaranteed that no EOQ would be less than 25% of average monthly usage, or greater than 200% of average monthly usage. In other words, no product in your inventory would have an EOQ of less than one week's worth of average sales, or greater than three months worth of average sales.

The EOQ formula is as follows:

$$EOQ = \sqrt{\frac{2 * Order\ Cost * Annual\ Usage}{Inventory\ Carrying\ Cost * Unit\ Cost\ (k)}}$$

In our example, if

Unit Cost   = 1.00
Inventory Carrying Cost   =   .29
Order Cost   = 5.00
Annual Usage   = 12 * 32 = 384

EOQ   = 115 (Rounded to nearest
                                            purchasing multiple and
                                            then stored in Prod.Det 102.)

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

EOQ CALCULATION (Continued**)**

B.   WHAT EOQ ACHIEVES (Courtesy of Gordon Graham)

A distributor has two costs to consider with regard to inventoried items: incoming cost and outgoing cost. Everyone knows about the first one. Incoming costs are what we pay suppliers for merchandise - and a number of people know exactly what these costs are. An outside salesman gets agitated when the purchasing department does not ". . . buy the item right!" The salesman wants the lowest incoming cost possible to allow him to sell competitively and still enjoy a nice gross margin percentage (often a basis for his compensation). Unfortunately, it is not the incoming cost that really matters. It is the outgoing cost that determines whether or not any actual profit is generated on a sale.

The outgoing cost is an accumulation of costs on a stock item while it remains on your shelves. The cost accumulation begins, of course, with the incoming cost. So that, you must add the cost of ordering, which is usually only a tiny segment of what it costs your company to go through the replenishment cycle on a stock item. But then the big profit draining cost element must be added: The cost of holding the item in stock pace, money, taxes, insurance, shrinkage, etc. Today, that cost is at least 35 cents for every average inventory dollar carried throughout the year. It is tragic, but all too often these days, the true outgoing cost on an item as it leaves a distributor's warehouse to go to the customer is higher than the selling price! Too much of that - and your distributorship turns into a nonprofit organization.

The EOQ formula messages all the costs involved, along with the rate at which an item is selling, to develop the quantity to purchase, which will result in the lowest possible outgoing cost as the material moves out of the warehouse to customers. Nice, huh? If you purchase an economic order quantity under the formula, each unit of stock as it moves out the door carries with it the lowest accumulation of costs possible under the conditions you plugged into the formula.   If the sales department then sells this item for as much as they can, net profit is maximized! Not gross profit - net profit! That is why the old EOQ approach has been around so long. It does a heck of a job.

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

INVENTORY CLASS METHOD

An alternate method to the EOQ is the inventory class computation method. The primary benefit of this approach is its simplicity and avoidance of the extreme results sometimes obtained from EOQ. As previously explained, items are categorized into 13 categories, and then bought according to the following table:

<u>CLASS X MONTHLY USAGE RATE</u>

Class	Months Supply to Purchase	Turns Per Year to Expect
1	1	12
2	2	6
3	3	4
4	4	3
5	5	2.4
6	6	2
7	7	1.7
8	8	1.5
9	9	1.3
10	10	1.2
11	11	1.1
12	12	1
13	Zero	0

What Results from This Method? (Courtesy of Gordon Graham)

When you review how items are sequenced as the classification step is completed, you'll note that Classes 1 and 2 have only 15 percent of your non-dog items . . . but account for 65 percent of the annual dollar-movement through inventory. Classes 3 and 4 add 20 percent more of the item total and 25 percent of the money movement. Consider that! Classes 1, 2, 3, and 4 account for 35 percent of all your good stock items . . . BUT 90 PERCENT OF THE ANNUAL MOVEMENT OF DOLLARS THROUGH INVENTORY! All the rest of the "good" stock items (65 percent of the total number) account for how much of the annual dollar movement? Wow! A whopping 10 percent! Who cares what turns you get on that 65 percent? Sure, it'll be low, but the high turnover on the first four classes . . . about 7 turns average across that group . . . more than offsets the zilch turnover on the 65 percent in Classes 5 though 12.

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

INVENTORY CLASS METHOD (Continued)
Get Most . . . But Not All of EOQ's Benefits Without the EOQ Math!

The classification method approximates the results you'd get with EOQ . . . not as precisely, mind you, but certainly within an order quantity's general range for any specific stock item. Classification is easier to understand, very easy to program, and easier to adapt to. A buyer might be mystified by EOQ's math and yet have no trouble at all grasping how classification works.

Are there drawbacks? Well . . . yes. EOQ offers very precise turnover results on each item. It will recommend 1.3 months' supply, or three weeks' supply, or 4.8 months' supply . . . very precise! With classification, you buy exactly 1 month's supply, 2 months' supply, six, 12, etc. . . . nothing in between. EOQ might suggest 24 turns on a very high money-movement-per-year item. Classification will direct you to only 12 turns a year, unless you identified a group of "Super Class 1" items.

EOQ Develops About One More Turn Per Year Than the Class Method.

EOQ also develops a better overall turn rate than you'll achieve with classification . . . about one full turn per year. EOQ is a superior method. It's more complicated. It's tougher to understand and sometimes easy to misapply. Classification avoids the complication and rarely recommends a foolish order quantity unless you attempt to classify an item without sufficient history. EOQ gets better results when both methods are applied correctly.

LINE POINT ORDERING
Line buying is one of the toughest problems a distributor's purchasing people face. "Which stock items in this supplier's line should be purchased so that the total order meets the free-freight requirement? Or gets us an extra 10% discount?"

Line buying is a constraint on your ability to replenish stock items properly. A single item reaches its order point, but you can't buy that one item all by itself. You would pay an exorbitant price, because your total order would not be anywhere near the amount required by the supplier to qualify for special handling or discounts. So you look around for other items to fill up the purchase order. But you really don't need anything else right now. Anything added on to the purchase order to make weight or build up enough dollars will be excess inventory.

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

LINE POINT ORDERING (Continued)
Traditionally, the buyer flips through a printout of all the items in the manufacturer's line, and fills in the purchase order with some fast movers. The total order requirement has been met. Never mind that none of these "good" items were near the point that they should have been replenished. Never mind that many other items in the product line were not considered even though they were closer to the order point.

It is easy to fill up purchase orders with fast movers in most product lines, but what happens when you do? The inventory investment becomes badly imbalanced. Those fast movers, which should be turning over quickly as the foundation of the replenishment system, instead turn over slowly. The problems compounds. The next purchase order requirement is more difficult to reach: the next, a little tougher yet. Many other items in the line sell moderately, but as they reach their order points they cannot be purchased. There is such a glut in the fast movers that future orders from this supplier must be postponed to sell off some inventory.

The answer: Establish a higher control set above the reorder point for each stocked item that will tell you when - and when not - to add the item to the current purchase order.

The higher control level is called a line point. Every item stocked in a supplier's product line, (where a total order discount is offered), has a normal replenishment control (the reorder point) but also has a line point. Certainly, any item below reorder point should be replenished. But in addition, any item below line point should be replenished also!

> Line Point = Reorder Point + Usage During the Order Cycle
>
> Reorder Point = Usage Per Day Times Lead Time Days + Safety Stock

The calculation of the line point is straight forward. Assuming:

> Usage   = 100/Month
> Reorder Point   = 100 units
> Order Cycle   = 1 Month

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

LINE POINT ORDERING (Continued)

<u>The Rule to Follow</u>

During a purchasing order cycle, purchase all items below their line or reorder points. The reason? The reorder points clearly control service. But the items below line point will be below their reorder points by the time the next order cycle comes around. If you are actually below reorder point when an item is replenished, you will likely run out of stock. This approach allows you to replenish those items that will be hitting their reorder points before you get another chance to order the line. Those are the items now below their line points. The line point can be manually set in Product Detail 108, and if so, the calculation is bypassed. The calculated result is stored in Product Detail 103.

Clearly, using line points will require a larger inventory investment since more products will be ordered earlier. But that is the cost of carrying a product line with the attendant minimum order constraints.

Therefore, the reorder quantity is defined as the greater of:

       1)   Quantity needed to raise availability to the line point,

       2)   Or the EOQ.

In the following example, projected inventory level equals:

       On Hand + On Order - Commitments (Open Orders)

The EOQ will be the actual purchase amount (the reorder quantity) under the following condition:

Line Point	=	200
Projected Inventory Level	=	198
EOQ	=	30

The system will recommend on the below line point purchasing reports to buy the EOQ of 30 versus the two necessary to reach line point.

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

LINE POINT ORDERING (Continued)

The EOQ will not be the actual purchases quantity under these conditions:

        Line Point   = 200
        Projected Inventory Level   =   5
        EOQ   =   30

The system will recommend on the below line point purchasing reports to buy the difference between the line point and the projected inventory value which is 195.

The reorder quantity can be manually set in Product Detail 51, and if so, the calculation is bypassed. The calculated result is stored in Product Detail 53.

MINIMUM/MAXIMUM
Branches, when supplied out of central warehouses, usually enjoy a very short lead time to get more of anything, and they don't have to order in large total quantities. Therefore, a branch often can be controlled effectively with the old "Min/Max" or "Order-Up-To" methods. When the stock drops to a minimum of two pieces of an item (for example), they "order up to" five. The calculations may be quite simple....often driven by how much space can be allotted to the item. The upper and lower control limits are set to avoid stockouts, stay within (usually quite limited) warehouse space, and to develop a higher (than the warehouse) inventory-dollar turn.

The same formulas that are needed so badly for effective warehouse inventory management will cause serious problems if used to replenish most stock items in a branch. The reason? Formulas for order points and EOQs, for example, work well in a range of usages and lead times that could be considered "normal". Extremes in usage or lead time cause the formulas to misfire. Branch items with very short resupply lead times from a central warehouse are good examples of the low-end extreme.

A GENERAL RULE TO APPLY
When lead times are shorter than one week, use Min/Max. When lead times are longer than a week, use order points. A branch who does order directly from the manufacturer likely has lead times longer than one week on the items involved.

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

A GENERAL RULE TO APPLY (Continued)

It's difficult to set down here the precise Min/Max "formula" to use. The right approach for a particular branch depends on how much space they have, the movement-class of items stocked in the branch, the "normal" lead time for resupply out of the warehouse, and the delivery they can expect when an emergency arises. Turnover goals are a consideration also. MDS will use the ROP as the minimum. Of course, to use Min/Max effectively, you will likely need to override the system calculated ROP.

Essentially, Gordon recommends that the reorder quantity for branches be developed along the lines of the inventory class method, but with a more aggressive turn ratio.

The maximum is simply the addition of the computer reorder quantity to the minimum previously computed. The amount to be ordered is the quantity needed to raise availability to the maximum.

> I.e., on hand + on order - committed backorder.

To illustrate:

> If management decides that a branch's inventory investment should turn 12 times a year, the individual classes must turn as follows:

Class 1	20 Times/Year	Class 7	6 Times/Year
Class 2	18	Class 8	5
Class 3	16	Class 9	4
Class 4	12	Class 10	3
Class 5	10	Class 11	2
Class 6	8	Class 12	1
		Class 13	0

If an item is class 1 in the branch, it's replenishment quantity (when resupply is needed from the central warehouse) is 1/20th of a year's supply. A Class 2 item's quantity is 1/18th, etc. For the class 1 item, the difference between minimum and maximum is 1/20th of a year's supply - easily calculable. Example:

> Monthly Usage = 100   Annual Usage = 1200
> Class 1   Replenishment Quantity = 60
> Difference Between Minimum and Maximum = 60

COMPUTE REORDER POINTS, LINE POINTS, AND REORDER QUANTITIES (EOQ)

A GENERAL RULE TO APPLY (Continued)

When the stock available-for-sale of this item reaches the minimum (very similar to an order point: Enough material to last until the warehouse can resupply the item, plus a normal safety allowance), the warehouse ships 60 units to the branch. If the item had been a class 7, the replenishment quantity would change to 1/6th of a year's supply, or 200 in the example above. If it were class 4, then 1/12th of a year's supply (100) is pushed to the branch when the supply runs low.

Thus, the maximum in this illustration would be 80, assuming the minimum was 20 (20 + 60 = 80).

Similar models could be developed for different inventory turn objectives.

MDS will use the replenishment quantity scheme described above as the default. If you override ROQ on a min/max item MDS will use ROQ as the replenishment quantity.

ROP AND ROQ PROOF LISTING

PROK NAME   INV.PROK PROP-ROQ.RPT
SELECTION   MENU-10.6
SELECTION NUMBER   4
FILES ACCESSED   PROD.DET

OVERVIEW

The proof listing details the results of the computer calculation. If desired, these results can be manually overridden using product file maintenance. However, the update must once again be run, to move the manual overrides to the system's "LIVE" fields.

OPERATING INSTRUCTIONS

REORDER POINT - REORDER QUANTITY PROOF LISTING

HIT <NL> TO CONTINUE OR 'END':

Hit 'RETURN' to continue or 'END' to return to the selector.

ROP AND ROQ PROOF LISTING

P/C	PRODUCT DESCRIPTION	UM	QTY SOLD 12 MONTHS	VEL	LEAD TIME	LST.CST.	DEMAND	SAFETY.ST	ON HAND	AVAIL	ROP	ROQ
001	ARWKSU-E STICK UP DEOD EVERGREEN	DZ	1925	A	1.1	11.00	138	0	-1	137	500	-137
001	ARWKSU-HD HVY DUTY STICK UP	DZ	1631	A	0.0	9.24	155	0	936	936	500	2,000
001	ARWKSU-RE REFRIG STICK UP 2 PK	DZ	1654	A	1.3	131.40	119	0	329	579	500	2,000
001	ARWKSU-S STICK UP DEOD SPRING	DZ	1507	A	2.0	9.08	229	0	1464	1464	500	2,000
001	APHOR-2 SENSIT CLEANSING BAR	EA		D	0.0	7.00		0	30	30	0	0
001	APHOR-3 MOIST CLEANSING BAR	EA		D	0.0	4.00	0	0	30	30	0	0

COPY MANUAL ROP AND ROQ TO ACTUAL FIELDS

PROK NAME   INV.PROK COPY.FIELDS
PROGRAM NAME   INV.BP MOVE.ROP
                                MDS.BP VALDIM
SELECTION   MENU-10.6
SELECTION NUMBER   5
FILES ACCESSED   PROD.DET

OVERVIEW

The last entry on the selector is provided for those customers not wishing to make use of the automated inventory management system. This program simply moves the manual override data into the system live fields. It should not be used if the computer generated system is in use.

The following fields are copied:

	Updated To	Override
Usage	64	105
Reorder Point	52	50
Reorder Quantity	53	51
Safety Stock	54	55
Line Point	103	108

OPERATING INSTRUCTIONS

COPY MANUAL ROP & ROQ TO ACTUAL FIELDS

HIT RETURN TO CONTINUE OR 'END'

Hit 'RETURN' to continue or 'END' to return to the selector.

PURCHASE ORDER GENERATION MENU

```
                    Account:BASE.10              Port: 37 Menu:INV.MGMT.PO.GEN

                          Inventory Management System
                          Purchase  Order  Generation
                          ───────────────────────────


                         1.Generate Recommended Purchase Order by Product Line
                         2.Recommended Purchase Inquiry / Update
                         3.Recommended Purchase Report
                         4.Generate Purchase Orders and Transfers
                         5.Below ROP Report
                         6.Inventory Analysis Report

                         7.Below ROP Report by Vendor
                         8.Generate Recommended Purchase Order by Vendor




                         Enter Selection or END :
```

GENERATE RECOMMENDED PURCHASE ORDER BY PRODUCT LINE

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ◖ Concord for Windows 95                                      _ □ ✕ │
├─────────────────────────────────────────────────────────────────────────┤
│ File  Edit  Settings  File Transfer  Help                                 │
│ RECOMMENDED  PURCHASE  ORDER  CREATION  AND  INQUIRY                       │
│                                                                           │
│ PRODUCT  LINE        XXXXXX                           TYPE                 │
│ SHIP  TO  WAREHOUSE                                   TOTAL UNITS          │
│                                                       MINIMUM              │
│  1.VENDOR #                                                                │
│                                                                           │
│     WHS  PRODUCT                     DESCRIPTION      AVAIL      ROP   EOQ  │
│                                                                           │
│                                                                           │
│                                                                           │
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│ │HELP│ │END │ │INSERT│ │LDELETE│ │PREV PG│ │NEXT PG│ │INQUIRY│ │ABORT│ k │
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└─────────────────────────────────────────────────────────────────────────┘
```

GENERATE RECOMMENDED PURCHASE ORDER BY PRODUCT LINE

PROGRAM NAME   SSS.BP GEN.MASTER
                                IM.PO.CREATE.INQ
SELECTION   MENU-10.7
SELECTION NUMBER   1
FILES ACCESSED   IM.WORK   PROD.DET
                                IM.PO   IM.ERR
                                PMR   IM.PLINE
                                COMPANY   DICT IM.PLINE
                                PLINE
                                WAREHOUSE
                                PARAMETER
                                PROD.MAST

OVERVIEW

This procedure utilizes the parameters and calculations previously performed to arrive at a recommended purchase order to a vendor for a product line.

Following are assumptions made by the procedure.

1.   The assumption is made that the usage and reorder point/quantity calculation procedures have been run.

2.   The program is designed to operate on a single product line at a time. The sequence of processing of the branches is determined by the branch sequence parameter in the Pline file.

3.   Only items purchased directly from a vendor are considered. This is determined by the path of replenishment code being 0 for that product line for that warehouse. Since adjusted usage Pmr (10) (Product Management record) is being used, the usage of a branch being replenished from another (i.e., branch 3 is restocked from branch 1) is considered as part of the vendor purchase for branch 1, since the usage for branch 3 is included in the adjusted usage for branch 1. (See the usage calculation - section)

        If all branches may order directly from the vendor (assuming minimums are met), the path of replenishment code should be set to 0 in the Product Line file.

GENERATE RECOMMENDED PURCHASE ORDER BY PRODUCT LINE

OVERVIEW (Continued)

4.   In an interactive fashion, the program determines if a single branch or a combination of branches can qualify for the vendor purchase minimum. If so, a suggested purchase order is generated for purchasing review and approval.

The reorder quantity is based upon the order cycle in the Pline file, and if insufficient to generate an order at the initial setting, the order cycle is incremented by .1 months until the maximum order cycle in the Pline file is reached, or the vendor minimum is reached.

5.   A procedure is made available to modify the recommended purchase order.

6.   Lastly, once accepted, a vendor purchase order (or a series of purchase orders) are generated, as well as transfers for that portion of the purchase order that is to be tran-shipped to another branch that could not meet its minimum.

DO YOU WANT TO ENTER DISTRIBUTION PATH OVERRIDES (Y/N/END)

ENTER PRODUCT LINE OR END

FILE DESCRIPTION FOR THE IM.WORK FILE (Also IM.PO)
The file is indexed by port number to allow multiple purchase operations to proceed simultaneously.

AMC	Name	Description/Source
0	KEY	Warehouse: Product Number (Internal)
1	AVAIL	Calculated from Product Detail file:
		On Hand + Vendor On+ In Trans - In Trans
		Order In Out
		- Backorder - In Pick
2	ROP	Reorder point PD(52)
3	EOQ	Economic order quantity PD(102)
4	SAFETY	Safety stock PD(54)

GENERATE RECOMMENDED PURCHASE ORDER BY PRODUCT LINE

FILE DESCRIPTION FOR THE IM.WORK FILE (Also IM.PO) (Continued)

5	PLT	Purchasing lead time PD(104)
6	ROQ	Reorder quantity - computed
7	Weight	Weight of product PM(29)
8	PURCH.COST	Purchasing cost -per Parameter record
9	SHIP.TO.WHS	Ship-To Warehouse - computed
10	ADJ.DEMAND	Adjusted demand Pmr(10)
11	VENDOR	Vendor number Pline(5)
12	PLINE	Product Line Pline(0)
13	ORD.CYCTL	Order cycle - computed
14	PO.UM	Purchasing unit of measure PM(58)
15	PO QTY	Purchase quantity - computed and manually adjusted
16	PO COST	Purchase cost - computed and manually adjusted
17	PATHNO	Branch sequence path number
18	RANK	Inventory class
		Based on the 13 class method of ranking. Will be used in the ROP update for items with replenishment method #2 - multi-value #9

OPERATING INSTRUCTIONS

1. The first step is the input from the operator of the product line to be processed. After validation of the product line, the program reads the Pline record and determines the sequence of branch processing and if that branch is replenished from a vendor.

   Determine from distribution path which warehouse group is to be processed first, and then which branch within that group:

   PLINE(14)   007,005,001
                004,001
                003,002,001

   The first path to be processed is 007 to 005 to 001 and branch 7 is therefore the first branch to be processed.

GENERATE RECOMMENDED PURCHASE ORDER BY PRODUCT LINE

OPERATING INSTRUCTIONS (Continued)

"007" is located in Pline(8) (branch string) to determine the value mark containing the data for warehouse 007 say V/M 7. Then Pline<11,7> is interrogated to make sure it is 0. If not 0, meaning that branch 7 is not replenished from the vendor, the program proceeds to next branch.

2. The program accesses the Pline.Xref file which contains an index list of all products for the specified product line.

3. The program then selects from Prod.Det all product records for the warehouse being processed (i.e., whse 007), where the following criteria are met:

    a. The do not stock flag is not set (Prod.Det(101) # "N").

    b. Availability is less than the line point.

        Available is calculated as:

        On Hand + Vendor On + In Trans - Backorder - In Pick
                    Order   In   Out

4. The Im.Work file is generated based upon the data in the Product Detail file, and the Pmr file which is also read at this time. The warehouse is written to Im.Work(9) as the file is created. The path number is written to Im.Work(17).

5   The reorder quantity of each item is computed as follows:

Maximum of:

    a. EOQ, or
    b. Line Point less available

        Where Line Point = Reorder + [Adjusted * Computed Order]
                            Point   Usage   Cycle
                            PD(52)   PMR(10)   PLINE(19)

GENERATE RECOMMENDED PURCHASE ORDER BY PRODUCT LINE

OPERATING INSTRUCTIONS (Continued)

Example:

        EOQ   = 30
        ROP   = 50
        AVAIL   = 5
        Order Cycle = 1.0 (Months)
        Usage   = 150 (Months)

        ROQ   = Line Point   -   AVAIL
                     = 50 + (1 * 150)   5   =   195

The result is stored in the IM.Work file.

6.   The program next determines if the vendor minimum has been met (whether
     expressed in units, dollars, or weight as directed by the Pline file). It should be
     noted that records from another branch that failed to reach minimum may already
     be in the Im.Work file, and would be included in the minimum order check. If the
     minimum is met, the process for this phase of the calculation for this branch is
     complete, and the program proceeds to process the next branch as outlined in step
     1. The branch number is written to the ship-to warehouse (attribute 9) of the Work
     file and the records are copied to the Im.Po file, where they will await final
     processing.

7.   If the minimum has not been met, the processing takes one of two paths based upon
     the status of Im.Param(48).

     A.   If the methodology selected to reach the vendor minimum is proportionate
          (P), then the program will determine the total amount ordered (i.e., $4,000)
          and will compare it to the vendor minimum. All items ordered will be
          increased in a proportionate manner to reach the minimum.

          i.e.,   Minimum = $5,000
                  Ordered = $4,000

                  Increase all items by 5000 or 1.25% to reach minimum 4000

GENERATE RECOMMENDED PURCHASE ORDER BY PRODUCT LINE

OPERATING INSTRUCTIONS (Continued)

      B.   If the order cycle method (O) is selected, the file is reprocessed with the order cycle incremented by .1. Steps 5 and 6 are repeated to see if the vendor minimum is met. In our example, the reorder quantity would become:

$$ROQ \quad = \text{Line Point} \quad - \quad \text{AVAIL}$$
$$= 50 + (1.1 * 150) \quad - \quad 5 \quad = \quad 210$$

8.   This process continues until the vendor order minimum is met, or the maximum order cycle [Pline(10)] is reached.

9.   If the maximum order cycle is reached, the process will leave this branch's records in the Im.Work file and will proceed with the next branch in this path.

10.   When the last branch in a path is reached, it is assumed to be the distribution warehouse. The Im.Work file will be generated for this branch, but it will not attempt to generate a purchase order until all the paths are completed. The reason for this is that if there is more than one path with the same distribution warehouse, only one combined purchase order should be processed, not one for each path.

11.   Since the lead time for receipt of the item is increased when transhipped from another branch rather than directly from the vendor, the reorder quantities of all the items must be recomputed. The new lead time is set to the lead time of the branch into which the usage was folded, plus the additional lead time days [Pline(13)].

    Thus, if the lead time of an item in Warehouse 4 is .4 and the differential is .1, the ROP is recomputed based on:

$$ROP \quad = (ALT + PLT) * \text{Usage} + \text{Safety Stock}$$
$$= (.1 \; + \; .5) \quad * \quad 150 + \quad 50$$
$$= \quad\quad\quad\quad 90 \quad + \quad 50$$
$$= \quad\quad\quad 140$$

    The result is updated to the work file [ATTR(6)].

12.   The program then returns to step 1, and accesses the next path in sequence to be processed.

GENERATE RECOMMENDED PURCHASE ORDER BY PRODUCT LINE

OPERATING INSTRUCTIONS (Continued)

13.   When the final path is reached, the process is completed and the program returns to the selector.

RECOMMENDED PURCHASE INQUIRY/UPDATE

```
┌─────────────────────────────────────────────────────────────────┐
│ ◖                                                      _ □ ✕      │
├─────────────────────────────────────────────────────────────────┤
│ File  Edit  Settings  File Transfer                              │
│ RECOMMENDED PURCHASE ORDER CREATION AND INQUIRY                  │
│                                                                  │
│ PRODUCT LINE      XXXXXX                    TYPE                  │
│ SHIP TO WAREHOUSE                           TOTAL UNITS           │
│                                             MINIMUM               │
│  1.VENDOR #                                              ORDER    │
│                                                                  │
│    WHS PRODUCT               DESCRIPTION    AVAIL  ROP   EOQ  QTY │
│                                                                  │
│                                                                  │
│                                                                  │
│                                                                  │
│                                                                  │
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│ ┌─────┐ ┌─────┐ ┌──────┐ ┌───────┐ ┌───────┐ ┌───────┐ ┌───────┐ ┌──────┐ Br │
│ │HELP │ │END  │ │INSERT│ │LDELETE│ │PREV PG│ │NEXT PG│ │INQUIRY│ │ABORT │ k  │
│ └─────┘ └─────┘ └──────┘ └───────┘ └───────┘ └───────┘ └───────┘ └──────┘    │
└─────────────────────────────────────────────────────────────────┘
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RECOMMENDED PURCHASE INQUIRY/UPDATE

PROGRAM NAME   SSS.BP GEN.MASTER
                                IM.PO.INQ
SELECTION   MENU-10.7
SELECTION NUMBER   2
FILES ACCESSED   IM.PO
                                IM.PLINE
                                PLINE
                                PROD.MAST
                                PROD.DET
                                IM.ERR
                                DICT PMR
                                DICT IM.PLINE

OVERVIEW
This inquiry allows the purchasing agent to review the recommended purchase quantities generated by the system in the Im.Po file. Access is by product line and ship-to warehouse. The screen will display for a specific ship-to warehouse, by product, by branches.

OPERATING INSTRUCTIONS
As the screen is displayed, the purchasing agent will be able to override the ROQ (order quantity), the vendor, and/or the ship-to warehouse. In the upper right portion of the screen, the total quantity of the order (or $ or weight) will be displayed together with the vendor minimum derived from the Pline file.

As the purchasing agent modifies the purchase, the totals are updated on the screen to reflect the adjusted quantities.

RECOMMENDED PURCHASE REPORT

PROK NAME   INV.PROK PIM.PO.RPT008
SELECTION   MENU-10.7
SELECTION NUMBER   3
FILES ACCESSED   IM.PO

OVERVIEW
This report will provide the ability to select one ship-to warehouse or all.

The report can be sequenced by:

      1.   Ship-To Warehouse
              Product Code
              Branch

  or

      2.   Ship-To Warehouse
              Branch
              Product

  and will display:

              Ship-To Warehouse
              Branch
              Product Code
              Product Description
              Availability
              Reorder Point
              Economic Order Quantity
              Reorder Quantity (Total)
              Purchase Cost (Total)
              Weight (Total)

RECOMMENDED PURCHASE REPORT

OPERATING INSTRUCTIONS

RECOMMENDED PURCHASE REPORT
HIT <RETURN> TO CONTINUE OR END

Hit 'RETURN' to continue or 'END' to return to the selector.

SORT OPTIONS:
1. BY SHIP.TO.WHS BY PRODUCT # BY BRANCH
2. BY SHIP.TO.WHS BY BRANCH BY PRODUCT #

ENTER CHOICE OR 'END'

Enter choice or 'END' to return to the selector.

ENTER WAREHOUSE, <ALL> OR <END>

Enter warehouse number, 'ALL' for all warehouses or 'END' to return to the selector.

ENTER PRODUCT LINE

Enter the product line or 'END' to return to the selector.

RECOMMENDED PURCHASE REPORT

BRANCH	A.PROD.NO	PROD.DESC	AVAIL.	ROP	EOQ	ROQ	PO.COST	WEIGHT
001	CP201	CP201	0	345	41	345		0.00
001	CP327	CP327	0	59	21	59		0.00
001	CP330	CP330	0	355	56	355		0.00
001	LP1010	LP1010	0	636	87	636		0.00
001	LP204A	LP204A	0	2168	210	2168		0.00
001	LP229	LP229	0	1114	147	1114		0.00

GENERATE PURCHASE ORDERS AND TRANSFERS

PROK NAME   INV.PROK PIM.PO.CREATE008
PROGRAM NAME   INV.BP IM.TRANS.CREATE008
                                MDS.BP VALDIM
                                INV.BP IM.UPD.CHECK008
                                INV.BP IM.PO.CREATE.RESET008
                                INV.BP IM.PO.CLEAR008
SELECTION   MENU-10.7
SELECTION NUMBER   4
FILES ACCESSED   IM.PO
                                CONTROL
                                IM.ERR
                                PLINE
                                DICT PMR

OVERVIEW

Once the purchase agent has completed his review of the recommended purchase order, the last step is the generation of the purchase order to the vendor, and transfers from the branch scheduled to receive the product from the vendor, to the warehouses needing the product.

1.   The purchase order is generated to the specified vendor using the product codes, quantities, and cost from the Im.Work file. The entire purchase order will be directed to be shipped to the "ship-to warehouse". After the purchase order is generated, the normal purchase order editing procedure can be used to add special instructions, or make other changes as required.

2.   Transfers are generated wherever the "ship-to warehouse" and the actual branch differ. These transfers will be coded as future transfers so as not to affect availability of the "ship-to warehouse", the transfer numbers will be updated to the purchase order.

3.   When the purchase order is received, a transaction will be generated to convert the corresponding transfers to a current backorder status. The system will then release the transfers from their backorder status. Operator override will be available to prevent the future conversion, if necessary, due to short shipment or other reasons.

GENERATE PURCHASE ORDERS AND TRANSFERS

OPERATING INSTRUCTIONS

ENTER PRODUCT LINE OR END

Enter the product line or 'END' to return to the selector.

BELOW ROP REPORT

PROK NAME	INV.PROK PIM.REORDER.RPT008
SELECTION	MENU-10.7
SELECTION NUMBER	5
FILES ACCESSED	PARAMETER
	PROD.DET
	PROD.MAST
	PL.LINE
	VEND.MAST
	WAREHOUSE

OVERVIEW

This report is processed as part of the end of day job stream, as well as being available from the selector.

The parallel inquiry is available, which allows the operator to view a single product line or a specific product on the screen. Identical information will be displayed, however, in a slightly different format to accommodate the smaller dimensions of the CRT.

Selection Criteria

All items below ROP, and stocked in that warehouse. One warehouse or all.

Sort Sequence

Ship-To Warehouse
Vendor product line
Product Code

Data Items

Warehouse
Product Line and Description
Product Code and Description
Availability
Reorder Point
Economic Order Quantity
Normal Reorder Quantity
Suggested ROQ (as above)
Warehouse with Surplus Stock (if any)
Date of Next Product Line Review Cycle

BELOW ROP REPORT

OPERATING INSTRUCTIONS

REPORT FORMAT, INQUIRY FORMAT OR END (R/I/END)

REPORT ON A SPECIFIC PRODUCT, PRODUCT LINE, OR ALL (P/L/A)

If 'A' is entered the report/inquiry will run. If 'P' is entered you will be prompted:

ENTER PRODUCT # OR END

Enter the product number or 'END' to return to the selector.

If 'L' is entered you will be prompted:

ENTER PRODUCT LINE OR END

Enter the product line or 'END' to return to the selector.

BELOW ROP REPORT

WAREHOUSE: 001--NEW YORK

PRODUCT NO	PRODUCT DE	O HAND	V ONORD	C B/O	A	R	E	R ROQ	S UM	P ORDER	L RECEIPT	L SURPLUS PURCHASE	N E X T	W H S

--

PRODUCT LINE: A30001   A3000

--

PRODUCT NO	PRODUCT DE	O HAND	V ONORD	C B/O	A	R	E	R	ROQ	UM	ORDER	RECEIPT	PURCHASE
NFSU-E	NO FRILLS STICK UP EVER	23	50	0	73	100	168	500	183142	GR	2/02/97	1/24/97	6/30/97
NFSU-L	NO FRILLS STICK UP LEM	30			30	100	144	500	70751	GR	1/24/97	1/24/97	5/25/97
NFSU-S	NO FRILLS STICK UP SPG	0		25	-25	100	144	500	55251	GR	2/02/97	1/25/97	4/30/97
PRODUCT LINE TOTAL ***		53	50	25	78				309144				

INVENTORY ANALYSIS REPORT

PROGRAM NAME   INV.BP IM.INV.ANAL008
SELECTION   MENU-10.7
SELECTION NUMBER   6
FILES ACCESSED   PARAMETER
                            WAREHOUSE
                            PMR
                            PROD.DET
                            PROD.MAST
                            DICT PMR

OVERVIEW

The objective of the attached analysis report is to identify items within the product line than can be eliminated.

-   The report shows an entry for every stocked item in this branch. The first item listed is the one that enjoyed the highest sales (units x unit cost) during the previous 12 months. The second item listed is the second best selling item in terms of total value moved through the inventory. The listing continues through many pages until all sales of all stock items are accounted for. Many items at the end of the list will show no sales activity at all.

-   The right-hand section of the report shows the current inventory investment for each item listed and a running cumulative percent as the list progresses of how much of the total inventory investment has been accounted for to this point.

-   The astute reader may have already guessed what this analysis will reveal. When 99%, for example, of the sales at cost for the year (through stock) has been reached on the list, what percent of the total inventory investment will have been accounted for? 60% . . . or 53% . . . or hopefully, 90%.

-   The analysis identifies all stock items that are contributing less than 1%, or 5%, or whatever level you select of the sales. You could get rid of all those items and risk losing only 1% of the sales you experienced during the last 12 months. A branch manager might really want to argue this statement. "We have to keep that stock item 908762 to assure that we'll get the good stuff XXX Mfg. buys from us !" No problem. Keep it. Keep every one of the items someone can give a specific reason for retaining. But get rid of the rest. The fact is : They are contributing nothing!

INVENTORY ANALYSIS REPORT

OVERVIEW (Continued)

- In too many distributor's inventories, as much as 30% or 40% of the total investment may be below the 100% sales line. Zero turns per year. No sales activity at all. Obviously, these are the candidates for disposition. Realistically, you should cut more deeply. Items below the 98% sales line ought to be dropped from stock as a general rule.

- Often, a distributor will keep a stock item active if one unit sells in a years time. More than likely, he could have supplied the items on a special order to the manufacturer and his customer would not have complained. But because one piece sold, the item stays on the shelf for another year.

OPERATING INSTRUCTIONS

INVENTORY ANALYSIS REPORT

ENTER WAREHOUSE OR END:

Enter warehouse number or 'END' to return to the selector.

IS THIS CORRECT (Y/N)

Enter 'Y' to continue with the report. If you enter 'N' you will be re-prompted for warehouse number.

INVENTORY ANALYSIS REPORT

PRODUCT	DESCRIPTION	UM	UNITS SOLD IN PAST 12 MONTHS	COST PER UNIT	EXTENDED COST	CUMULATIVE % OF ALL SALES	UNITS NOW IN STOCK	VALUE OF STO AT COST	CUMULATIVE % OF TOTAL INVENTORY
E-C570D	NYLON BLK BRD	EA	9597	157.33	1509896.01	8.690	18	2831.94	0
E-TPW62	TEMP CARD PACING WIRE	EA	3783	292.82	1107738.06	43.327	18	10541.52	0
E-CO53D	SILK BKD BRD	EA	2702	128.55	475892.10	83.445	12	1542.60	0
E-Y111G	MONOCRYL-VD MONO	EA	6730	68.50	461005.00	86.098	13	1233.00	0
AQUASONIC	ULTRASOUND TRANS GEL	EA	2788	4.25	11849.00	99.571	0	0.00	0
LEUKOFLEX	SURGICAL TAPE	EA	12470	0.79	9851.30	99.691	48	37.92	0

BELOW ROP REPORT BY VENDOR

PROK NAME   INV.PROK PBELOW.ROP.RPT011.IM
PROGRAM NAME   INV.BP BELOW.ROP.RPT011.IM
SELECTION   MENU-10.7
SELECTION NUMBER   7
FILES ACCESSED   PROD.DET
                             PROD.MAST
                             COMPANY
                             SALES.2

OVERVIEW
This report prints all items that are below reorder point by vendor.

OPERATING INSTRUCTIONS

ITEMS BELOW R.O.P. REPORT

PRESS <RTN> TO CONTINUE OR 'END';

Hit 'RETURN' to continue or 'END' to return to the selector.

ROQ MONTH STOCKING FACTOR

RANK 'A'
RANK 'B'
RANK 'C'
RANK 'D'
RANK 'E'

ENTER STOCKING FACTOR USED IN ROQ CALCULATION

Enter stocking factor that will be used in reorder quantity calculation.

BELOW ROP REPORT BY VENDOR

OPERATING INSTRUCTIONS (Continued)

ENTER 'ALL' FOR ALL PRODUCTS, 'R' FOR RANGE OF PRODUCTS 'I' FOR INDIVIDUAL PRODUCTS OR 'END'

Enter 'ALL' for all products. If you enter 'R' you will be prompted for beginning and ending products. If you enter 'I' you will be prompted for product number. Enter 'END' to return to the selector.

ENTER 'ALL' FOR ALL VENDORS, 'R' FOR RANGE OF VENDORS 'I' FOR INDIVIDUAL VENDORS OR 'END'

Enter 'ALL' for all vendors. If you enter 'R' you will be prompted for beginning and ending vendors. If you enter 'I' you will be prompted for vendor number. Enter 'END' to return to the selector.

BELOW ROP REPORT BY VENDOR

RANK = 1   FACTOR =

PRODUCT	DESCRIPTION	ROP	QOH	QOO	AVAIL	USAGE	ROQ
AQUAPHOR	AQUAPHOR MOISTURIZING OINTMENT 1 OZ	263	92	110	178	373	-173
AQUAPHOR-GAUZE	MOISTURIZING GAUZE 100 COUNT	269	113	0	113	381	-113
AQUAPHOR-HEAL	FAST HEALING OINTMENT 12 OZ JAR	195	12	24	36	276	-36
AQUAPHOR100	MOISTURIZING CREAM	259	24	24	48	851	-48

I N D E X

I N D E X

THE SYSTEMS HOUSE
MASTER DISTRIBUTION SYSTEM DOCUMENTATION

I N D E X