forward faster

SSA® ERP$_{LX}$™

Overview of Multi-mode Manufacturing

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About This Guide

The information in this guide includes:

- General navigational information for using SSA® ERP$_{LX}$™ products on the iSeries™
- Product-specific overview information

Navigation and performance

Use the information below to navigate within and between SSA ERP$_{LX}$ panels and programs.

Menus

SSA ERP$_{LX}$ menus allow you to access individual programs to process or view information. You can access individual products directly from any menu by typing the program ID into the empty field at the top of a menu and pressing **Enter**.

Refer to the “Product Quick Reference” section for a list of program IDs.

Dates

SSA ERP$_{LX}$ includes full support for dates up to and beyond the year 2000. Although most date fields display as six characters, SSA ERP$_{LX}$ records the date as eight characters. Refer to the *Company Name* and *Date Format* fields in the System Parameters Generation program for information on configuring century dating and entering dates beyond 1999.

Attention key

Press **ESC** (attention key) while in a SSA ERP$_{LX}$ program to access other programs, menus and products. You must have security authorization to use this feature.

Look-up features

When a plus sign (+) is displayed at the end of a field, press F4 to display a look-up window that is used to select from a list of valid values. Most windows accessed from inquiry programs allow you to search for alphanumeric strings.

Retention of key values (remember keys)

SSA ERP$_{LX}$ remembers certain key values, such as item number, salesperson or container in your workstation memory as you process information in certain programs. This is set up in the SYS product. (See SYS080 help text for a current program list.) The settings are as follows:

0	SSA ERP$_{LX}$ automatically retrieves this value from remember key memory. SSA ERP$_{LX}$ updates this value on a continual basis.
1	SSA ERP$_{LX}$ automatically retrieves the value you entered in SYS080 and does not update the value from any other program.
2	SSA ERP$_{LX}$ does not retrieve or update remember key fields.

Rounding

SSA ERP$_{LX}$ supports three system-wide rounding methods:

- truncate
- increment
- half-adjust

SSA ERP$_{LX}$ also supports three round-to positions:

- 0
- 10
- 100

This rounding fulfills legal and fiscal requirements in several European countries.

Depending upon the SSA ERP$_{LX}$ products you have installed, you select the rounding method and round-to position in one of two places:

- In the Currency Code Maintenance (CLD107D2-01) panel in the Multiple Currencies (MLT) product
- In the Currency application in the Configurable Enterprise Accounting (CEA) product

The rounding method and round-to position you select are then used throughout SSA ERP$_{LX}$ to consistently round calculated amount fields, displayed amount fields, and amount fields on audit reports. This rounding process affects calculated amount totals such as Invoice Total, Taxes Total, and Amounts in Journals. However, it does not affect the Unit Cost or Unit Selling Prices.

Throughout the Promotions and Deals cycle, SSA ERP$_{LX}$ presents information necessary to monitor the performance of the incentive programs. Information pertaining to discounts offered during the Order Processing cycle versus discounts taken during the Accounts Receivable cycle is available. Also, the Expected Lift (projected sales) versus the Actual Lift (actual sales) can be analyzed.

Standard help features of SSA ERP$_{LX}$

Many SSA ERP$_{LX}$ programs contain generic help text that is displayed when the user presses F1 on a panel, field or on the list of processing options. This generic help text includes help for action codes, run time parameters and processing options (also called function keys or F keys).

The information below usually is not displayed in the help text on the iSeries for individual SSA ERP$_{LX}$ programs and panels since it is used on almost all panels. If an action code or processing option other than those defined here occurs in a program, it is defined in the help text for that program and can be displayed by pressing F1 on the panel where the function keys are displayed.

Standard help text for list panels

Many SSA ERP$_{LX}$ 100-level and 300-level programs contain list panels of records from which to select for maintenance (100-level programs) or inquiry (300-level programs). Press F1 in the *Action* field to access the following generic information:

Action codes

Below are valid action codes:

Action	Description
1 = Create	Enter **1** on the prompt line, along with a new value in at least one key field, to create records in the file. Then enter data on the maintenance panels which follow. New records are printed on the audit report. You cannot enter **1** next to any displayed record.
2 = Revise	Enter **2** to change a record. You can either enter **2** and a value for at least one key field on the prompt line or you can enter **2** next to a displayed record. The change will be noted on the audit report. Entering **2** next to an inactive record will reactivate it.

Action	Description
3 = Copy	Enter **3** to create a record which is based on an existing one. You can either enter **3** and a value for at least one key field on the prompt line or you can enter **3** next to a displayed record. A maintenance panel displays, on which you can enter the new key field and change any other data.
4 = Delete	Enter **4** to delete a record. You can either enter **4** and the key field(s) to be deleted on the prompt line or you can enter **4** next to a displayed record you wish to delete. Deleted records can be reactivated using Action Code 2 (Revise).
5 = Display	Enter **5** to display a record without being able to change it. You can either enter **5** and the key field(s) to be displayed or you can enter **5** next to a record you wish to display.
6 = Print	Enter **6** to print a record. You can either enter **6** and the key field(s) to be printed on the prompt line or you can enter **6** next to a displayed record. The record is printed on the audit trail.
8 = Position To	Enter **8** to move a record to the top of the page. You can either enter **8** and the key field(s) of the record on the prompt line or you can enter **8** next to a displayed record. The selected record is displayed at the top of the page. If the record is not found, the next record in sequence is displayed at the top of the page. Once the Position To feature is used, you can continue to page down or you can use the Position To action again with a different value, but you cannot page up. However, you can return to the top of the file by entering **8** with no record selection on the prompt line.

Additional action codes

If a program contains additional action codes, refer to the help text in that specific program for descriptions of those action codes.

Standard help text for processing options

Many processing options (also called function keys or F keys) perform the same function for every program or panel in SSA ERP$_{LX}$. Definitions for these processing options are below.

Processing Option	Description
Enter	Used to proceed to the next panel of a maintenance program; on the final panel, press Enter to update the file and return to the first panel of the program for any additional maintenance activity. Also used in a report or listing program to send it to an output queue for processing.
F1	Used to display Help Text.
F3	Used to exit a program without recording, updating, or printing any information entered on the program's panels.
F4	Used on prompt-capable fields, denoted by a plus (+) character, to display a pop-up window for the field.
F5	Used to redisplay the panel; this enables the user to check the status of a function which has been executed.
F7	Used to display previous records (those alphanumerically closer to A or those with earlier dates).
F8	Used to display additional records (those alphanumerically closer to Z or 9, or those with later dates).
F11	Used to display a folded view of the panel containing additional information; pressing F11 again returns the panel to its previous format.
F12	Used to return to the previous panel without saving any information entered on this panel.
F13	Used to switch between multiple modes of a display. If three or more modes exist, a window displays the selection choices. This is also used to access Filter panels.
F23	Used to display additional action codes.

Processing Option	Description
F24	Used to display addition processing options (F keys).

Standard help text for filter panels

Some SSA ERP$_{LX}$ programs feature a filter panel that you can access when you press F13. This option enables you to filter the data to be displayed. For example, press F13 in Customer Master Maintenance to display all records by customer number or to display only active records, either by customer number or by customer name.

Chapter 1
Advanced Process Industries

1

This chapter describes the main processes found in Advanced Process industries.

Potency

In a process environment, the true quantity of an ingredient may not be adequately defined by its physical quantity. The ingredient may have a potency that relates its physical quantity to the theoretical quantity of the ingredient.

For example, one component may be a solution which is 50% w/w sodium hydroxide. If sodium hydroxide is the active ingredient, then this component can be defined as having a potency of 50%.

The potency function is critical when the ratio of theoretical-to-physical quantity varies from lot to lot. The potency of a lot is compared to the standard potency of the ingredient [defined in the API Item Master (API100)] to determine the physical quantity of the lot needed to meet formula requirements for the parent item. An item is defined as a potency item when the standard potency percentage is not equal to zero. Entering a number in the Standard Potency % field will activate the potency functionality for this item throughout the system.

In SSA ERP_{LX}, potency is defined as the ratio of the theoretical to the physical quantity expressed as a percentage. For example,

Potency Percentage equals the theoretical quantity divided by the physical quantity, multiplied by 100.

The activity percentage ranges from .0001 to 999.9999.

When the potency and physical quantity of a lot is known, the theoretical quantity can be expressed as the lot potency percent divided by 100, then multiplied by the physical quantity.

When a shop order requires a potency item, the theoretical quantity is expanded by the order size (compared to the formula). The physical quantity of the activity material, when allocated by SSA ERP_{LX} becomes:

(std potency percent / the lot potency percent) x (std physical quantity) x (order size)

The reporting, tracking, and display for activity items can be set at the system (API820D-01) and item (API100) levels for either physical or theoretical quantities. The item can be stocked in either physical or theoretical quantities. After you define the method, it should not be changed. SSA ERP_{LX} currently does not recalculate inventory quantities when the method is changed.

SSA ERP_{LX} does allow an alternate unit of measure to be defined for each item which allows transactions for that item to be entered in the alternate mode. If the item is defined in physical units, transactions may be entered in theoretical units with the alternate unit of measure label or the reverse. SSA ERP_{LX} converts the transaction quantity to the reporting unit of measure by factoring quantity by lot activity (if defined) or standard potency.

Unit of measure conversions

The Unit of Measure conversion program is used to create unit of measure conversions for batch balancing applications. The conversion factors are kept in the same file.

Conversion factors between the Batch Balancing U/M in the Parent Item Master Record and the Stock U/M in the Component Item Master record must be set up before Batch Balancing can be done. You can set up both global (leave Item Number blank on API120D2-01) and item-by-item conversion factors.

Global units of measure are not tied to a specific item and should define standard conversions (such as pounds to kilograms). You may tie conversion factors to individual items to incorporate density or specific gravity in the conversion factor for that item.

Usage codes

Usage codes can be created and maintained through the Usage Type Code Maintenance program (API110). Each usage code sets two flags. These flags allow the system to determine whether the component will be:

- Included in the batch weight calculations when batch balancing calculations are performed
- Used and adjusted to compensate for variations in the physical quantity of the active components allocated to the shop order

Enter the ten usage codes below during implementation. The recommended settings should never be changed.

0 = Fixed Quantity	B = By-Product (variable quantity)
1 = Active	C = Co-Product (variable quantity)
2 = Compensating	D = By-Product (fixed quantity)
3 = Filler	E = Co-Product (fixed quantity)
4 = Packaging	
9 = Miscellaneous	

Usage codes are associated with the components of an item through the formula (BOM500). A component may also have a default usage code defined in the Item Master record for the component (API100). The function of a particular usage code is determined by:

- How the Adjust During Batch Balancing flag is set
- How the Include in Batch Weight flag is set, and whether or not a Standard Potency % is defined in the - Item Master record -- API100).

The SSA ERP$_{LX}$ Batch Balancing Process filters out usage codes which exclude the item from batch weight calculation, yet list the item as an adjusting agent.

You can change a usage code after you create a formula. You can change a potency component to a compensating component or the reverse. A potency component cannot also be a compensating component.

You may sub-divide usage code functions into specific categories by providing a description for the usage code. For example, the Packaging (4) and Miscellaneous (9) reserved usage codes provide the same function but are given different descriptions for application convenience.

Usage code functions

Reserved Usage Code	Function	Item Master Potency (>0<)	Adjust During Batch Balancing (Y,N)	Include in Batch Weight (Y,N)
4	packaging	N	N	N
9	miscellaneous	N	N	N
3	filler, non-compensating	N	N	Y
2	compensating	N	Y	Y
1	active potency component	Y	N	Y
0	fixed quantity (special)	N	N	Y

The usage codes are described in detail below:

4 Packaging: The usage code for packaging allows a component on the formula to be set outside of batch quantity calculations and potency considerations. For components assigned this usage type function, the quantity will vary directly with the shop order size.

9 Miscellaneous: The miscellaneous usage code allows a component on the formula to be set outside of batch quantity calculations and potency considerations. For components assigned this usage code function, the quantity will vary directly with the shop order size.

3 Filler/Non-Compensating: This usage code allows a component on the formula to be included in the batch weight, but will be held constant in potency calculations. The 'Filler' usage code (3) is non-compensating. For components assigned this usage code, the quantity varies directly with the shop order size.

2 Compensating: This usage type allows a component on the formula to be included in the batch weight and used to compensate for variations in the batch physical quantity due to non-standard potency components. The compensating component provides a buffer for variations in the physical quantity of potency components. If the allocation of potency components produces a decrease in the required physical quantity of the potency component due to a higher than standard potency, the allocation of the compensating component will be increased to balance the deficiency. If the potency component physical quantity must be increased, the net change will be subtracted from the compensating component.

A formula may have more than one active potency and/or compensating component. In such cases, the compensating requirements are distributed proportionally among the components:

Compensating Component Requirements = SUM [standard component requirement] + SUM [change from standard requirement X standard component requirement]

The allocated quantity of compensating components may be reduced to zero if the difference between the required physical quantity of a potency component and the standard physical quantity equals the quantity of the component. SSA ERP_{LX} will not produce a negative allocation of a compensating component. If the required physical quantity of a potency item must be increased beyond the quantity of compensating components, no allocations will be performed for this shop order and an error message stating the condition is produced. No allocations will be performed when the following condition is true:

Total standard compensating quantities < SUM of [each potency component actual qty – each component standard qty]

Example: 20 < SUM [50 - 40] = 10

1 Active Potency Component: An ingredient that bases the requirement on the theoretical quantity (the quantity of the active part of the ingredient). For example, if a component contains a mixture of 50% sugar, (active ingredient), the item has a potency of 50%. The requirement of the active ingredient in a potency component varies only with batch size. The physical quantity is determined by:

Physical Qty = SUM [(each lot theoretical qty x 100) divided by lot activity percent]

The difference between the standard physical quantity (from the formulas) and the calculated actual physical quantity will be added to the requirement for the compensating components.

0 Fixed: The quantity of a component with this usage code is the quantity defined in the parent item formula, regardless of batch size or any other factors. This component must not have a potency or a scrap factor.

The fixed usage code may be useful for components that are tied to a shop order (lubricants, cleaning fluids, surfactants, etc.) but not related to the quantity of the other components or the parent item.

The figure below shows settings that are INVALID in both API110 and in BOM500:

Item Master Potency (>0<)	Adjust During Batch Balancing (Y,N)	Include in Batch Weight (Y,N)	Not Allowed in
	Y		(API100)
Y	Y		(API100)
Y	Y	Y	(BOM500)

Batch balancing

SSA ERP$_{LX}$ uses two methods to perform allocations incorporating variable lot potencies:

- Fixed Batch - This method allows you to define a constant unit or batch size at a standard active component potency. At least one other component must be defined as "compensating". When allocations are performed by the system, the proportion of the compensating components will vary to compensate for lot variations in the active components.
- No Balancing - This method allows you to define the theoretical units of the potency item as a constant. Variations in the lot activity of active components will result in adjustments to the physical quantity allocation of the active component(s) and this adjustment will alter the total batch size accordingly. No compensating component is required since the batch size is allowed to vary.

	Batch	Compensating Component(s) Required?	Defines
Fixed Batch	Constant size	Yes (one or more)	batch size at standard active potency
No Balancing	Size varies	no	theoretical units of potency item

When you print shop packets through the Shop Packet Print (SFC520) or Print Released Orders (SFC550) programs, SSA ERP$_{LX}$ checks the System Parameter file to determine if inventory allocations should be created automatically. If you do not want inventory to be allocated automatically you can perform batch allocations for selected orders through the Batch Allocations program (SFC730) or perform manual allocations through either the On-Line Allocations (SFC720) or Inventory Transactions (SFC570) programs.

SSA ERP$_{LX}$ will perform batch balancing only if the Potency flag on the System Parameter file (ZPA) is set to "Y" (Yes).

Fixed batch balancing

Fixed batch balancing is a method of adjusting the mix of components for a batch of the parent item according to the actual quantity of the batch's potency component's active percentage. Items defined as potency items (ingredients) can be assigned a standard potency in the Item Master record and an actual lot potency after they are tested and received into inventory.

To batch balance, SSA ERP$_{LX}$ first compares the actual potency in the Lot Master file (ILN) for all potency components to the item standard potency recorded in the Item Master file (IIM). When an actual potency differs from the standard potency percentage, SSA ERP$_{LX}$ performs a unit of measure conversion to convert the component requirements into the parent items batch balancing units. The potency factors are used to compute the actual amount of the potency ingredient required.

Example:

100 standard units of component "A" required

(formula - MBM)

75% standard potency (Item Master file - IIM)

80% actual potency (Lot Master file - ILN)

100 x (.75/.80) = 93.75 actual requirement

SSA ERP$_{LX}$ performs a similar calculation for all potency items in the batch. Once the actual requirements have been computed, SSA ERP$_{LX}$ compares the standard batch weight for the parent item to the actual batch weight, which is the sum of the actual potency ingredient requirements along with the quantities of all other component items that contribute to the final batch weight. SSA ERP$_{LX}$ computes the standard batch weight based on the amount of the components that would be required if only standard potency items were used. The component requirement quantities are retrieved from the Material Allocation file (FMA).

The quantities of the compensating components are adjusted in fixed proportion to offset the change in the batch weight from standard as a result of variations in the amount of potency ingredients used.

Example:

End item = D Std Batch Size = 100

```
|       |       |
A (100)   B (100)   C (100)
```

Total standard batch weight = 300.00

Total actual batch weight as a result of potency variations = 293.75

Total difference = 6.25

If all components contribute to batch weight and component "A" is the active ingredient represented earlier and components B and C have usage type codes flagged as "adjustable" in batch balancing, the quantities for components "B" and "C" are adjusted as follows:

B = 100 + (100/200 x 6.25) = 103.125

C = 100 + (100/200 x 6.25) = 103.125

Batch balancing occurs before the "final" allocations for a shop order are created. These allocations are derived from preliminary allocations created directly from inventory reservations. Allocations are not really final after batch balancing, because you can update them manually during production reporting.

Reservations are based on the parent item requirement, the formula quantity, and the formula scrap factor. The parent item requirement will reflect yield adjustments if it is based on a planned or firm-planned order that was created from a customer order. Allocations incorporate batch balancing into the requirements calculation.

No balancing

Potency items with usage codes set so that the items are not included in the batch weight calculation will be allocated based upon their actual potency. Production of parents will have varying batch sizes as there are no compensating adjustments made.

Co/by-products

Co-products/by-products are held in the formula, like other components. A co-product or by-product is distinguished by one of the following component usage type codes:

Reserved Usage Code	Function
B	By-Product variable quantity
C	Co-Product variable quantity
D	By-Product fixed quantity
E	Co-Product fixed quantity

The quantities in the formula are positive, and represent potential receipts.

Co/By-product relationships are valid whenever SSA ERP_{LX} accesses:

- the formula
- scheduled receipts or issues
- planned receipts or issues

This includes MRP, CST, MDM, SFC, INV, and JIT.

When planned orders are exploded through the formula (MRP and MPS) co/by-products are tagged. These requirement records are treated like planned orders for the Co/By-Product, shown as supply, not demand. From the point-of-view of the Co/By-Product, requirement records look like firm planned orders in the netting calculation. These types of records are included in the view of the planned order file. These types of planned orders are designated by "PLN-CB" on the reports and inquiries.

When a shop order is created, SSA ERP_{LX} creates a normal material allocation for the Co/By-Product but the *Co/By-Product* flag set to "Y". In addition, when you have a Co-Product (usage type codes "C" and "E"), SSA ERP_{LX} adds the routing data to the shop order operations for the Co-Product. For identical operations with the same work center and operation number SSA ERP_{LX} adds in the required hours. For new operation numbers, SSA ERP_{LX} adds those numbers to the shop order operations. For identical components (same item number and operations number) SSA ERP_{LX} adds in the required quantity. For new components, SSA ERP_{LX} adds these components to the material allocations for the shop order.

Maintenance for released shop orders is done from the component line SFC540 (shop order maintenance) for the shop order. If the due date is changed on the parent, the due date of the Co/By-Product automatically changes. Regular planned orders for Co/By-Product items can be maintained in the normal fashion through MRP510 and DRP510.

During standard cost rollups, SSA ERP_{LX} subtracts component by-product costs from the total cost of the parent item. Component co-product costs have no effect on the non-actual cost of the parent.

By-product actual costs can only be updated manually because the total shop order cost will be posted to co-product and parent production.

Co-product actual costing is based upon an allocation percentage maintained in the formula. If this percentage is greater than zero, the co-product production will absorb that percentage of the total shop order cost and the remaining cost will be posted to the parent product.

Example 1:

Parent A Product C actual cost in item master = $8 each
Component B Co-Product C Cost% = 25

If the total order production Is 100 A's and 10 C's at a total shop order cost of $400, then the actual costs to post are:

A = $ 3.00 each ($400 x (100 - 25) / 100) / 100

C = $10.00 each ($400 x 25 / 100) / 10

If the percentage is equal to zero, the current actual cost of the co-product production is subtracted from the total shop order cost and the remaining cost is posted to the parent product.

Example 2:

Parent A Product C actual cost in item master = $8 each
Component B Co-Product C Cost % = 0

If the total order production was 100 A's and 10 C's at a total cost of $400, then the actual costs to post are:

A = $ 3.20 each ($400 - (10 x $8)) / 100

C = $ 8.00 each (no cost update required)

The shop order cost variance reports (both CST and API versions) show the co/by-product costs, co-product percentage, and reported production under the parent item data.

Orders can be closed manually. The automatic close includes production for all Co/By-Products at quantities equal to or greater than the quantity of the material allocations.

Currently, there are no usage code functions or Co/By-Product functions for planning formulas.

Notes

Chapter 2
Capacity Planning

2

The chapter consists of the following topics:

Overview

Capacity Planning allows production control to identify capacity bottlenecks and backlog problems before they occur. It pinpoints loading problems at critical work centers and allows for better scheduling, work center utilization, and manpower planning.

The CAP product includes the following functionality:

- Rough cut planning from the Master Production Schedule Variable planning horizon
- Flexible time bucket summarization of work center loads
- Detail capacity requirements on-line or in report form
- All requirements pegged to orders (actual or planned)
- Loading of each work center by setup, run, machine, setup and run, or setup and machine hours
- Backward scheduling of planned operations
- Bills of resources
- Detail Shop Calendar by work center
- Input/Output control

Application interfaces

- Master Production Scheduling
- Material Requirements Planning
- Shop Floor Control
- Material Data Management

Implementation plan

Prior to implementing this product, the Inventory Manufacturing Data Management, Shop Floor Control, and the MRP/MPS guides should be reviewed. A thorough understanding of each of these products is required before Capacity Planning can be implemented successfully.

Suggested implementation plan

Once the MPS, MRP and MDM products are operating properly, Capacity Planning can be implemented. To establish the Bill of Resources, the expected hours at each work center to be used in the manufacture of each item are loaded. Departments and Work Centers should be established.

Processes

This section lists the main processes in Capacity Planning.

Inquiries

- Work Center Loading/Pegged Requirements (CAP300)
- (Other as required)

Reports and listings

- Work Center Load report (CAP200)
- Bill of resources report (CAP210)
- Detail Requirements report(CAP220)
- Pegged requirements report (CAP230)
- Work Center List (CAP110)
- Department List (CAP130)
- Input/Output Control Report (CAP250)
- Group Technology Report (CAP240)
- (Others as required)

Generation

- Rough Requirements Generation (CAP500)
- Capacity Requirements Generation (CAP600)
- Reload Bill of Resources (CAP160)

On-line maintenance

- Department Maintenance (CAP120)

- Work Center Maintenance (CAP100)
- Bill of Resources Maintenance (CAP140)
- Machine Maintenance (CAP170)

Close programs

- Capacity Week End Close (CAP900)
- Capacity Year End Close (CAP910)

Product workflow

The MRP and MPS products plan material requirements to meet expected demands, Capacity Planning determines if the manufacturing plan can be achieved with the available machine and labor resources.

Rough cut capacity

Sets up the expected hours to be worked in each critical work center for each item manufactured. This is the Bill of Resources.

The system takes MPS and "explodes" it through the Bill of Resources to determine the resulting load on all critical work centers. Some work centers may be overloaded and production cannot proceed as planned. Changes may be made to the MPS or the available capacity resources to obtain a workable MPS

Detail capacity planning

Explode the MPS to give a full Material Plan (using MRP600), and reschedule any orders that need to be changed. Generate the Detailed Capacity Requirements and check the work center loadings. There may be more adjustments to be made, but eventually an achievable Production Plan should be determined.

Capacity simulation

Changes to the MPS can be made without affecting the "live" MPS through the Simulation facility in the MRP/MPS product.

This includes a Simulated Rough Cut Capacity generation. You may replace the original Master Schedule with the Simulation Master Schedule via a copy function.

Week-end and year-end processing

The capacity Week-end (period end) and Year-end Close programs maintain period and year-to-date load figures. They should be run on a regular basis.

The following suggests a list of activities:

- Time frame maintenance (MRP120) - defining the reporting periods to be used.
- Forecast maintenance (MRP100) - Updating forecast item requirements.
- Master production schedule (MRP240, MRP500) - regenerating and printing the MPS. Providing the production/purchasing plan for the most important items (For example, Master Schedule items).
- Generate bill of resources (CAP140) - The system generates the Bill of Resources from the current Bills of Material and Routings, or you can maintain it directly.
- Generate Rough-Cut Capacity (CAP200, CAP500) - Explode the MPS through the Bill of Resources to arrive at rough work center loadings. Report/inquire on results
- Adjust MPS (MRP510) - If any work center is overloaded, change the MPS accordingly.
- Optional: MPS Simulation (MRP7xx) - Copy MPS, make changes, and print simulated MPS in total or detail. If desired, simulate MRP Explosion and Capacity plan. Copy simulated MPS back over original.
- (MRP600) - Explode MPS to give detail Material Requirements.
- Rescheduling (MRP209, MRP510) - Print Rescheduling report, make suggested changes.
- Generate detailed capacity requirements (CAP600) - Explode the detailed Material Requirements Plan through the Bill of Material to get the full Capacity Plan.
- Review work center loads (CAP220, CAP230, CAP300) - Use the detail reports/inquiry programs.

Product quick reference

Function	Program
Add bills of resources	CAP140
Add departments	CAP120
Add machines	CAP170
Add work centers	CAP100
Change bills of resources	CAP140
Change department data	CAP120
Change operation dates	SFC540
Change shop order dates	SFC540
Change work center description/loading/	CAP100
Close the week	CAP900
Close the year	CAP910
Delete bills of resources	CAP140
Delete departments	CAP120
Delete work centers	CAP100
Display pegged capacity requirements detail	CAP300
Display pegged capacity requirements rough cut	CAP350
Display work center load detail	CAP300
Display work center load rough cut	CAP350
Generate rough cut capacity requirements	CAP500
Generate detail capacity requirements	CAP600
List departments	CAP130
List work centers	CAP110
Print bill of resources	CAP150

Function	Program
Print group technology scheduling report	CAP250
Print rough cut pegged requirements	CAP200
Print rough cut work center load	CAP200
Print pegged requirements	CAP230
Print detail work center load	CAP220
Print group technology report	CAP240
Print input/output report	CAP250
Reactivate deleted bills of resources	CAP140
Reactivate deleted departments	CAP120
Reactivate deleted work centers	CAP100
Reload bills of resources from routings + BOMs	CAP160
Week end close	CAP900
Year end close	CAP910

Glossary

Bill of Resources
A list, by item and work center, of the work hours needed in the manufacture of the item. It is a measure of the commitment of resources involved in making the item.

Rough Cut Capacity Planning
A rough cut capacity plan is available as a capacity planning tool and is generated by exploding the master schedule through the bill of resources. This allows critical work center loads to be checked without a full MRP explosion.

The rough cut capacity plan is available in report format that shows capacity requirements pegged to master scheduled items. The results are summarized by work center into a load profile of up to 40 time buckets. These time buckets are of any length set by the user and can start at any date. This summarization is in bar graphs.

The bill of resources can be calculated automatically from the existing bills of material and routings. The bill of resources for any item is available in report form. This report indicates the total work requirement at each critical work center to build the item and all its components.

Detail Capacity Requirements
Detail capacity requirements are supported in both inquiry and report form. Both the inquiry and report have pegged detail as well as bar graph summaries of the work center load profile. These are summarized into 40 flexible time buckets and indicate planned load versus released load.

For planned and firm planned orders, the operations are automatically backward scheduled from the planned order due date using the production routing. For released orders, the system backward schedules each remaining operation on each production order.

Work Center Loading
Work center loading is done with setup, run, machine, setup and run, or setup and machine hours. Each work center may be loaded differently. Load and backlog calculations are done automatically by the system.

Departments
Work centers are grouped into departments for cost and labor reporting purposes.

Group Technology
The group technology code for each item is used to group similar orders for minimal setup time.

Input/Output Analysis
SSA ERP_{LX} has input/output control including cumulative deviation of standard hours input and output from plan. The I/O analysis is done on a weekly bucketed basis for each work center.

Notes

Chapter 3
Configuration Management

3

The part consists of the following topics:

Overview

The Configuration Management System (CMS) addresses the needs of assemble-to-order, finish-to-order, and configure-to-order manufacturers. It facilitates the manufacture of products with complex interdependent sales options directly from a customer order. The foundation of the system is your existing sales and engineering knowledge base, which you define through its Master Files, Configuration Structure, and Boolean Rules.

The system's analytic engine interprets the knowledge base to enable order-takers to navigate order entry choices quickly and accurately. CMS automatically generates related item master records, bills of material, routings, and price and cost records following validation of the sales order.

System highlights

The Configuration Management System helps you do the following:

General

- Define multi-level sales and manufacturing options
- Translate customer oriented sales options into manufacturing detail
- Convey the end item price to the customer as soon as the sales order is placed

Knowledge base

- Configuration Structure
- Build parent-child relationships in a decision matrix
- Use items, variables, and attributes as valid structure options
- Boolean Rules
- Redefine operation steps from the master routing
- Enable alternate routings and bills
- Adjust the quantity-per on the final bill
- Insert any component beneath any parent item on the bill of material
- Override or discount price and estimated cost values

Analytic engine

- Pricing
- Generate prices using an option-based, cost-plus or price book summation pricing method
- Update your cost master with the configured item costs
- Allow price to fluctuate with variable price break-points
- Routings
- Create routings with the appropriate operations
- Bills of Material
- Create bills with the appropriate components and quantities
- Add components from common bills by inheritance
- Add optional components to bills by implication
- Mass-replace configurable items with standard items by infusion
- Add optional components to bills with Boolean Rules

Order entry

- Respond to prompts or add directly to a catalog string
- Edit order entry with line rules such as “must pick one” or “may pick up to three”
- Edit order entry with quantity rules such as “select quantity“ or “at least quantity”
- Confine options available to those in effect as of the customer's required date
- Order sub-assembly items as final items
- Copy standard and configurable sub-assemblies to the end item bill

Processes

These are the main processes in Configuration Management.

Translate sales options into manufacturing detail

CMS provides the flexibility of defining product characteristics in sales-oriented terms. Order entry can consist of selecting options such as, style, color, and finish as opposed to specific item or catalog numbers. After the sales order is complete, CMS generates bills and routings using the parts, quantities and operations needed to manufacture the end item to the customer's specification.

Multi-level configurations

CMS enables you to create configured sub-assembly items, bills, and routings, in addition to the configured end items, bills, and routings. You define family and sub-assembly items as configurable with manufacturing mode code 6 (assemble to order) in the Item Master (INV100). Facility Planning (MRP140) includes an override to the manufacturing mode. You can include standard and configurable items as components of the family item.

Bills of material for configurable items contain the components that are always part of an end item configuration. Following configuration order entry, CMS uses the process of inheritance to copy the common components from the common bill to the configured end item bill.

Multi-level configurations may require the same component in multiple subassemblies and multiple levels within the configured end item's indented bill of material. To make this process simpler and more efficient, CMS includes a feature called infusion that allows you to mass-replace configurable items with standard items.

Configuration structure

The configuration structure is a decision matrix that ultimately prompts the order-taker through the configuration order entry. Prompts take the form of questions that may require answers or additional, lower level questions to finalize the order. The structure can contain attributes, variables, standard items, and configurable sub-assembly items. An option type code distinguishes one type from another.

The parent (top-most) structure level is always the family item, which you define as an assemble-to-order item with manufacturing mode 6 in the Item Master, or a manufacturing mode override in MRP140.

Configurable and standard items belong at the lower levels of the structure.

You can position attributes and variables at all levels of the structure, except the top-most level occupied by the family item.

All options structured directly beneath the family item are presented during configuration order entry unless excluded by your Boolean compatibility rules.

Attributes, or sales characteristics, can be high level questions such as what color? Variables (measurements or dimensions) can be prompted at order entry, or calculated by the system, based on the rules that you define for them. You can write rules that adjust the bills and routings based on prompted or calculated variables. For example, CMS calculates area based on your entry of height and width, and executes a rule to add a component to the bill if the total area exceeds the value you specify.

You can selectively include items in one configuration and exclude them from another by listing them in the configuration structure. When the order-taker selects an item that is defined in the structure, CMS automatically adds it to the end item bill by the process of implication.

Boolean rules

Use Boolean Rules to link sales options with a variety of actions to perform under pre-defined conditions. There are two categories of Boolean Rules in CMS: *Sales* and *Manufacturing*.

Sales rules consist of compatibility rules, and price or cost rules. Compatibility rules are based on a condition that you define to ensure that only buildable options appear to the order-taker on the Option Selection window. Price and cost rules allow you to redefine or adjust unit prices and

estimated costs. Manufacturing rules actually affect the generation of routings, bills of material, and component quantities.

Rule Entry/Maintenance provides a prompt window that allows you to choose from a list of the keywords. Based on the keyword you choose, additional prompts are available that govern the rule syntax and valid values. Note that keyword QTYPER (which adjusts the quantity-per-parent) is processed as a sales rule if the parent/child combination exists in the configuration structure. It is processed as a manufacturing rule if the parent is a configurable item not listed in the structure.

The following list of keywords shows the rules that are available in CMS.

Keyword	Rule
IF	A positive condition statement for a selected option or one with specific values.
IF NOT	A negative condition statement for an option that is not selected or that does not have specific values.
THEN	A sales statement that requires an option, based on the IF or IF NOT condition.
THEN NOT	A sales statement that excludes an option-based on the IF or IF NOT condition.
ONLY	A sales statement that creates exclusive selections.
NONE	A sales statement that excludes all options.
CALC	A sales statement that triggers a calculation that is pre-defined in the Calculation Master.
PRICE	A sales statement that activates or adjusts a unit price.
COST	A sales statement that activates or adjusts an estimated cost.
QTYPER	A sales and manufacturing statement that adjusts the bill of material quantity-per-parent by a user-specified value field or by a calculation.
METHBL	A manufacturing statement that selects an alternate bill of material method.
METHRT	A manufacturing statement that selects an alternate routing method.
PUT	A manufacturing statement that adds a component to the configured bill and allows you to enter a point-of-use operation for the component.

Keyword	Rule
OPER	A manufacturing statement that activates alternate (status 2) operation steps from the master routing.
OPER NOT	De-activates active (status 1) operation steps from the master routing.
RTNOTE	Defines operation-specific routing notes.
AND	Use And as a connector to make multiple condition statements.
OR	Use Or as a connector to make multiple condition statements.
IF	A positive condition statement for a selected option or one with specific values.
IF NOT	A negative condition statement for an option that is not selected or that does not have specific values.
THEN	A sales statement that requires an option, based on the IF or IF NOT condition.
THEN NOT	A sales statement that excludes an option-based on the IF or IF NOT condition.
ONLY	A sales statement that creates exclusive selections.
NONE	A sales statement that excludes all options.
CALC	A sales statement that triggers a calculation that is pre-defined in the Calculation Master.
PRICE	A sales statement that activates or adjusts a unit price.
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METHBL	A manufacturing statement that selects an alternate bill of material method.
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RTNOTE	Defines operation-specific routing notes.
AND	Use And as a connector to make multiple condition statements.
OR	Use Or as a connector to make multiple condition statements.

Pricing methods

You select your default pricing method in the system parameters. You can override this default with an item specific pricing method in the item master. CMS bases the configured price on the family item's pricing method if the pricing methods differ between a family item and its subassembly items. It uses the pricing method assigned to the subassembly item if the subassembly is ordered as an end item. Discounts by customer, customer discount code, and item discount code are validated with each method.

Cost-plus pricing

Allows you to define a mark-up percentage over the configured cost by family item. The sales order automatically updates the calculated price so the price can be conveyed to the customer at the time the order is placed or modified. Cost-plus pricing uses the existing cost set that you have defined in CST.

Price book summation

The first cost roll is done to roll up the costs under the configured end item. The second cost roll, using the pricing cost set that you select in the system parameters, is done to determine the end item price and update the Cost Master with costs for the pricing cost set. The end item cost updates the List Price in the item master. Price book summation uses the existing cost sets that you have defined in CST.

Option-based pricing

Allows you to record prices for all structure options (attributes, items, prompted variables), family items, and calculated variables at the master file

level. You can override attribute and item prices in the configuration structure. CMS totals all prices to arrive at the price of a configured end item. All prices assume global currency, defined in the Multi-Currency System Parameters.

You can use the Variable Master and Variable Price Maintenance to define variable prices as unit prices or associate them with dimensional breakpoints. A dimensional breakpoint is a numeric value that serves as a gradient point in a range of values. When the order-taker selects a value on or within breakpoints, the system uses the matching list price in developing the configured end-item price.

You override prompted variable prices in Structure Variable Pricing (CFG571). You can override unit prices from the item master, attribute master, or variable master in Structure Entry/Maintenance (CFG550)

Order entry - option selection

Option Selection is a windows based client interface which provides two order entry methods: prompted entry, and fastpath entry.

Selecting choices from a prompt window is similar to a conversation between the system and the order taker. Answers to higher level questions prompt additional lower level questions and eliminate or automatically answer other lower level questions.

With the catalog string, the order taker can directly enter abbreviation codes or numeric values as specification of prompted variables.

With both entry methods, CMS executes the user-defined Boolean rules to ensure that only buildable configurations are entered.

Configured cost generation

CMS updates the cost master with the costs of the components and operations needed to build the configured end item, using your pre-defined cost set. The cost displays during order entry if you use the cost-plus pricing or price book summation method.

If you use option-based pricing, you can view rolled up estimated costs in the Cost/Price Window. Estimated costs developed with option and variable based pricing are informational only—they do not update the cost master files. Viewing them in the Cost/Price Validation Window enables you to

accurately project how selected options will affect overall cost and to make price adjustments if needed.

Manufacturing costs display in the Cost/Price Window if you use either the Cost-plus Pricing or Price Book Summation method.

End item price

CMS validates the selected sales options and generates the end item price. The price displays in the stocking unit of measure and is converted to the selling unit of measure on the customer order. The order-taker can adjust the price or accept it as the end item price. Once the order-taker accepts the end item price, CMS copies the end item price to the list price field in the item master and updates the order with the new configured end item number and price.

After the configuration order is accepted, Order Entry concludes the process by doing the following:

Apply discounts and promotions to the end item price. Discounts and promotions are applied to component items whose prices are rolled up into the end item price only when the component items are ordered as end items.

Convert global currency to order currency using your existing Currency and Exchange Rate Definitions.

Print the net selling price (list price less discounts and promotions) on the customer order acknowledgment.

Files used

CMS contains the files in the table below.

File	Text	Effect
CAC	Application Codes Table	Input/Output
CAM	Attribute Master	Input/Output
CAT	Item Attribute Sequence	Input/Output
CCA	Calculation Master	Input/Output
CIR	Edit Rule Detail	Input/Output
COD	Configuration Order Detail	Input/Output
COH	Configuration Order Header	Input/Output

File	Text	Effect
COV	Configuration Order Variable Table	Input/Output
CRD	Rule Definition Header	Input/Output
CRV	Variable Master	Input/Output
CSS	Configuration Structure Physical	Input/Output
CVA	Structure Variable Master	Input/Output
CVP	Variable Price Master	Input/Output
CVS	Structure Variable Price Master	Input/Output
IIM	Item Master	Input/Output
CIC	Facility Planning Master	Input/Output
CMF	Cost Master	Input/Output
ECL	Sales Order Detail	Input/Output
FRT	Routing Master	Input/Output
MBM	Bill of Materials Master	Input/Output
MPN	Item Process Notes	Output
ZPA	General Parameters	Input/Output

Product workflow

Complete the steps below to define the Configuration Management System defaults and processing controls. Each step is required, although there is no requirement as to the order in which you perform them.

1 CFG Security Options (SYS603)

Set the revision and option selection flags. The revision flag controls whether the user ID has authority to maintain the structure type and attribute status fields in the Attribute Master (CFG110). The option selection flag controls whether the user ID can process orders in engineering mode or only in order entry mode in the Option Selection window.

2 Parameters Generation (SYS800)

- Configuration Cost Set: Select the cost set for the configured end-item cost roll-up.
- Pricing Method: Select the default pricing method. 1=option-based pricing, 2=cost-plus pricing, 3=price book summation. With method 1, you can define three cost types for CMS estimated costs. With methods 2 and 3, system defined values (material, labor, and overhead) are in effect for cost types 1-3. Each method uses the Configuration Cost Set defined above.
- Price Set: This parameter is valid only with pricing method 3 (price book summation). Select the price set to use for configured end item price summation. This must be a valid, user defined set (11-99) already defined in CST140.
- Manufacturing Method: Select a manufacturing method code (defined in SYS115). Bills and routings will be created under this code. This parameter is valid with all pricing methods.
- Item Suffix Code: Enter from one to four digits to define the length of the suffix code. SSA ERP_{LX} uses suffix codes to sequentially identify each configuration whenever multiple configurations of the same family item exist on one sales order.
- Slash Indicator: Select this option if you want a slash indicator to separate the family item number from the sales order number in the order entry catalog string.

3 Item Master (INV100)

Create an Item Master record for each family (top-level) item and for each component that can be selected as part of the configuration. Manufacturing Mode and Generate Shop Order are required; CMS Abbreviation, CMS Pricing Method, and CMS Estimated Cost are optional for each item.

4 Routing Master (SFC100)

CMS uses your existing master routing records. You can activate alternate routings from the Configuration Structure or from the Boolean Rules.

5 Special Pricing Maintenance (ORD120)

If you select the pricing method 2 (cost-plus pricing) in System Parameters Generation, define a standard markup over the configured end item cost roll.

6 Facility Planning Maintenance (MRP140)

Manufacturing Method and Shop Order Generation options in Facility Planning provide a facility level override to the Manufacturing Mode and Shop Order Generation options in the Item Master.

7 Calculation Master (CFG555)

Define the calculations for Boolean Rules.

8 Constant Names (CFG105)

Define the constants for Boolean Rules.

9 Structure Type Codes (CFG551)

Define structure type codes that, when assigned to an attribute, identify the attribute’s allowable position in the structure, and show whether line and quantity rules are required for the child options.

10 Attribute Status Codes (CFG565)

Define attribute status codes, that, when assigned to an attribute, identify whether the attribute is a valid option in the structure or rules.

11 Attribute Master (CFG110)

Create attribute masters to define high level descriptions of sales options or item groupings.

12 Variable Master (CFG560)

Create variable masters to allow user specification of values for prompted entries or calculations.

13 Variable Price Maintenance (CFG561)

Create unit price records for variables.

14 Configuration Structure (CFG550)

Create a decision matrix of options using parent/child relationships.

15 Structure Variable Master (CFG560)

Enter variable value and price overrides to the Variable Master.

16 Rule Entry/Maintenance (CFG131)

Define Boolean Rules to link sales and manufacturing options with order entry selections.

Product quick reference

The table below provides the functions used within this product as well as their associated program codes. Program codes are used to quickly access a function. To use a program code, type the program code in the empty field at the top of a menu panel and press Enter. The system displays the first panel in that program.

Function	Program
Maintain Constant Names	CFG105
Maintain Attributes	CFG110
Look up Attribute Descriptions	CFG120
Maintain Configuration Rules	CFG130
Find where Attributes are used	CFG300
Maintain Structure Variables	CFG301
Find Busy Orders/Quotes	CFG310
Find Configured Items on sales orders/line items	CFG390
Maintain Configuration Structures	CFG550
Maintain Structure Type Codes	CFG551
Maintain Calculations	CFG555
Maintain Variables	CFG560
Maintain Variable Prices	CFG561
Maintain Attribute Status Codes	CFG565
Maintain Structure Variable Prices	CFG571
Resubmit CFG program due to set-up errors	CFG390
Set Configuration Control System Parameters	SYS800
Set Configuration Security	SYS600

Glossary

Attribute
A logical grouping of family item characteristics, such as color or size, and their descriptions, such as red or large. Attributes eliminate the need for dummy item numbers to describe such broad characteristics.

Attribute status codes
Controls that identify attributes as required or optional, and active or inactive. You cannot add an inactive attribute to a configuration structure.

Calculations
Set up calculations in the Calculation Master. The calculation factors can be numeric literals, variables, or constants joined by an operator (+, -, /, *, =). Once you define calculations in the master file, you can use them in Boolean rules.

Common Bills
A family item bill of material. Since the configuration structure can include family items and subassembly items, subassembly items defined as components on a common bill are automatically included in the configured end item bill by the process of inheritance.

Compatibility Rules
Boolean Rules that are defined by keywords Then, Then Not, Only, and None. They are used to eliminate invalid options from the display of available options in Order Entry.

Configurable Item
A family item or subassembly item that can be configured to customer specifications.

Configured End Item
The result of the configuration process, it is the final item that is shipped to the customer. Any number of configured sub-assembly items, and standard items, can support assembly of the configured end item.

Constant
Use this program to assign constant names to dynamic conditions, such as temperature or humidity. You can assign constants in Boolean rules to trigger various actions (compatibility, price/cost, manufacturing)..You can use constant names in your calculations.

Dimensional Breakpoint
A user defined numeric value that serves as a gradient point in a range of values. When the order-taker selects a quantity/value on or within breakpoints, the system uses the matching list price in developing the configured end-item price.

Engineering Mode
A security flag in SYS603 that, if selected, allows the user ID can view all possible order options and selections for testing purposes. Also see Order Entry Mode.

Family Item
A configurable item that serves as a generic description of the finished good sold to a customer. It represents a high level grouping of potential configurations from which to define a final configuration.

Global Currency
In CMS, the system interprets option and variable based pricing as the global currency you defined in MLT800. The system converts this to your base currency during order entry validation if the Configurable Enterprise Accounting is installed.

Implication
The process by which the system automatically adds child items, selected from any level of the structure, to the immediate parent's end item bill and routing. The parent can be the configured end item or a configured sub-assembly item.

Inheritance
The process by which the system automatically copies components from a common bill to the configured item bill and operations from the common routing and item routing.

Infusion
The process by which the system automatically replaces configurable items with standard items, based on the template, segments, and abbreviation/values that you assign.

Item
Standard and configurable items are valid configuration options. Use manufacturing mode 6 (assemble-to-order) to classify items as configurable in the Item Master. In CMS, standard items are identified as option type 2 and configurable items as option type 3.

Line Rules
Line rules guide the order-taker through actions required on lower levels of the structure. Use the structure type code to identify attributes that require line rules. The following line rules are available:

Rule	Requirement
MALL	Required. Select all choices regardless of rules
MREM	Required. Select all remaining choices not excluded by rules
Mnnn	Required. Select exactly the number shown
Mnn+	Required. Select at least the number shown
Mn-n	Required. Select a number within the range shown
Onnn	Optional. Select exactly the number shown
Onn+	Optional. Select at least the number shown
On-n	Optional. Select a number within the range shown

Manufacturing Mode
A code in the Item Master that allows you to identify items as configurable. Manufacturing mode 6 (assemble-to-order) is reserved for your configurable items.

Options
Entries in the configuration structure that govern the choices presented to the order-taker. An option can be an attribute, prompted variable, configurable sub-assembly item, or a standard item.

Order Entry Mode
A security flag in SYS603 that, if selected, allows the user ID to view only the option categories (parent options and available sub-choices) that require user action. Selections that are processed automatically do not display. Also see Engineering Mode.

Pricing Methods
Three pricing methods are available in CMS:

- Option Based Pricing: allows you to separate pricing from costing by entering independent prices for options and variables.
- Price Book Summation: rolls up material, labor, and overhead costs and then generates pricing records based on cost sets pre-defined in CST820.
- Cost-plus Pricing: allows you to use a cost mark up (defined in ORD120) to calculate prices for configured end items.

Select the desired method in System Parameters Generation (SYS800) to use as the global default. You can override that default, on an item by item basis, in the Item Master (INV100) or at the order entry level on the Price/Cost Validation window.

Quantity Per
The quantity of a component required for production of the parent. This is abbreviated as QTYPER in the Boolean rules. Because QTYPER is reserved for rules, you cannot use it as the name for a calculation or a variable.

Quantity Rules
These rules guide the order-taker through quantity selections required for lower levels of the structure. Every option in the structure that has a line rule must have a quantity rule. These quantity rules are available.

nnnn	Select exactly the quantity shown
nnn+	Select at least the quantity shown
n-nn	Select a quantity within the range shown

Boolean Rules
Boolean requirements that control configuration order entry. For example, "if item 1 is selected under branch A and item 3 is selected under branch B, then item 6 must be selected under branch C." You can also use rules to invoke calculations, for example, “calculate the area (if the order-taker enters height and width) and if the area is greater than N then add component Z to the bill.”

Standard Item
A non-configured item. The components of configured item bill of material are standard items.

Standard Configuration
A configuration with an order volume that justifies a permanent item master, bill, and routing. You can identify standard configurations by the item number or the combination of selections that match the standard item.

Configuration Structure
An option matrix that categorizes and sequences valid options in a question and answer flow for order entry.

Structure Type Codes
Controls that allow you to define an option’s allowable position in the configuration structure, and to identify parent options whose children have required line and quantity rules.

Segment
The parent of selection level options that describe the configured end item. For example *color* is a segment code and *blue, red,* and *green* are selection level options. When the order-taker selects the combination of segments and associated abbreviation codes, and variable values that define selection level options, the system automatically replaces them with standard items. The

segment code also specifies which child option abbreviation codes that make up a unique configured item description.

Template
A standard family or sub-assembly item that you use as the basis for a standard configuration. You associate the template items with configurable parent/child options. When the order-taker selects the precise combination of configurable parent/child options (designated by the segment and associated abbreviation and variable values) the system automatically replaces the configurable item (defined in the template) with a standard item.

Variable
Calculated variables are calculated by the system, based on the rules that you define for them. Prompted variables are numeric sales option data that you can use in Boolean rules to limit available options presented to the order-taker. Prompted variables can also be entered in the Option Selection window at order entry time. Prompted variables, along with attributes, configurable items and standard items are valid configuration structure options.

Chapter 4
Just-in-Time Processing

4

The chapter consists of the following topics:

Overview

Just-in-Time (JIT) excites nearly everyone in manufacturing businesses today. JIT provides an endless variety of visions, yet maintains traditional goals. To be competitive, businesses must continue to find ways to improve their costs, quality, and customer service.

Each business has different visions: better bottom lines, paperless factories, instantaneous production, no inventory investment, miraculous customer service, workers singing songs, Kanban cards, Total Quality, and on-time vendors. Yet confusion usually follows the dreams. "What, exactly is Just-in-Time? Does it run on my computer? Does someone sell Just-in-Time software? What does it take to implement Just-in-Time?"

SSA and our worldwide network of Affiliates have been steadily working toward ending a lot of this confusion about Just-in-Time. We have been to Japan. We are continuing to enhance and upgrade our SSA ERP_{LX} software to help you implement the Just-in-Time philosophy in your factories. Many of our users are making dramatic improvements in repetitive and job-shop manufacturing performance. And some of our Class A MRP II users are on the way to becoming Just-in-Time showcases.

Product description

Just-in-Time (JIT) is a management philosophy that focuses on minimizing the resources necessary to add value to your products and to operate your factory in ways that eliminate waste. Resources are labor, materials, equipment, space, and time. Waste is anything that does not add value to your products. Moving work-in-process from place to place, stacking and sorting, investing capital in large work-in-process and raw material inventories, inspecting materials at your vendors' sites, and tying up warehouse space with finished goods are all activities that add cost, not value, to your products.

JIT can be defined as a program that reduces lead time. JIT does not replace an MRP, an inventory program, a scheduling technique to bypass your Master Schedule, or a materials management project. JIT is the never-ending commitment of everyone (from top management to your workers on the floor) to maximize your effectiveness through continuous, incremental improvements.

Problem solving and work improvement

American manufacturers have recognized the dramatic productivity improvements that result when Master Schedules are tested to ensure that they are doable. Manufacturers use rough-cut capacity planning to ensure that the bottleneck resources are not overloaded. The result is improved delivery performance, reduced work-in-process inventory, and increased productivity. Problems remain covered up by excess materials, workers, space, etc. In addition to the hidden problems, thousands of opportunities for other potential improvements are missed.

Typical problems include:

- Machine breakdowns
- High scrap and rework
- Bad raw materials
- No repair parts for machines
- Worn tooling
- Worker tardiness and absenteeism
- Late arrival of parts
- Material handling delays
- Untrained workers
- Waits for inspection or setup people

Traditional manufacturing has attempted to solve problems by using:

- Buffer stock at each work station
- Backup machines or elaborate, multi-functional machines
- Excess material handling equipment and people
- Excess tooling
- Excess repair parts
- Excess workers
- Elaborate tracking and information systems

Another way to look at JIT is to equate it with enforced problem solving. By eliminating traditional solutions, we force ourselves to recognize, and solve, our real problems.

The JIT approach exposes and solves problems by:

- Removing excess materials, space, and workers

- Scheduling each workstation under its capacity to ensure flexibility
- Cross-training and developing multi-functional workers
- Adopting Total preventive maintenance in each work station
- Reducing setup and material movement time
- Adopting a pull approach to production (where work is performed only when it is needed by the customer)
- Continuing to remove the excess little by little, year after year

Attacking problems with common sense has resulted in some truly uncommon results. The people most familiar with the problems are encouraged to solve them. The solutions are usually simple. And the cumulative effect of this effort is an organization able to respond to pressure from competition.

The benefits of implementing Just-in-Time approaches include:

- Faster cycle times
- Reduced rework
- Minimized costs for engineering changes
- Fewer production line stoppages
- Longer machine life
- Higher product quality
- Improved worker response to real needs for flexibility
- Greater sense of importance felt by workers
- Increased labor productivity
- Increased market responsiveness

Benefits are not only internal. Working on Just-in-Time performance with vendors has resulted in shorter deliveries, better prices, and higher quality.

JIT is real. Principles can be applied internationally.

One of the keys to implementing competitive strategies is a competitive manufacturing organization. JIT is the key to unlocking the full potential of yours.

SSA ERP$_{LX}$ and Just-in time integration

For years, repetitive manufacturing industries have been applying many of the principles in Just-in-Time philosophy. They have established balanced production lines that depend on a steady flow of material to each work station. Production is scheduled in daily or weekly rates rather than in discrete shop order lots. Finished inventory is tracked by work center rather than by job. Stock balances are typically backflushed (decremented upon completion of specific manufacturing steps rather than issued at the beginning of each production run). Costing is typically based upon a daily rate or hourly rate rather than being associated with specific shop orders.

Repetitive manufacturers have demanded MRP II software adaptable to their environments in key areas such as:

- Product definition
- Inventory tracking
- MRP/Master Scheduling
- Shop Floor Control
- Purchasing
- Costing

Each of these key areas is discussed in more detail in the paragraphs below.

Just-in-Time uses the same types of data processing linkages with additional capabilities for timing the flow through the shop.

SSA ERP$_{LX}$ meets these challenges with integrated manufacturing products that accommodate process, repetitive, and job shop production in Just-in-Time environments and in MRP II environments where JIT has not yet been implemented.

SSA ERP$_{LX}$ product definition

Defining products involves creating three information files that describe material content (bill of material), sequence of steps (routings) and labor location (work centers).

Work centers are often combined into Group Technology cells for scheduling similar items

These three files are the basis for:

- Scheduling requirements for material and capacity

- Detailed scheduling of shop activity
- Developing standard product costs
- Providing the yardsticks used to track actual costs

Material must be able to be related to specific routing steps. Each work center in the routing must be described. (How much capacity does the work center have? Is the work center labor hour dependent or machine hour dependent? How is the work center going to absorb overhead costs?)

After you define the product, master schedule the JIT item. Specify the quantity of the item and the system creates planned production to match that quantity. When you release planned production, the system can print Kanban cards along with the shop packet. Kanban cards are used on the shop floor to record the quantity of an item received at a particular work center and operation from some other work center and operation.

Component allocations are created when you release the planned production, but the system will generate lower-level issues only when production is posted for the appropriate operation (as specified on the bill of material).

SSA ERP$_{LX}$ meets these needs with:

- Optional JIT Planning by item - Allows you to schedule production for some items by using Just-in-Time scheduling and continue to use standard master scheduling for other items.
- Routing operation reference in the bill of material - Enables the system to backflush component item requirements when production activity for a given operation is posted.
- Phantom assembly designation - Identifies a transitional component which is generated and completely consumed during the manufacturing process. For example, designate a phantom assembly for transitional components for which you do not want to generate component requirements.
- Work center capacity loading codes - Help you to determine exactly the type of labor that is used at each work center.
- Overhead absorption basis for each work center - Allows you to compute overhead costs by using either a fixed rate or a fixed percentage.
- Group technology code for each item - Makes it easy to select similar items for JIT reports.
- Concurrent operation or overlapping operation capability in the routings. Allows you to track or plan: multiple operations occurring on different parts an assembly at the same time (concurrent operations), or a

subsequent operation to begin before the preceding operation is complete (overlapping operations)

SSA ERP$_{LX}$ inventory tracking

To track inventory you must account for receipts, issues, adjustments, and transfers. These transactions may be reported as discrete events or inferred from the completion of production activity. Just-in-Time needs inventory tracked to each individual work center or data collection point. Scrap must be accounted for and rejects analyzed. You'll also want to be able to verify on hand inventory balances.

SSA ERP$_{LX}$ meets these needs with:

- Inventory by work center or data collection point
- QC and inventory transactions that you define
- Backflushing capability
- Optional standard locations by item and warehouse
- Reason codes and account numbers that you define
- Two-step cycle counting with separate verification and update
- Automatic pull-through based on workcenter production reporting
- Quality control and reject reporting by item, by work-center or by reason code

SSA ERP$_{LX}$ MRP/master scheduling

JIT production is not usually planned in discrete production lots. Instead, a volume over time is set. For example, a daily, or weekly rate of production is planned. Production is tracked cumulatively to large, blanket schedule quantities. Schedules are usually stable and center around combining Group Technology resources to minimize set-up and change-over times. Rough-cut simulation capability is a must for JIT production; however, the SSA ERP$_{LX}$ scheduling system also accommodates non-JIT production. Time fences are necessary to avoid disruptive rescheduling signals to production.

In addition to standard MRP II Master Scheduling capabilities, SSA ERP$_{LX}$ supports Just-in-Time with:

- Group Technology planning to minimize set-ups
- Full simulation and rough-cut capacity planning capability
- Time fences by item
- On-line release and maintenance of JIT schedules

- System-generated schedules and run rates by item
- Automatic underrun planning adjustments

SSA ERP$_{LX}$ shop floor control

For Just-in-Time manufacturing, easy shop floor reporting and tracking are the keys to success. The system must be responsive to change and be able to communicate status and priority changes quickly. Reporting must be streamlined to utilize workers' time for production. Reporting adds cost, not value. SSA ERP$_{LX}$ reduces reporting costs with on-line, real-time dispatching and graphic work center load displays.

Additional Product Highlights:

- Daily JIT release schedules and build rates
- Repetitive make-to-schedule
- JIT processing by item
- Kanban card printing
- Automatic container need calculations
- Backflush of material usage based upon reported production
- Material consumption tied to operation steps
- Production reporting by item and work center
- Quality control feedback and analysis
- Work stoppage (red light) analysis
- Data collection interfaces
- Yield analysis by work center or data collection point
- User-defined data collection points with effectivity dates

SSA ERP$_{LX}$ purchasing

Controlling your vendors' performance is a major factor in improving both your responsiveness to the market and your quality. JIT requires good communications with your vendors to help them simultaneously lower their costs and to provide you with better service. You need to buy capacity, not just quantities of material. And you need to see your requirements in ways that let you negotiate volume purchases and discounts with your vendors.

SSA ERP$_{LX}$ provides you with solid information for effective vendor communications. SSA ERP$_{LX}$ supports your Just-in-Time needs with:

- Blanket purchase orders

- Purchase requisitions
- Ability to combine requirements for negotiating long-term agreements for vendor capacity
- JIT purchase release schedules
- Cumulative reporting and tracking
- Vendor Performance analysis — including quality
- Long-range vendor scheduling
- Vendor by item quotations and history

SSA ERP$_{LX}$ cost accounting

The challenge in cost accounting is tracking your manufacturing to the levels needed for useful management information. You need feedback for corrective action; but, you need to minimize the cost of collection. Some parts of your operation require specific job-cost tracking while the Just-in-Time areas require costing in terms of cost per process hour or day. Overhead must be applied in different ways to different processes and products. And costs have to be segregated into enough detail to provide management with an accurate picture of your products' contents. Material, material overhead, labor, fixed overhead, variable overhead, outside processing, outside processing overhead, etc. all have to be considered.

SSA ERP$_{LX}$ meets your cost accounting needs with:

- Four sets of costs: actual, standard, frozen standard, and simulated
- Nine user-defined elements per set
- Full and partial cost roll-up and simulation
- Cumulative in-process cost tracking
- Cost summaries by item
- Cost definition tied to work centers or material type
- Process hour costing

Implementing just-in-time processing

SSA Global and our Affiliates want you to be successful on the journey to Just-in-Time. We know SSA ERP$_{LX}$ can make the journey possible — with flexibility, ease of use, fully-integrated information and on-line real-time processing. Affiliates can provide the implementation and installation support you need anywhere in the world. But software alone does not solve your problems.

Just-in-Time is a philosophy that you have to support, understand, and adopt if you are to be successful. It requires working, educating, and continuously uncovering and solving the problems that are hidden under the waste. We want you to be successful. The balance of this information should help you get started.

The Just-in-Time processing can be divided into five major steps:

1. Organize your resources

   Establish a steering committee and a project team.

2. Educate the team

   Learn, plan, and experiment to develop understanding and confidence.

3. Prepare your data and production environment

   Prepare your plant layouts, reduce setup times, develop quality programs, level the final assembly schedules and commit to solving problems.

4. Convert each area

   Process to a pull system.

5. Continue the improvements.

   Expand the pilot programs to cover your entire plant. Work toward continuous improvement.

Conclusion

Just-in-Time is the logical continuation of the progress made with a closed-loop approach to business planning and control. It is a proven method for achieving reduction in inventory investment and increasing responsiveness to market demands, product quality, and vendor performance. The greatest financial benefits come from the reduction of work-in-process and from better vendor price performance. Just-in-Time also makes the factory able to respond more rapidly to changes in customer demand. Higher quality products are produced throughout the organization.

Implementing Just-in-Time also takes flexible business planning and control software that lets you run different areas with different degrees of control and software with information that provides value, not just added cost, to your management. SSA ERP_{LX} provides the flexibility you need.

We are excited about our continuous improvement of SSA ERP_{LX}. SSA and our Affiliate network want you to share our enthusiasm — about SSA ERP_{LX} and about Just-in-Time. Our goal is to continue to be the world leader for independently developed business solutions in the IBM AS/400 marketplace. We want you to be the world leader in your industry.

Product workflow

The processing flow chart below illustrates the basic relationships between the various programs in this product. This chart illustrates one of many processing flows that you could follow to complete a transaction from start to finish. You do not necessarily need to follow this sequence rigorously, though it does represent a logical order that you might find suitable. This sequence closely resembles the steps you might follow the first time you operate the Just-in-Time product.

Some sections of the chart can be omitted when the product is completely implemented and processing becomes routine. For example, you do not need to use the master file maintenance programs every time you perform JIT processing, unless you need to maintain specific master file data. Likewise, you will learn to perform the JIT processing programs in a sequence that suits your needs. The various inquiry and report programs are also available to be used as needed. They are positioned in this flow chart after the processing programs that affect the primary data contained on those reports. That is, initially, they can be helpful only after those order processing programs have generated data.

Parameters generation, SYS800

Before you perform any JIT processing, you must set system parameters to define basic information about the item such as its bill of material and its routing. You must set system parameters to determine whether the system will:

1. Multiple Issue from:
   - lot/location allocations
   - location entered during inventory posting
2. Use last cost or weighted average cost for Costing for Update of Material Costs
3. Allow non-allocated issues during Inventory Posting
4. Run MPS/MRP by Warehouse
5. Include planned orders as scheduled receipts

6 Print Kanban Cards

7 Sequence Labor Tickets/Kanban Cards by work center or order number

Repetitive items use a lot sizing technique that allows variable periods to be established for repetitive, high volume manufacturing. Define items as repetitive in Item Master Maintenance (INV100) or Warehouse Planning Data (MRP140). This allows you to create:

- Dynamic period quantities
- Fixed period/variable quantities, or
- Variable periods/fixed quantities

Specify whether the item is a JIT item in the Item Master Maintenance (INV100) by entering a J for JIT items or N for non-JIT items.

Enter a default warehouse location for each item in Warehouse Planning Data (MRP140). The system uses this default to create allocations.

Specify the number of the operation where each component is issued in the parent item's bill of material (BOM500).

Define locations in Location Master Maintenance (INV170).

Define to and from machine location codes in Machine Master Maintenance (CAP170). The Machine Master Maintenance program provides capacity scheduling for a repetitive manufacturing environment. Scheduling is based on the speed and efficiency of machines within a work center. To and from location codes must exist in Location Master Maintenance (INV170).

In Work Center Maintenance (CAP100), enter the work center location and specify a From and To location. This allows a single path of inventory flow during JIT production. You can override the To location directly at entry time. The override hierarchy for the From location is:

8 Machine from location

9 Work center from location

10 Previous work center to location

Overriding the To location allows completed items to be directed to a specific inventory location that is not normally part of the production cycle. The override hierarchy for the To location is:

11 The to location entered in the Production Reporting program (JIT600)

12 Machine to location

13 Work center to location

If any of these from or to fields are not defined, the system searches for the default in the next level of the hierarchy. For example, if Production Reporting (JIT600) does not list a To location, the system searches the Machine to location for a default. Leaving the field blank denotes no override. To override the location code of all From or To fields, enter the special value *BLANK. The system then uses a location master defined with a location code of all blanks.

Define non-collecting (non-reporting) operations in Routing Maintenance (SFC100). The effective collection period can also be overridden from Production Release (JIT540). The SSA ERP$_{LX}$ JIT product provides pull-through capability that posts standard run, setup, and machine hours for operations that occur between two data-collecting operations. The last operation on the routing must be a collecting operation for the system to function.

Program Name	Program Number
Item Master Maintenance	(INV100)
Bill of Material	(BOM500)
Warehouse Maintenance	(INV110)
Location Maintenance	(INV170)
Machine Master Maint	(CAP170)
Department Maintenance	(CAP120)
Work Center Maintenance	(CAP100)
Routing Maintenance	(SFC100)
Warehouse Planning Maint.	(MRP140)

Before you begin any JIT processing, you may want to view the current status of the purchase orders for a specific warehouse and group of items. Produce the Production Purchasing/Planning report (JIT200). (After viewing this report, you can reschedule firm-planned orders as necessary so that you have realistic time-phased requirements based on the dates that you expect vendors to deliver materials.) You may also want to view this report after creating manufacturing orders and requirements through JIT to give you an idea of the adjustments you need to make to your purchase orders.

Product/purchasing planning report, JIT200

To create a planned production schedule in JIT, use Schedule Maintenance (JIT510). To print the shop packet, you must first select the planned production through Production Release (JIT540). Print the releases by using Production Print (JIT550). At this point, the system creates detail time phased material allocations, see the Material Issue Logic section of these instructions.

Report	Program
Schedule Maintenance	(JIT510)
Production Release	(JIT540)
Production Print	(JIT550)

When you first create planned production through the Schedule Maintenance program (JIT510) you can view those planned orders from the Planning Inquiry (MRP300). After you produce a shop packet for the production run, the system assigns a number to each released order that is part of the production run and updates the quantity accordingly. At this point, the production can be selected to appear on the group technology report. This report produces time-phased order quantities for the item categories you define.SL

Report	Program
Group Technology Report	(CAP240)
Planning Inquiry	(MRP300)
Production Reporting	(JIT600)

After shop floor operation activity has taken place, you can update or add production reporting using Production Reporting (JIT600). If an operation is linked to an item's bill of material, the system creates inventory allocations to issues for component items when labor tickets are posted for the parent item and operation. Production reporting also records cost data for the item.

When production reporting is posted for the final operation of an item's routing, the system updates the inventory status for the appropriate quantity of finished goods from adjustment to received. The SSA ERP_{LX} JIT product posts standard run, setup, and machine hours for operations that occur between two data-collecting operations (pull-through).

Production data list, JIT610

Production Data List (JIT610) lists all production reporting in the work file. A work file contains all production reporting that you added or updated through the Production Reporting program (JIT600). Usually, you would run this report to verify that the production reporting is valid before you executed the Production Update program, which updates the system master files.

Production maintenance, JIT540

Material allocations and issues logic

Allocations: When you print the shop packets for selected planned production SSA ERP$_{LX}$ JIT creates material allocations for the required component items. This occurs when you execute Production Print (JIT550). These allocations are necessary to reserve the items needed to complete the planned production.

To create the allocations, SSA ERP$_{LX}$ needs to determine the warehouse locations and, if necessary, the lots that it will use.

SSA ERP$_{LX}$ allocation logic supports a wide range of exceptions. These exceptions take the form of forced locations. Forced locations are specified locations from which to issue components. If a forced location is defined, components are issued from that location and only from that location; no other search logic is performed. This form of allocation is useful in situations involving line stocking where it is undesirable to allocate inventory from the main storage locations. Another use occurs when an item is located in one and only one location, and is always issued from that location.

The following chart lists fields that are used in the allocation hierarchy. The program or record is listed. Each field is assigned a designed abbreviation that will be used in the hierarchy listing below.

Record	Field	Designated as
Schedule)	warehouse	S/O-WHS
Item Master (INV100)	default warehouse default location	IIM-WHS, IIM-LOC
Item/warehouse planning	default location	IWI-LOC
Work center	from location	LWK-LOC

A location (WHS,LOC) is defined if an ILI exists for this location. An ILI record will exist if any inventory transactions (including opening balance and adjustments) have been performed against this location.

The hierarchy used to determine if a forced location has been defined is listed below:

1. SSA ERPLX checks Warehouse Planning record -- If IWI-LOC for S/O-WHS is non-blank, and the location (S/O-WHS, IWI-LOC) is defined, SSA ERPLX uses it as the forced location.

2. SSA ERP_{LX} checks Item Level Override -- If location (IIM-WHS, IIM-LOC) is defined, SSA ERP_{LX} uses it as the forced location.

3. SSA ERP_{LX} determines the warehouse -- (At this point, the forced location search continues only in a single warehouse, designated as FRC-WHS. If IIM-WHS is specified, SSA ERP_{LX} uses it as FRC-WHS. If IIM-WHS is NOT specified, SSA ERP_{LX} uses S/O-WHS.

4. SSA ERP_{LX} checks Work Center location -- SSA ERP_{LX} determines the routing step associated with the component through its bill of material record. SSA ERP_{LX} determines the work center for that operation. If the location (FRC-WHS, LWK-LOC) is defined, SSA ERPLX uses it as the forced location.

5. No forced location has been defined, SSA ERP_{LX} uses the final search logic -- For lot-controlled items, SSA ERP_{LX} searches the FRC-WHS for unexpired lots, and consumes them in alpha location sequence. For non-lot controlled items, SSA ERP_{LX} searches the FRC-WHS in alpha location sequence. After SSA ERP_{LX} reaches this point, inventory is consumed from many different locations.

The following example illustrates how the component item allocation process works if you do not specify a default warehouse location. Consider the following inventory status information.

Item	Item	Lot#	Receipt Date	Expiration Date	Qty On Hand
A	AA	LOT1	12/20/93	12/31/93	10
A	AA	LOT2	12/21/93	12/22/93	10
A	AA	LOT3	12/21/93	01/01/94	10
A	BB	LOT1	12/22/93	01/02/94	10

For planned production released on 12/25/93 for a quantity of 25, the system would create the following allocation:

Item	Location	Lot#	Expiration Date	Qty Allocated
A	AA	LOT1	12/31/93	10
A	AA	LOT2	12/22/93	Expired
A	AA	LOT3	01/01/94	10
A	BB	LOT1	01/01/94	5

The system will not allocate inventory from expired lots.

Material backflush

When you post production activity by using the Production Reporting program (JIT600), SSA ERPLX does the required component item backflush based upon the quantity reported complete and rejected at the operation.

The backflush hierarchy is very similar to the allocation hierarchy. The only differences are the:

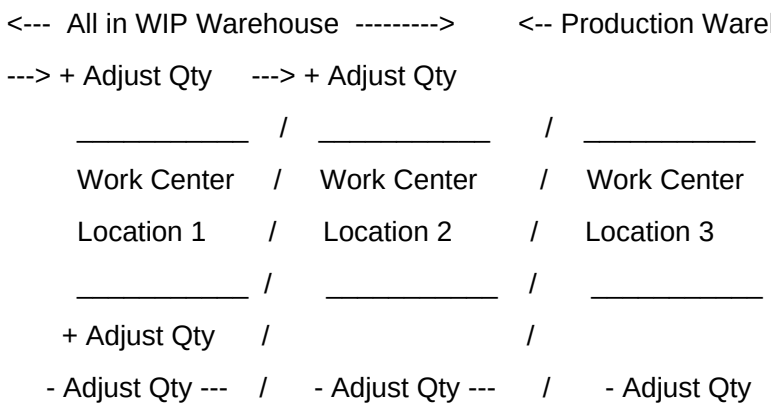
- use of pre-existing allocations
- machine level
- ability to override the forced location at production reporting time directly from entry panel

A summary appears below. All of terms from the previous allocation section apply; however additional terms are added:

Record:	Field:	Designated as:
Schedule	warehouse	S/O-WHS
Item Master (INV100)	default warehouse default location	IIM-WHS, IIM-LOC
Item/Warehouse planning	default location	IWI-LOC
Work Center	from location	LWK-LOC
Machine	from location	LMH-LOC

JIT processing tracks the parent item through the production cycle. This unique aspect of JIT processing is related to production reporting. In SSA ERPLX JIT, the quantity of the parent item being manufactured is recorded as being on hand as soon as you report production activity for any operation in its routing. This is necessary to record the quantity of the item pending completion. However, to indicate that the parent item is not actually

completed and that the manufacturing of the item is completed only up to a certain operation, the system uses a concept called adjustments to the on hand balance. SSA ERP$_{LX}$ JIT records the adjustments for the most recently reported operation, and removes the adjustments for the previous operation at the same time, when you post activity through the Production Reporting program (JIT600). Thus by checking the adjustment quantity for a location, you can determine the exact status of the parent item in process. This process is illustrated below:



The work center location used to record the adjustment is specified through the Work Center Maintenance program (CAP100). The quantity good that is posted through the JIT600 program is the quantity of the parent item recorded as an adjustment for the reporting operation. If there is a previous operation, the system creates a negative adjustment equal to the quantity reported as good plus the quantity rejected at the current operation.

To ensure that the MRP system does not recognize the work-in-process parent item as being currently on hand, you should use a non-allocatable warehouse for the warehouse location specified through the Work Center Maintenance program (CAP100).

Product quick reference

The table below provides the functions used within this product as well as their associated program codes. Program codes are used to quickly access a function. To use a program code, type the program code in the empty field at the top of a menu panel and press Enter. The system displays the first panel in that program.

Function	Program
Add and maintain bill of material	BOM500
Add and maintain firm planned orders	JIT510
Add and maintain production reporting	JIT600
Cancel firm planned orders	JIT510
Delete production reporting	JIT600
Department maintenance	CAP120
Define to and from locations	INV170
Define period length, repetitive	SYS800
Generate inventory allocations	JIT550
Group technology report	CAP240
Item master maintenance	INV100
Location maintenance	INV170
Material status inquiry	INV300
Override due date for released orders	JIT540
Override quantity for released orders	JIT540
Override warehouse for released orders	INV170
Perform inv. allocations/released orders	JIT550
Planning inquiry	MRP300
Post labor tickets	JIT620
Print allocation detail report	JIT270
Print cumulative production by item report	JIT210
Print cumulative costs by item report	JIT220

Function	Program
Print cumulative purchasing by item	JIT260
Print employee efficiency report	JIT280
Print downtime analysis report	JIT230
Print Kanban cards	JIT550
Print production posting report	JIT610
Print production purchasing planning report	JIT200
Print shop floor QC/Reject analysis report	JIT240
Print shop packet	JIT550
Print yield analysis by operation	JIT250
Production posting	JIT620
Production report	JIT610
Report downtime and quantity rejected	JIT600
Report machine, labor, and run time	JIT600
Routing maintenance	SFC100,SFC500
Select plnd. prod. runs/release to shp. flr.	JIT540
Set component issuing operation	BOM500,SFC500
Set item JIT code	INV100
Set order policy	INV100,MRP140
Set warehouse default for inventory issue	MRP140
Shop packet print	JIT550
View production inquiry	JIT300
Warehouse maintenance	INV110
Warehouse planning maintenance	MRP140
Work center maintenance	CAP100

Glossary

Backflush
The process of issuing component materials for operations AFTER the operations are completed. Backflushing occurs at the time that a collecting operation is posted. When a collecting operation is posted, the prior non-collecting operations for component materials are automatically posted by the system.

Component C	Child Item	Component D	Component E	Child Item
	Posted collectible			Posted collectible

Backflushing can occur only for items that have an N in the Must Single Issue Y/N field in the Item Master Maintenance program (INV100). The last operation must be a collectible operation for the system to function.

Backflushing is also a process of posting standard labor for non-collecting operations.

Batch Queue
A batch queue is a computer term for a list of jobs waiting to be processed on a first-come, first-serve basis. A job can be any program or procedure that is waiting to be executed. This job includes any necessary input data, processing attributes, and output information. If you submit a job to the batch queue, you may have to wait for the job to process or print. However, you can use your terminal for other processing while you are waiting for the job.

Collecting Operation
A production operation for which you post production activity through the Production Reporting program (JIT600). The last operation on the routing must be a collectible operation in order for the JIT system to function.

Interactive Processing
During interactive processing, the work station submits the job directly to the central processing utility and waits for a response -- just like it does when you execute any on-line procedure, such as selecting a menu option. Occasionally, the system executes the job more quickly than if the job were submitted for batch processing. However, during interactive processing you workstation cannot be used for any processing until the job has been executed. If you submit an interactive job when the system is in heavy use, your workstation could be tied up for several minutes. Use the F18 interactive processing command ONLY:

- When you must process the printed listing quickly, — and —
- When you are NOT under pressure to perform other processing in a hurry.

Just-in-Time (JIT)
Repetitive manufacturing philosophy used to reduce waste and lead time. The JIT approach stresses continuous problem solving, employee involvement, and consistent improvement in productivity.

Kanban Cards
Cards used to record the quantity of an item received at a particular work center and operation from some other work center and operation. With SSA ERPLX, you can print Kanban cards as part of the shop packet.

Non-Collecting Operation
An operation for which you do not post production activity. (The system, however, may automatically post production activity via backflush for a non-collecting operation.)

Repetitive Items
Repetitive items use a lot sizing technique that allows variable or fixed length periods to be established for repetitive, high volume manufacturing. This technique offers forward scheduling and the ability to establish up to 152 planning periods. This allows you to create:

- Dynamic period quantities
- Fixed periods for variable quantities
- Variable periods for fixed quantities

The following chart indicates the differences between repetitive and non-repetitive processing.

Differences	Repetitive	Non-repetitive
Order Policy:	K	A; B; F; G; H; J
# of Periods	152	40
Length of Periods	variable	defined

Pull-Through
a pull approach to production means that items are produced only when they are needed by the customer. The pull-through concept also applies to reporting and posting. Pull-through allows the system to automatically post production and time for non-collecting operations AFTER the parent item is finished.

During the routing of an item, non-collecting operations are performed but not posted. When you post production activity for a collecting operation through

the Production Reporting program (JIT600), the system automatically posts the production activity for the non-collecting operations. The system presumes that when production is posted for a collecting operation, the manufactured item must have already passed through all previous non-collecting operations in the routing even if no activity has been explicitly reported. The system uses the standard setup, run, and machine hours needed at the non-collecting operations to produce the quantity of items consumed by the data-collecting operation and it posts the standard hours to record production costs. For example, you may decide to have component item production posted using pull-through. The non-collecting operations for the component item are automatically posted via pull-through at the time you post the parent item.

Pull through also refers to the movement of a parent item work in process (WIP) through work centers.

Reference Fields
Some fields are for memo purposes. The Run Instructions indicate memo fields by stating, "... this field is for reference only." If you enter a value to a reference field, this data is not presently accessed by Shop Floor Control and is not passed on to other SSA ERPLX products. Some fields that are presently reference fields may be implemented in future releases.

User-Defined
a code that you create and maintain. For example, reason codes for rejected items are user-defined codes. You might decide that items rejected for paint imperfections should be monitored. SSA ERPLX does not care what reason code number you assign to paint imperfections. However, if you enter a code number of 25 for a paint imperfection reject, you must consistently use 25 for the reason code for paint imperfection rejects. If you consistently use the same code, reports that list this code will be more meaningful. Some user-defined codes are not edited by the system. This means that if you enter an invalid or incorrect code, SSA ERPLX does not reject the code or present a warning message. You may want to maintain a master list of user-defined codes to ensure consistent usage of the codes.

WIP
Abbreviation for work-in-process.

Chapter 5
Lean Manufacturing Processing

5

The chapter consists of the following topics:

Overview

A Lean Enterprise Processing Product is part of SSA ERP_{LX} as of V8.0. The new functionality provided in the product allows your business to improve productivity through a more efficient use of its people and capacity. By taking a lean approach, an enterprise can cut its costs and benefit from improved use of labor, shrinking inventory, reduced throughput time, and increased capacity without additional capital expenditure.

Lean Enterprise is not about software, it is about empowering people. At its most basic, a lean enterprise eliminates waste by a process of continuous improvement. It concentrates on eliminating activities that do not add value, such as storage, transportation and inspection.

Caution: Implementing lean software without adopting a lean enterprise culture and recognizing the changes required to a company's operating procedures can create huge problems for the organization. However, companies in very competitive markets should always strive for a competitive advantage. Put simply, they either go lean or they don't survive.

In conjunction with the software changes described below, SSA Global Technologies, Inc. has a team of experienced Business Consultants able to assist any company with the challenge of becoming a Lean Enterprise.

Lean enterprises require enabling software that can process to customer demand and reduce the amount of transaction input needed. This minimizes the number of manual interventions in the lean process, helping to eliminate waste. The LMP product enables simplified processing and reduction of transaction input with the following capabilities:

It introduces the concept of a Production Cell that is a unit within a factory totally responsible for the quality, quantity and output of a family of finished products.

A program called the Cell Workbench manages the load on the cell in terms of its finite capacity.

The Lean Manufacturing product also enhances Customer Order Entry by adding the following features:

Return of a Capable to Promise Date in Order Entry (ORD700), which is determined by the Load vs. Capacity in the Item's Cell. Capable to Promise can be defined as “promising a date for delivery based on availability of capacity, even if no plans for production exist.” It is different from Available

to Promise, which is based on stock and firm planned production minus existing customer commitments.

The product uses SSA ERP_{LX} “generate Shop Order” processing to automatically and transparently link a shop order to the customer order.

With this product, when you delete or change a customer order line, you automatically change the shop order.

The product also provides auto-creation of a line on a contract purchase order from the customer order line for Lean purchased items.

It provides multi-level backflush of materials and labor from production reported against a customer order number or shop order number.

It offers an optional auto-allocation of the quantity against the customer order line after production reporting or purchase order receipt.

It offers the option of pick confirmation automatically linking to the invoicing process.

And it allows the recording of a used kanban to add a line to a contract purchase order.

Lean manufacturing allows you to schedule the following on “make-to-order” customer orders:

- Customer-requested dock date: the date on which the item on the order line is to arrive at the customer's site.
- Customer-requested dock time: the time of day, in 24 hour clock format, on the customer-requested dock date, when the item on the order line is to arrive at the customer's site.
- Customer-requested ship date: the date on which the customer requests shipment of the order line. This date will initially be the same as the order line request date (LRDTE) unless you have entered a date in the “customer-requested dock date” field. In this case, SSA ERP_{LX} will offset the date backwards from the customer-requested dock date by the shipping lead time days and hours on the Address Master record.
- Customer-requested ship time: the time of day on the customer-requested ship date on which the customer requests the item on the order line be shipped. The time is expressed in 24 hour clock format. The time is backward-scheduled along with the customer-requested ship date. SSA ERP_{LX} offsets it backward from the customer-requested dock date and time by the shipping lead time days and hours on the Address Master record.

- CTP (Capable to Promise) ship date: the date scheduled for shipment of the order line by the capable to promise calculation. For a manufactured item, this calculation looks at available cell capacity to determine when the order line can be manufactured. SSA ERP_{LX} offsets this date from the manufacturing (shop order) completion date by the dispatch lead time, and it is adjusted to the next ship date and time on the OLM dock scheduling file (if this is used).
- CTP ship time: the calculated time of day in 24 hour clock format, on the CTP ship date, when the order line is scheduled to be shipped. With the CTP ship date, it is offset from the manufacturing (shop order) completion date and time by the dispatch lead time, and adjusted to the next ship date and time on the OLM dock scheduling file (if used).
- CTP dock date: the date calculated for when the order line is expected to arrive at the customers site, by forward scheduling the address masters shipping lead time days and hours from the CTP ship date.
- CTP dock time: the time in 24 hour clock format, calculated on the CTP dock date for when the order line is expected to arrive at the customer's site.
- Original Request Date: the customers initial request date for the order line to be shipped. It might be different from the request date and the customer-requested ship date, because these could have changed after the order was originally entered.
- Original Request Time: the time of day in 24 hour clock format, on the original request date, for the order to be shipped. It might be different from the customer-requested ship time, which could have been changed after the order was originally entered.

The LMP menu

Lean Processing	Programs
Order Entry	ORD700D1
Cell Workbench Detail	LMP500D1
Multi-Level Backflush	LMP600D
Scheduled Production Schedule Print	PUR540D
Purchase Order Receipt	PUR550D1
Pick Confirm	ORD570D1
Kanban Procurement Processor	LMP620D
Maintenance	
Cell Maintenance	CAP100D1
Shop Calendar Maintenance	SFC140D1
Inquiries	
Order Inquiry	ORD300D1
Purchasing Inquiry	PUR300D1
Material Status Inquiry	INV300D
Shop Order Inquiry	SFC300D1

Non-Display Programs in Lean Manufacturing Processing

Shop Calendar Calculator	LMP005B
Capacity Scheduler	LMP010B
Attribute Utility (Mixed mode)	LMP501B
Kanban procurement processor	LMP620B
Shop Order Rebuild	LMP700B
Batch Labor Ticket Create	LMP720B
Access CIC File	SYS954B

Notes

Chapter 6
Laboratory Management System

6

The chapter consists of the following topics:

Overview

The SSA ERP$_{LX}$ Laboratory Management System (LMS) builds on the structure of QMS to help you effectively manage stability sampling and testing of perishable products.

Integration with QMS

Full integration with the Quality Management System enables you to:

Flag items in the QMS Item master (QMS165) for automatic selection for stability testing.

Assign planning and stability planning specifications to items in the QMS Item master (QMS165) to help in capacity and workload planning for stability.

Assign a stability specification to manufacturer/item records (QMS105) to use as the default specification for all stability items selected automatically or manually in LMS.

Define stability sample masters and their storage conditions and testing relationships. This is a pre-condition to defining your interval sample masters. You can define storage condition codes in SYS105 tables 410 (temperature), 420 (humidity/air condition), 430 (storage position), and 440 (lighting conditions).

Flag test masters (QMS125) for automatic inclusion on your Stability Regulatory Reports.

LMS features and functions

Once you have defined stability sample masters (LMS120) set up your interval samples (LMS130) with the time intervals and testing levels.

Use the Receiving program (LMS500) to generate the testing intervals for the scheduled disposition 99 records. Use the Planning and Scheduling program (LMS600) to manually select items for testing.

You can print a listing and run an inquiry on all intervals due, but not released, within a selected time frame. A stability interval is released when it becomes an open disposition. You can maintain the stability sampling (open code 4) and stability testing (open code 5) dispositions from the LMS menu.

By selecting the Sampling Requirements (action code 14) in Dispositions, you can verify the required samples and print stability label sets for each required sample. A set consists of one label for each sample interval, each label with its own pull date.

Glossary

Actual Lot
The lot number actually selected for stability testing, which can differ from the lot originally planned for selection.

Interval
A period of time between tests, used to define test cycles for stability and life testing.

Lot number
A way to identify items manufactured or received at the same time and that share testing characteristics.

Retire
An action code in Stability Receiving or Stability Planning and Selection that prevents release of further stability intervals for the selected record. Another action code allows you to reverse a retired record.

Sample
Product or substance used in testing can be primary, a composite of the primary, or aliquots made up of one or more composites.

Select
An action code in Stability Planning and Selection to select a planning record for stability. You cannot revise a selected record (show by status code 1 on the QMS500 list panel) although you can change its specification. Another action code allows you to reverse a stability selection (clear the actual lot field and deletes all dispositions 99 to 199 with their comments, samples, results, and raw data.

Stability testing
Testing performed on perishable items/lots during the item's shelf life. Stability testing specifications, methods, sampling rules, etc. can be separate from acceptance and process control testing.

Commonly used SSA ERP$_{LX}$ terms

Batch Queue
A computer system term for a list of jobs waiting to be processed on a "first-come, first-serve" basis. A job can be any program or procedure that is waiting to be executed. This job includes any necessary input data, processing attributes, and output information. If you submit a job to the batch

queue, you may have to wait for the job to process or print. However, you can use your terminal for other processing while waiting for the job.

Item
A part, collection of parts, or finished product considered "inventory" for resale or manufacturing purposes.

Item class
A two-character code which classifies items into product groups. Inventory reports are sorted and subtotaled by item class. You must have at least one item class on the Item Class Master file. If CEA is in use, the Item Class can be used to drive your journal entries.

Item number
A 15-character alphanumeric code which identifies an item. Every item must have a unique item number. Item numbers are left-justified and sorted in ALPHA order (in other words, A-Z followed by 0-9). This means that if you have numeric item numbers and you want them to displaying proper numeric sequence, you must zero-fill the fields so that they are all the same length. For example, use 10000 to 99999, not 1 to 999999. You can use a combination of letters and numbers, but the same principle applies -- use AA001 to ZZ999, not AA1 to ZZ999.

Item type
A one-character code describing the kind of item, such as "finished product," or "raw material." For details, see the field explanations in the Master Files section of this manual. You must have at least one item type on the System Parameter file.

Location
A six-character alphanumeric code designating a physical or logical warehouse subdivision, such as a bin/rack, an aisle, or an idea such as "awaiting lab check." The location is used for tracking stock movements and specifying availability of stock for resale or manufacturing. Location codes are stored in the Location Master File.

Lot
A ten-character alphanumeric code identifying a particular batch of product for lot-specific items such as pharmaceuticals and other perishables. Lots are received into warehouses and may be associated with locations. Lots are sold or released to the shop floor according to the availability as described on the Lot Master file (ILN). Automatic allocation of lots to orders may be overridden by the operator. Full lot tracing is available upon request. Only items for which lot control has been requested are automatically validated by lot.

User-defined
A term designating an entry created and maintained by the user. For example, reason codes for rejected items are user-defined codes. You might decide that items rejected for paint imperfections should be monitored. If you enter a reason code of "25" for a paint imperfection reject, you must consistently use "25" for these rejects so that reports listing this code are more meaningful to you. Keep a master list of user-defined codes to ensure consistent usage of the codes.

Vendor
A five-character numeric code identifying the supplier of an item. The vendor code is required in the Purchasing product; it is optional in the Inventory product. If a vendor code is used, it must already have been set up in Vendor Master Maintenance (ACP100 or PUR100).

Warehouse
A two-character alphanumeric code designating a physical or logical place where inventory is kept. You must have at least one warehouse on the Warehouse Master File.

A/R, A/P
These abbreviations are used throughout the documentation to denote the terms Accounts Receivable and Accounts Payable, respectively. This distinguishes them from the corresponding product codes of ACR and ACP, respectively, which precede program numbers (for example, ACR500, ACP100, etc.).

Chapter 7
Manufacturing Data Management

7

This chapter is a high-level overview of Manufacturing Data Management, MDM.

The chapter consists of the following topics:

Overview

The Manufacturing Data Management System allows production control, engineering, and cost accounting to retrieve and use product structure, routing and work center information for a wide variety of planning and costing needs. It features immediate on-line posting and access to all basic manufacturing data. It allows the definition of engineering controlled items and the control of those items with Engineering Change Orders.

System highlights

- On-line posting of additions, deletions, and changes to product structures
- On-line copying and modification of bills and routings
- Effectivity and discontinue dates
- User defined decimal precision in the quantity required
- Automatic update of low level codes
- Multi-level where-used and end item where-used inquiry
- Mass replace for components
- Allows multiple occurrences of child item on a single BOM
- Complete planning bill of material functions
- Mass replace for planning bill components
- Departments and work centers supported
- Tooling and efficiency information
- Alternate operations
- Engineering Controlled items
- Revision Level tracking for parents and components
- Drawing master control and revision tracking
- Engineering Change Orders with automatic posting to the BOM
- Approval processing for Engineering Change Orders
- Audit trails of all BOM maintenance

Inquiries	Program
Bills of Material/Where Used	(BOM300)
Indented bill	
Single level bill	
Single level where used	
Multi-level where used	
End item where used	
Planning Bills of Material	(BOM320)
Indented bill	
Single level bill	
Single level where used	
Multi-level where used	
End item where used	

Reports	Program
Bills of Material Listing	(BOM200)
Indented	
Single level	
Where Used Listing	(BOM220)
Multi-level	
Single level	
End items	
Production Process Sheet	(BOM240)
Planning Bill Listing	(BOM260)
Indented	
Single level	
Department List	(CAP130)
Work Center List	(CAP110)
Routing List	(SFC110)

On-line data entry	
On-line Bills of Material Processing	(BOM200)
Add components	
Update components	
Delete components	
Delete a structure	
Copy a structure	
Mass Replace	(BOM510)
On-line Planning Bill Processing	(BOM600)
Add components	
Update components	
Delete components	
Delete a structure	
Copy a structure	
Department Maintenance	(CAP120)
Work Center Maintenance	(CAP100)
Routing Maintenance	(SFC100)

Application interfaces	Programs
Shop Floor Control	(optional) SFC
Material Requirements Planning	(optional) MRP
Master Production Scheduling	(optional) MPS
Cost Accounting	(optional) CST
Inventory Management	INV
Capacity Requirements Planning	(optional)
Order Processing	(optional)

MDM02 Menu Engineering change management	
Engineering Change Order Maintenance	BOM100D1
Approval Processing	BOM550D1

ECO Stock-Based Effectivity Processing	BOM620D

Engineering change control files

Engineering Change Controlled Items	BOM110D1
Revision Level Tracking	BOM120D1
Code Table Maintenance	SYS105D1
Approval Process Maintenance	BOM170D1
Approval Process Steps Maintenance	BOM175D1
Drawing Master Maintenance	BOM140D1

Engineering change inquiries

Engineering Change Order Inquiry	BOM305D1
Revision Level Trace	BOM120B1
ECO Approval Process Inquiry	BOM550B2
ECO by Parent Item Number Inquiry	BOM340D1
Drawing Inquiry by Item Number	BOM345D1

Engineering change reports

Engineering Change Order Reports	BOM210D
BOM Audit Report	BOM265D
Approval Processing Report	BOM555D

Engineering change master file listings

Engineering. Change Controlled Items	BOM115D
Engineering Change Revision Levels	BOM125D
Approval Process Listing	BOM171D
Approval Steps Listing	BOM176D
Drawing Master Listing	BOM145D

Introduction

This document is a guide to operating the SSA ERP$_{LX}$ Manufacturing Data Management product. In addition to this guide, read the Inventory documentation. Installation of the Inventory product is a prerequisite for this product.

Implementation sequence:

Note: SYS is required for method codes and facility codes. MRP is required for facility planning data. CAP is required for work centers, machines, and departments. SFC is required for routings.

- Inventory Files. Item Class, Item Type, Warehouse, Location, Item Master, Lot Master, Transaction Effects (see Inventory Run Instructions).
- Bill of Material. The structures that show which items are components of other items, and how much is used of each.
- Departments. Groups of work centers. Each work center is in a department.
- Work Centers. A specific machine or group of machines that can perform the same function. May also be a certain job or group of employees.
- Routings. The sequence of operations required to make each manufactured item. Each operation is tied to a work center.

Suggested implementation

1. Reading:

   Read and understand this documentation, including the Inventory and Manufacturing Data Management Operator Run Instructions.

2. Existing System Review:

   Review your existing manufacturing material lists for:

   - Completeness
   - Accuracy
   - Detail - Enough detail of quantities required?
   - Allowance for scrap?
   - End item batch sizes?
   - Number of changes occurring
   - Control - How are actual material decisions made in practice?

3. Requirements Review:

   Arises out of existing system review. Establish an accurate and complete Bill of Material, and keep it up to date.

   - How many items do you produce and from how many components?
   - Average amount of levels involved?

4. Resource Review:

   Review staff and time available for implementation. Consider the activities in this list plus normal business operations.

5. Implementation Timetable:

   Schedule the implementation activities into your calendar. This should provide a realistic "go live" date.

6. System Definition:

   Bill of Material should be installed as an active product in your system. If not, activate now.

7 Inventory:

Install first, and run live, before you implement Manufacturing Data Management.

8 Office and Shop Integration:

Define the procedures to go with the new system, and explain the new reports to the people who will be using them. User education should begin early.

9 Operator Training:

Operation of Manufacturing Data Management is consistent with the operational procedure for the Inventory product; operators working with MDM should be trained in use of the Inventory product.

10 Master File Data Loading:

A one-time-only task. An accurate bill of materials is essential to shop floor control and requirements planning. The BOM must reflect the way product manufacture is actually scheduled, and it must be changed when necessary to represent actual practice. SSA ERP_{LX} makes it easy to copy whole structures, then make minor changes to them.

11 Parallel Running:

It is advisable in the first month to keep the old system running in parallel with the new one so that all functions can be monitored. If you cannot run parallel, consider a "test month" prior to running live, using a small but representative sample of customers. The test data is then erased and "real" processing begins.

12 System Review:

Choose appropriate intervals for review.

How-to index

Functions	Program
Add bill of material	BOM200
Add components	BOM200
Add departments	CAP120
Add planning bill of material	BOM600
Add routing steps/operations	SFC100
Add work centers	CAP100
Change discontinue date	BOM200
Change effectivity date	BOM200
Change quantity required	BOM200
Change a component across the entire BOM	BOM510
Change planning bill of material	BOM600
Copy bill of material	BOM200
Copy planning bill of material	BOM600
Copy a routing	SFC100
Delete bill of material	BOM200
Delete components	BOM200
Delete departments	CAP120
Delete operations/routing steps	SFC100
Delete planning bill of material	BOM600
Delete work centers	CAP100
Display bill of material	BOM300
Display where-used	BOM300
Display planning bill of material and where-used	BOM320
Print bill of material	BOM200
Print where used	BOM220

Functions	Program
Print production process sheets	BOM240
Print planning bill of material	BOM260
Print process sheets	SFC110
Print work centers	CAP110
Reorganize bill of material master file	BOM900
Replace a component across the entire BOM	BOM510

System functions

Effectivity dates

The system allows for an effective and a discontinue date on each component. These dates are not mandatory; the default values are the current system date and 99/99/99 for the effective and discontinue dates, respectively. These dates are referenced by all functions accessing bills of material. The date format follows the parameters set in Company Name and Date Format (SYS820) in the System Parameters Generation application (SYS800).

Note: ECO programs display four positions for the year, while other programs display a two-digit year. However, all SSA ERP$_{LX}$date files record 8 digit (century) dating and all programs can process century dating.

Creating bills of material

All bill of material processing is on-line. The where-used chains and low level codes are updated dynamically. Entire structures can be copied and modified on-line. Entire structures can also be deleted with one command. The "Required Quantity" field is nine characters long and has five-decimal-place accuracy.

The system allows a mass replace (substitution) of component items.

Interfaces

The bill of material is accessed by:

- Inventory Management (for multiple issues)

- Shop Floor Control (for creating soft bills of material by individual order)
- Cost Accounting (for standard and actual cost roll-ups)
- MRP (for requirements explosions)
- Capacity Planning (for bill of resource explosions).

Inquiries and reports

SSA ERP$_{LX}$ supports multi-level and end-item where-used inquiries and reports, as well as single-level and multiple-level bills. A costed bill of material is available in the Cost Accounting product.

Batch Bills of Material:

If a parent item has a standard batch size defined in its Item Master record, the bill of material required quantity for each component of that parent is the quantity of the child required per batch of the parent. This is also how the quantity required is displayed in the BOM product. Other modules will convert this to a per-unit quantity automatically, as required.

Planning bills of material

SSA ERP$_{LX}$ supports full planning bills of material for use by features and options in the Order Entry (ORD) and Master Production Scheduling (MRP/MPS) products. Information for planning bills of material includes forecast percentage, quantity required, feature group codes, effective and discontinue dates, invoicing options, and scrap.

Work centers and departments

Work Centers and departments can be created for routings, shop floor control, and capacity planning. Each work center will have its own efficiency, cost rates, method of loading hours, capacity, and other parameters. Work centers can be grouped into departments.

Routings

Full operation and routing information is supported, including alternate generations and extra descriptions. Routing information includes run, setup, and machine hours, the number of operators, move and queue time, and other information. A production process sheet produced from the shop packet print will include routing and bill of material information.

Example

The Bill of Material file, together with the Item Master file, is the prime source of material data for production and production planning. To make a finished product, you must know what components will be used and how much of each to use. Each component may be made from other components and may be included more than once on the same or different levels of a bill of material or in the bills of material of different items.

	Item Number	Description	Quantity Made	Quantity Needed
Finished product:	4522	Aspirin 100x.25		10 bottles
Requires:	B-4522	Bulk aspirin		250 gm
	RX100	Painaway bottle		10 bottles
	RX516	Painaway label		10 labels
	RX971	Cap for RX100		10 caps

This is the first-level bill of material for item 4522. Item B-4522 (bulk aspirin) has the following components:

	B-4522	Bulk aspirin	100 gm
Requires:	C100	Salicylamine	90 gm
	C200	Acetaminophen	10 gm

We can show a multi-level indented bill of material for item 4522 as follows:

Level Parent	Item Number	Description	Quantity Made	Quantity Needed
1	4522	Aspirin 100x.25	10 bottles	
2	B-4522	Bulk aspirin		250 gm
2	C100	Salicylamine		225 gm
1	C200	Acetaminophen		25 gm

Note: The required quantity of each component is the quantity for a batch of the finished item. You specify batch size on the Item Master. A "parent" item is built up from "child" items on subsequent levels. The top level is finished goods, the lowest level in any assembly is the raw material or purchased parts from which manufacturing starts. In the above example, level 2 is considered lower than level 1. If an item appears in more than one assembly, its "low level" is the lowest level of appearance. For example, if C200

appears elsewhere with level numbers 1 and 3, the low level is 3. The system allows 99 levels.

C200 (Acetaminophen) is an ingredient in the concentrate HC499, which is used to manufacture the cough mixture HM66. Also, 1 gm of C200 is used to make 100ml of HC499, which is enough for 10 bottles of HM66. Before you order stock of C200, you want to know where it is used, and in what quantities. For example:

Level Child	Item Number	Description	Quantity Needed (C2000)
1	C200	Acetaminophen	
2	B-4522	Bulk aspirin	10 gm (per batch B-4522)
1	4522	Aspirin 100x.25	25 gm (per batch 4522)
2	HC499	Cough concentrate	1 gm (per batch HC499)
	HM66	Cough mixture	1 gm (per batch HM66)

Note: The level numbers are in reverse order from the bill of material. The child is still considered lower than the parent.

It is important that the bill of material (BOM) be kept accurate and up-to-date, especially when the MRP (Material Requirements Planning) and CAP (Capacity Planning) products are used to schedule shop production. All bill of material processing is on-line, i.e., updates take place immediately, including the low-level code in the Item Master.

SSA ERP_{LX} allows for optional Effective and Discontinue dates for each component. The default values are today's date for the effective date and 99/99/99 for the discontinue date. The dates are checked by all functions accessing the bill of material.

Note: ECO programs display four positions for the year, while other programs display a two-digit year. However, all SSA ERP_{LX} date files record 8 digit (century) dating and all programs can process century dating.

Entire structures can be copied and modified on-line. This is the best way to handle a new product that uses most of the same components as an old one. Entire structures can also be deleted with one command.

If any component becomes obsolete and is replaced by a new one, the system allows a "mass replace" that will automatically search the entire Bill of Material file (MBM) and allow you to update the item wherever it appears.

You can enter a Scrap Factor for any component. This value allows you to adjust your order quantities to compensate for a statistical average amount of defective items in every order received from a given vendor. For example, if you know from experience that approximately one item per thousand child items received from a specific vendor will not meet your quality standards, you will want to order one extra item per thousand to meet your material requirements. In this case, your scrap factor should be 1.001.

Where-used inquiries and reports look upwards on the bill of material. The system provides multi-level and end-item where-used inquiries and reports as well as single-level and multi-level bills. A costed bill of material is available in the Cost Accounting product.

Glossary

The following terms are used in this product, in addition to those used in the Inventory guide.

Batch size
Each item on the Item Master has a Standard Batch Size field that shows the normal quantity produced of that item during manufacture. Bill of Material processing shows child quantities as the amount needed to make a standard batch of the parent.

Bubble
User-defined display sequence for on-line bill of material maintenance.

Child
A direct component of a parent. The parent item is built from child items on the next level down.

Component
An item that is used in the manufacture of another item. Components can themselves be manufactured from other components.

Effective date
SSA ERP_{LX} allows for "starting date" and "discontinue date" on each component of an assembly. This allows you to prepare for manufacturing process changes and ensures that obsolete items are not included in shop order planning. The date format follows the parameters set in Company Name and Date Format (SYS820) in the System Parameters Generation application (SYS800).

End item
A finished product that is not a component of any other item.

Level
An end item will have a number of components that are directly used to make it. This is the "first- level explosion" or bill of material. If a component is itself made of further components, then these can be listed as "lower levels." A "multi-level indented bill of material explosion" for any item, is a report or inquiry showing all the components needed to make it. The different levels are shown by different indented level numbers. Lower levels are indicated by numerically greater level numbers.

Low level
For any item, the lowest level number it ever has in the bill of material. Remember, "lower" levels are indicated by numerically greater numbers (i.e. level 3 is lower than level 2).

Manufacture
For purposes of the Bill of Material, "manufacture" may mean "collect together for convenience," as long as the assembled collection is a single item on the Item Master file. If such a collection is neither sold nor stocked as itself, it is called a "phantom item." However, it is maintained like any other item in the bill of material.

Mass Replace
If a frequently-used component item becomes obsolete and is replaced by some other item, the system allows you to easily replace the item throughout the bill.

Material Status
Inquiry into inventory status (history, current, and future).

Offset
Lead time, in days, for a component or subassembly. Used in MRP and MPS.

Operation
A number assigned to a process through which a parent item must pass during manufacture.

Parent
An item that is manufactured from components. A parent may be a component of some other item.

Quantity Required
Quantity of a component or subassembly needed to produce a batch of the parent item.

Scrap
A correction factor used to adjust the quantity required because of defective material.

Where-Used Report
A component item may be used in more than one assembly. "Where-used" reports and inquiries show where the given item is used and in what quantities. A single-level where-used report shows only the immediate parents of the item. A multi-level report shows all levels up to the finished end items.

Chapter 8
Master Production Scheduling and Material Requirements Planning

8

The chapter consists of the following topics:

Overview

The MPS/MRP system gives production control, purchasing, and management the information needed to plan and control business operations. It identifies detail production and purchasing actions which need to be taken in response to day-to-day events. It ties overall business planning to detail operations through the master scheduling function.

System highlights

- Bucketless, net change MPS/MRP (with optional regeneration)
- Automatic first cut Master Production Schedule
- Variable planning horizon
- Flexible time bucket summarization of MRP data
- Firm planned orders supported
- Pegged requirements on-line and in reports
- Suggested rescheduling of shop orders and purchase orders
- English language action messages with dates
- Available-to-promise inquiry
- Flexible lot sizing and order policies
- Summary revenue and expense projections
- Summary production plans
- Real time planning and pegging inquiry
- Forecasts and consumption of forecasts by customer orders
- Master Production Schedule simulation
- Rough Cut Capacity simulation
- MRP simulation
- Multiple warehouse MPS/MRP
- Item Planning data by warehouse and lot
- Mass Release of Shop Orders from planned orders
- Multi-Level Master Scheduling

- Final Assembly Orders and Scheduling
- Finite Forward Scheduling

Application interfaces:

- Inventory Management
- Manufacturing Data Management
- Shop Floor Control (optional)
- Purchasing (optional)
- Configurable Order Mgmt.(optional)
- Billing And Sales Analysis (optional)
- Capacity Planning (optional)

Final assembly scheduling

Program Name	Program Number
Final Assembly Consolidation/Release	FAS500
FAS Shop Packet Print	FAS510
FAS Orders Not Released	MRP530

Finite Forward Scheduling	MRP640

Generation	Program Number
Print MPS Detail	(MRP240)
Master Schedule Generation	(MRP500)
MRP Maintenance	(MRP510)
Print MPS Orders	(MRP520)
Release Planned Orders	(MRP540)
Print Released Orders	(SFC550)
Explode Planned Order/Firm Planned Order Adjustments	(MRP550)
Explode Requirements - Net Change-Regenerative	(MRP600)

Inquiries	Program Number
Planning/Pegging Inquiry	(MRP300)
Available To Promise Inquiry	(MRP310)
MRP Schedule Detail Inquiry	(MRP320)

Maintenance and Utilities	Program Number
Forecast Maintenance	(MRP100)
MRP Time Frame Maintenance	(MRP120)
Facility Planning Data	(MRP140)
MRP Maintenance	(MRP510)
Release Planned Orders	(MRP540)
Print Released Orders	(SFC550)

MPS/MRP Simulation	Program Number
MRP Simulation Inquiry	(MRP650)
MRP Explosion Simulation	(MRP660)
MRP Simulation Report	(MRP670)
Copy MPS To Simulation	(MRP700)
MPS Simulation Generation	(MRP705)
MPS/MRP Simulation Maintenance	(MRP710)
MPS Simulation Orders Print	(MRP720)
MPS Simulation Detail Print	(MRP730)
Capacity Simulation Generation	(MRP740)
Capacity Simulation Inquiry	(MRP750)
Capacity Simulation Report	(MRP760)
Copy Simulation To MPS	(MRP770)

Reports	Program Number
Forecast List	(MRP105)
Firm Planned Order List	(MRP110)
Facility Planning Data List	(MRP145)

Reports	Program Number
MRP Education Report	(MRP200)
Shop Order Rescheduling	(MRP209)
Purchase Rescheduling	(MRP211)
Firm Planned Order Rescheduling	(MRP212)
MRP Summary Projection	(MRP230)
Print MPS Detail	(MRP240)
Releasable Orders Report	(MRP250)
Print MPS Orders	(MRP520)

Introduction

This document is a guide to implementing the SSA ERP_{LX} Material Requirements Planning/Master Production Schedule product. The Inventory product is a prerequisite for this product. Include Configurable Order Management and Billing, Purchasing, Manufacturing Data Management, Shop Floor Control and Capacity Planning. The purpose of the MRP/MPS product is to bring together all information held in the system about real and anticipated movements of inventory, to meet customer requirements through purchase and production.

The sequence of implementation is:

Files	Guides
Inventory files	See Inventory guide
Bills of material	See Manufacturing Data Management guide
Shop order	See Shop Floor Control guide
Purchase order	See Purchase guide
Customer order	See Configurable Order Management guide
MRP/MPS	In this guide

Suggested implementation plan

1. Reading - Inventory documentation and MPS/MRP guide.

2. Existing System Review - Review your existing material plans for:

   - Completeness
   - Accuracy
   - Detail - Do you have enough detail about requirements?
   - What are your order policies for material?
   - Which items are causing supply/production problems?
   - Number of changes occurring
   - Control - How are actual production/purchasing decisions made?
   - Is this satisfactory?

3. Requirements Review - This will arise out of your existing system review. Establish regular planning procedures, so that you are always up-to-date with actual and expected events.

   Determine your implementation of the system parameters. Select your master schedule items and what the order policy, order cost, lead time, minimum balance, standard lot and batch size will be. These fields may be entered into the Item Master or Facility Planning Data (CIC) files.

4. Resource Review - Review the staff and time available for implementation. Your own time (as Manager, and therefore Planner) is likely to be the greatest need. You will want to become familiar with the reports and inquiries available, and with the various options.

5. Implementation Timetable - Schedule the implementation activities into your calendar. This should provide a realistic "GO LIVE" date.

6. System Definition - Make sure that MRP/MPS is installed as an active product in your system. If not, it can be activated now (see the General Installation guide, System Installation).

7. Inventory and other products - These will normally have been installed first and should be running live.

8. Planning Procedures - Define some regular planning procedures, to take advantage of the up-to-date information which will become available to you.

The plans should be regenerated regularly and reviewed if they are to be really useful.

9 Operator Training - There should be no difficulty if the operator is already familiar with other products.

10 Master File Data Loading - If all the other products are running live, the only data loading needed will be to set up your time frames and forecasts of likely demand.

11 Initial Running - Use MPS Generation (MRP500) to generate your first Master Production Schedule. Use MPS Maintenance (MRP510) to enter any Firm Planned orders you already have in mind, and regenerate the MPS. Then plan your other items by running the MRP Explosion (MRP600). From this you can print your planning reports.

In the first month, it is advisable to carefully monitor planning reports. These reports can help you decide whether everything is set up properly, and whether you are getting useful results. You can rely more and more on the system for timely information about purchases and production, about prospective shortages or overstocking, and about your business operations generally.

How-to index

Function	Program
CREATE an item in a facility	MRP140
Firm planned orders	MRP510
Forecasts	MRP100
Master schedule plan	MRP510
Master schedule simulations	MRP710
REVISE item planning data	INV100
Item/facility planning data	MRP140
Firm planned orders	MRP510
Forecast quantities or dates	MRP100
Master schedule quantity	MRP510
Master schedule simulation quantity	MRP710
MRP time frames	MRP120
Planning start date	MRP120
COPY MPS/MRP to simulation	MRP700
Simulated MPS/MRP to live MPS/MRP	MRP770
DELETE firm planned orders	MRP510
Master schedule plans	MRP510
Master schedule simulation plans	MRP710
Purchase orders	PUR500
Shop orders	SFC540
DISPLAY orders and requirements	MRP300
Pegged requirements	MRP300
Available to promise	MRP310
Simulated MPS	MRP710
Simulated rough-cut capacity	MRP750
EXPLODE MRP	MRP600

Function	Program
GENERATE master schedule	MRP500
PRINT available to promise	MRP240
Exception messages	MRP210
Final assembly order	FAS510
Final assembly orders not yet released	MRP260
Master schedule detail	MRP240
Master schedule detail simulation	MRP730
PRINT available to promise (continued)	MRP240
Master schedule orders	MRP510
Master schedule simulation orders	MRP720
MRP exception report	MRP200
MRP summary report by class	MRP230
Releasable orders report	MRP250
Released shop orders	SFC550
Rough-cut capacity simulation	MRP760
REACTIVATE deleted master schedule plans	MRP510
Deleted master schedule simulation plans	MRP710
RELEASE final assembly orders	FAS500
Planned shop orders	MRP540
Purchase orders	PUR500
Shop orders	SFC500
RESCHEDULE firm planned orders	MRP510
Purchase orders	PUR500
Shop orders	SFC540

System functions

SSA ERP$_{LX}$ MPS/MRP programs offer the following system functions:

Netting calculation

The system is bucketless, net change MRP. It holds both the gross requirements detail and the planned order detail; however, no detail is duplicated from scheduled orders (shop orders, purchase orders, and customer orders).

The difference between the net change option and a full regeneration is that the net change update runs only explodes items that have their activity flag set to 'yes' (Y). Items are tagged for a net change update based upon any transactions which could affect the netting logic. Examples are the creation of a new shop order, a miscellaneous adjustment to the inventory, a change to the bill of material, or a change in gross requirements cascading from a higher level in the bill of material.

Many different lot sizing rules are available on an item basis. Examples are period order quantity, discrete above a minimum balance, lot for lot, multiple of the standard lot size, and least cost. The item minimum balance (or item per warehouse minimum balance if run by warehouse) is subtracted as part of the netting calculation to be used for safety stock.

The system keeps track of low level codes automatically and explodes the orders into lower level gross requirements via low level codes. The netting calculation is the same for phantoms as for regular items.

Time frames

The MRP detail can be consolidated into 40 time periods for report and inquiry purposes. The length of the 40 time periods is completely variable as is the starting date. The time periods are used for an optional horizontal format MRP report.

Firm planned orders

The system supports firm planned orders. It will suggest releases and rescheduling of firm planned orders but will not automatically reschedule as part of the netting logic.

Pegging

The system supports single level pegging on either a report or inquiry basis. The peg is to the specific order which generated the gross requirement and contains item and planning information.

Master scheduling

The master schedule is logically equivalent to a series of firm planned orders. The system will create a first cut master schedule if desired. The master schedule can be summarized by item class into a production plan. An available to promise calculation is automatically done on the Master Production Schedule reports.

Multi-level MPS

The system handles multi-level MPS scheduling for companies who need to schedule at more than one level. The option of exploding the forecast or the available to promise exists with the planning bill of material.

MRP/MPS simulation

The system allows you to manipulate and maintain a simulated MPS and MRP. The simulation may be copied from the existing first cut or may be a totally new schedule. In addition to the MPS and MRP, a simulation of the rough cut capacity plan can be performed. This allows a quick visual inspection (by inquiry or menu) of needed work center loads for the proposed MPS. Once a suitable MPS and rough cut capacity have been decided on, the system allows you to transfer the simulated MPS to the live Master Production Schedule.

Rescheduling and messages

The system makes the rescheduling assumption that you can expedite a released order before the system will generate a new planned order. Rescheduling messages are generated by automatically setting a reschedule date for either firm planned orders, shop orders, or purchase orders during the netting logic. The reschedule date, the due date, the start date, and the current date then combine to produce messages. Possible messages include cancel, expedite, de-expedite, and release. A suggested date is given with each message.

Planning horizon

The system has an infinite horizon for planning. All data is stored by date, not by summarized buckets.

Planned shop order release

The system provides an on-line review and release of planned shop orders. Planned quantities and dates may be changed for the release. Planned

orders may be deleted whether or not a shop order is released. A normal shop packet is printed for all released orders.

Reports and inquiries

Planning detail and pegging is available on-line. MRP planning reports are available in either vertical or summarized horizontal format. Rescheduling dates and messages are available by item for shop, purchase or firm planned orders.

A report of which planned orders are releasable to the shop is available. This report indicates shortages as well as orders which can be released.

Master schedule and production plan summaries are available. An item planning report lists all constant data for each item and affects netting logic.

Forecasting

Forecasts may be entered and maintained manually for any item including independent demand for an MRP item.

The system has several method options for including forecasts in the gross requirements. These options are: the greater of forecasts or customer orders (consumption of the forecast), adding forecasts to customer orders, use forecasts only, or use customer orders only. There are two different types of consumption logic; "lumpy" and "smooth" customer demand.

Phantoms

Items tagged as phantoms are exploded during the MRP or MPS generation after available inventory for the phantom is consumed. Release messages are suppressed for phantoms, and phantoms do not display on the MRP/MPS detail reports unless there is a rescheduling message or a past due scheduled receipt. Phantoms can be reviewed through MPS and MRP inquiry programs.

Phantoms are item type zero and are defined as neither manufactured nor purchased items. If you change this flag from the Item Type Maintenance (INV171), the phantom item type will no longer be enabled.

Yields

Yield percentages are supported at the item level; MRP and MPS use the net quantities. Sub-applications (Purchasing or Shop Floor Control) use and display the nominal quantities. Planned orders generated in the MPS and MRP explosions account for the item yield.

Planner codes

Each item is tied to a planner code. The detail MPS and MRP report may be printed in sequence by planner then item, or just by item. Planner code limits and item number limits may also be specified. In the multi-warehouse option, the same item may have different planner codes at different warehouses.

Scrap factors

Each bill of material record on the regular and the planning bill of material has an optional scrap factor. These scrap factors are included during the MPS and MRP explosions when gross requirements for child items are calculated.

Final assembly order release

The system provides for an on-line review and release of final assembly orders based upon the scheduled shop date and item. This review displays specific customer order information as well. A shop packet is then printed for all released final assembly orders. The correct material and routing configuration is automatically pulled from the customer order.

Order policy codes

A = Discrete (lot for lot) - Generates planned orders in quantities equal to the net requirements on each day. Phantom items should be set up with this policy code.

F = Least Cost - Uses the Boe-Yilmaz algorithm to closely approximate the Wagner Whitin algorithm (see Production & Inventory Management, Journal of APICS, Second Quarter, 1983) while eliminating the complex calculations for that algorithm. It is especially useful for uneven demand. An item with this policy code must have an Order/ Setup Cost specified using Item Master Maintenance (INV100). During system installation, the MRP parameter "Holding Cost Percentage" should be input. This parameter indicates the average percentage of the standard item cost to hold that item in inventory for the year (usually about 35%). The algorithm calculates the holding cost for a specified time (until the next order date) using the following formula:

Holding Cost =Holding Cost % x Std Cost (#Days until (Quantity x next order - 1) x req. next 100 % x 365 days order)

The system then compares the calculated holding cost to the order/setup cost to see if it is better to combine future demand with current demand in one order, or to wait to order future demand when it is needed.

Depending on the system parameters, holding cost and standard item cost can come from different files. If the 'Run MPS/MRP' flag is set to 'Y', the Order/Setup Cost must be present in the Facility Planning Data file. If the 'Run MPS/MRP' flag is set to 'N', the Order/Setup Cost must be present in the Item Master file.

If the 'Cost by Facility' flag is set to 'Y', the standard cost must be present in the Facility Planning Data file. If it is set to 'N', the standard cost must be present in the Item Master file.

If no standard cost is detected in the respective file, the system reverts to Order Policy Code A (Discrete).

Example: Suppose you are ready to order an item and look to future demand to see if you should include the next demand with the current order. Given the following information:

Holding Cost = 50%

Standard Cost = 2.00

Number of Days to Hold (until next demand) = 8

Total Required for Next Demand = 100

Order/Setup Cost for Item (from INV100) = 1.50

The Holding Cost Calculation yields:

$$\frac{50 \times 2.00}{100 \times 365} \times (8 - 1) \times 100 = \frac{700}{365} = 1.9178$$

Since the calculation shows the cost to hold the item in inventory (1.9178) is greater than the cost to reorder when the demand is actually there (1.50), the system would produce a planned order for the current demand only. The order for the 100 items required 8 days out would be considered at that point in the MRP run.

G = Fixed Period Requirements - During system installation, the user specifies the number of days of coverage each planned order should provide. You can also specify the number of days of coverage for a specific item from the Item Master Maintenance program (INV100), which will override the system default. The system will group all net requirements for that period and produce one planned order at the start of the period, beginning only on a day that has requirements. A period length of one will produce the same order results as lot for lot (order type "A" = discrete).

H = Discrete Above Standard Lot Size - Will produce a planned order of one lot as specified for that item in the Item Master (INV100) if the net requirements are less than or equal to the lot size. If the requirements

exceed the lot size, the size of the planned order will be increased by the excess.

I = Incremental Above Standard Lot Size - Will produce a planned order of one lot as specified for that item in the Item Master (INV100) if the net requirements are less than or equal to the lot size. If the requirements exceed the lot size, the size of the planned order will be increased by increments specified in the Item Master record for the item.

J = Multiple of the Standard Lot Size - Planned orders will be produced for net requirements in multiples of the lot size as set up in the Item Master (INV100).

Note: If you select to plan by warehouse, the values defined for these policy codes in the Item Master may be overridden for specific warehouses using the Warehouse Planning Data Maintenance program (MRP140) in this product.

K = Repetitive Order - Used for repetitive, high volume manufacturing and variable periods. Order Policy K produces a single firm planned order consisting of the total requirements of a repetitive order for a given period. You can define up to 152 periods. The period length is variable. Specify a start date for the first period. The system then calculates the start/end dates for all periods.

L = Fixed Period Plus Increment Above Lot Size - this allows you to combine the features of order policy G for fixed period with order policy I to adjust the initial order quantity up to the lot size or, if it is already greater, to increase it by the specified increments. This provides additional planning flexibility when quantities per period are important but your manufacturing process is most efficient at making specific quantities or multiples of quantities.

System flow

The MRP/MPS product allows you to bring together all the information held in the other SSA ERP_{LX} products about the movement of inventory items. Stock on hand and on order is compared with stock known to be required for customer orders or shop orders. You can set the time frames to be required for customer orders or shop orders. You can set the time frames to be considered, and you can enter forecast of expected demand.

If any item is in danger of becoming overstocked at any time within the specified time frames, the system will recommend that certain purchase orders or shop orders be canceled or delayed. If there is likely to be a shortage, the system will recommend that purchase orders or shop orders be expedited, and it will create planned orders (suggested orders) where

necessary. You can add, change, or delete these planned orders, then use them as the basis for purchase or shop orders. Requirements and expected supplies can be shown "pegged" to the individual transaction creating them; each requirement is linked to the actual customer order, shop order, purchase order, planned order, or forecast.

The system creates the Master Production Schedule for the items most important to you -- the items you marked on the Item Master as Master Schedule items. The MS is a list of planned orders (in date-needed sequence) for the Master Schedule items. After you have the MS, you may want to try out alternative schedules without necessarily committing yourself to them. With this in mind, the system allows you to create a simulated MS. For example, you can copy from the real MS, and then alter the simulated MS. If you like the altered simulated schedule, you can copy the simulated MS back as the real one. If you do not like the simulated schedule, you can ignore it.

In a manufacturing business, Master Schedule items would be finished items to be manufactured. The Master Schedule generation program MRP500 looks at these items and generates planned orders for them. This gives rise to requirements for component items according to the Bill of Material. Use the Explode Requirements program MRP600 which produces planned orders to satisfy component requirements. The result is a set of detailed orders ready to be released to the Shop Floor, plus planned orders for raw material and purchased parts.

In a distribution business, Master Schedule items are the most important items to you, and are the ones looked at by the Master Schedule generation program (MRP500). After you have firm plans for these items, you can create a supplementary planning schedule for less important items using the Explode Requirements option (MRP600).

For a manufacturing environment, the system follows the bill of material, and "explodes" gross requirements into details of all the components needed. You can print summary and detail reports showing exactly which components will be needed for each requirement.

There are a number of System Parameters (or options) for the MRP/MPS product, all of which affect the way planned orders are created. These parameters are options which you normally set during implementation; however parameters can be changed later if necessary.

As processing continues, the other products create events; for example, shop orders are completed, purchase orders fulfilled, inventory received or issued, planned orders definitely scheduled or canceled, etc. When either the inventory or planning status of an item changes, the system sets an "MRP net change flag" for that item. Periodically, regenerate and reprint the Master Production Schedule. This can be done in one of two ways. You can request

a full Regeneration or you can request a Net Change regeneration. If you request a full Regeneration, the system looks at all Master Schedule items and all movements for each item. If you request a Net Change regeneration, the system looks at only those items with a net change flag. The same option applies to the Explode Requirements program (MRP600) for non-Master Schedule items. In either case, the previous plans are recalculated, and previous planned orders (not firm planned orders) can be rescheduled or deleted.

The planning start date can be any date you specify. The horizon date, which is a fixed number of days forward from the current planning start date, is one of the System Parameters. This horizon date will be the limit on what you can definitely plan into the future. The system will not create planned orders to be released with a due date within the horizon; however, you may use a maintenance program to create planned orders regardless of the horizon date. You may also create firm planned orders. Firm planned orders are not rescheduled by the system, even when you do a full MPS regeneration.

The system also has up to 40 time frames for reporting purposes. You may define each time frame as a number of days, starting from any date. Gross and detail material requirements will be shown summarized into these time frames.

There is no daily running or specific period-end processing, since the planning process is undertaken as required. Review plans and release planned orders on a regular basis. The following is a suggested list of activities:

1. Time frame maintenance - define the reporting periods to be used Program: MRP120 - Time Frame Maintenance

2. Forecast maintenance - update forecast item requirements Program: MRP100 - Forecast Entry/Maintenance

3. Master Production Schedule - regenerate, print, make changes as required, and reprint. Programs: MRP500,MRP510 - Generate MPS, Maintain MPS, MRP520,MRP240 - Print MPS Orders, Print MPS Detail.

   Note: The generation program MRP500 should not be run while anyone else is accessing the Inventory or Bill of Material files. This gives you the production/purchasing plan for the most important (Master Schedule) items.

4. Create and Maintain planned orders for NON-Master-Schedule items - explode requirements and use maintenance programs to adjust. This produces planned orders for components and creates requirements for MPS items. Programs: MRP600 - Explode Requirements, MRP510 - MRP Maintenance

5 OPTIONAL: MPS Simulation - copy MPS/MRP, make changes, print simulated MPS in total or detail. If desired, simulate MRP explosion and capacity plan. You may copy simulated MPS back over original. Programs: MRP7XX - MPS Simulation.

6 Firm Planned Orders - select the planned orders that you want to enter as firm planned orders. These firm planned orders can then be released as shop orders or used as the basis for purchase orders. Program: MRP510 - MRP Maintenance

7 Reports and Inquiries - including Releasable Orders Report (MRP250) and Rescheduling Report (MRP210). Use the MRP Maintenance program (MRP510) to change release dates. Programs: MRP2XX, MRP3XX - Reports and Inquiries.

8 Release Planned Orders - select planned orders to be mass released to the Shop Floor Control product, within a selected date range. Program: MRP540 - Release Planned Orders

9 Print Released Orders - you MUST do this to complete the release of planned orders to the shop floor. This program prints shop documents and places the released orders in the permanent Shop Order file. Program: SFC520 - Shop Packet Print

Most files used by MRP/MPS are maintained by other products, such as; Inventory, Manufacturing Data Management, Shop Floor Control, Configurable Order Management, and Purchasing. The Planned Orders file is updated by MRP500 (Generate MPS) or MRP600 (Explode Requirements) and accessed by all MRP/MPS programs.

Glossary

The following terms are used in this product as well as other SSA ERP_{LX} products.

Master Schedule item
An item marked with an "M" in the Master Schedule field on the Item Master file.

Master schedule items are usually independent demand goods or finished items. The Master Schedule program (MRP500) generates planned orders for those items. This gives rise to requirements for component items according to the Bill of Material. Then, the Explode Requirements program (MRP600) to produces planned orders to satisfy component requirements. The result is a set of planned orders that satisfy manufactured and purchased requirements.

In a Distribution business, Master Schedule items are the most important items to you, and are the ones which will be looked at by the Master Schedule generation program MRP500. Once you have firm plans for these items, you can create a supplementary planning schedule for less important items, using the Explode Requirements program MRP600.

Planning Date
Whenever you generate a schedule using either MRP500 or

MRP600, you may set the planning start date to any date. The system will re-plan material requirements from that date forward.

Horizon
In the system parameters, you can specify a number of days forward from the current planning start date to produce the "horizon date". The MPS system will not create orders for release with a due date within the Horizon. Producing a horizon date allows you to freeze a safety period in the production plan. You can manually enter or move planned or firm planned orders to be due at any time.

Planned order
The system will create "planned orders" when you run the generation programs MRP500 and MRP600. These planned orders are recommendations to purchase or manufacture, in order to meet the calculated requirements at the proper time.

Firm Planned Order
You can enter planned orders or firm planned orders directly to the system. A Firm Planned order will not be rescheduled or deleted automatically, though the system will make recommendations about it. Ordinary planned orders are subject to rescheduling or deletion every time a regeneration is run.

Net change
As actual events are entered through other products (for example, inventory movements), the system sets an "MRP net change flag" if anything affects the inventory or planning status of an item. You can run the schedule generation programs so that they use only these "net change" items. This is quicker than a full regeneration.

Pegging
The system keeps track of which event gave rise to which requirement, and which events are expected to satisfy requirements. For any item, you can display and report how requirements are "pegged" to individual customer orders, purchase orders, shop orders, planned orders, and forecasts.

Time frames
You can specify up to 40 time periods. Starting from a date (usually the current planning start date), each period can be any number of days long. The time frames are used for reporting.

Forecast
You can enter forecasts of expected demand over the time period. The system will take these forecasts into account when calculating requirements, according to the system parameters.

Simulation
The system allows you to make a copy of your MPS, then try out changes on the copy and print reports, without affecting the original MPS. If you like the results, you can copy the simulated MPS back as the real one. You can also simulate the supplementary schedule (MRP Explosion), and the Capacity Plan if you are using the Capacity Planning product.

Mass release

You can release a group of planned orders to the Shop Floor product to become definite shop orders. The system allows you to review and revise the planned orders before you release them. Any that are not to be released can be deleted.

Notes

Chapter 9
Performance Measurement

9

The chapter consists of the following topics:

Overview

This chapter contains overview information for indexing, system functions and system flow. An important part describes Performance Measurement values for each of the predefined performance measures including the formulas used to compute those values.

How-to index

Function	Program
Adjust tolerance days	PRF100
Change user-defined measures	PRF100
Change user-defined ratios	PRF100
Change budget name	PRF100
Close PRF period	PRF900
Inquire PRF data	PRF300
Load actuals to B budget	PRF930
Load B to A budget	PRF920
Maintain measurement budgets	PRF120
Maintain measurement actuals	PRF130
Maintain PRF periods	PRF140
Maintain PRF product parameters	PRF100
Print PRF bar graphs	PRF200
Print PRF product parameters	PRF110
Print PRF reports	PRF200
Transfer actual data to budget B	PRF930
Transfer budget data	PRF920

System functions

Predefined measures

The Performance Measurement product offers you 20 pre-defined measurements or ratios that let you gauge the efficiency of various business activities. For example, there are measurements for on-time vendor delivery by item type, manufacturing performance, and routing efficiency. Other measurements gauge your production efficiency for critical areas of your business that range from when you first receive raw material to your shipping performance of the finished goods.

User-defined ratios and measures

In addition, you can establish up to 3 user-defined transaction type ratios and 3 user-defined measurements. The transaction type ratios compute a simple numeric, amount, or quantity ratio of any one transaction type total to any other transaction type total. The system computes the total transaction values for each transaction type over a given period and performs the ratio calculation.

The user-defined measurements are values that you manually input and maintain. No system calculations will generate the values for these fields; they are solely user entered literals, and are not operable in any user defined calculations. The system displays these measurements via the inquiry and report programs. Your business must assign descriptions for each of the ratios and measurements. These descriptions will appear on various maintenance, inquiry, and report menus.

Budget maintenance

The Performance Measurement product offers two user-defined budgets for each measurement: Budget A and Budget B. These budgets are manually maintained and normally represent "This Year Budget" and "Last Year Actual."

For some measurements, you must enter a planner code or an item type code to identify the budget. These codes enable the budget to be planner code or item type specific. The system also allows you to set up separate budgets for each warehouse.

Actual measurements and budget transfer

In addition to budgets, the system maintains actual measurements based on current manufacturing activity. These measurements can be generated at any time and are normally updated during end-of-month processing (PRF900).

You can use the Load B to A Budgets program (PRF920) to transfer budget data and the Load Actuals to B Budget program (PRF930) to transfer actual data to the B Budget. Actual data cannot be transferred directly to the A Budget. Normally, Budget A is defined as "this Year" and Budget B is defined as "Last Year." This facilitates the display (PRF300) and reporting (PRF200) functions.

The following procedure is used at year end to properly load "Budget A" and "Budget B."

1. Run PRF930 to load Actuals to Budget B.

   Note: Old Budget B data will be deleted.

2. Run PRF920 to load Budget B to Budget A.

   Note: Old Budget A data will be deleted.

3. Run PRF120 to modify Budget A data as required.

Performance measurement periods

The final set up step you must perform before generating performance measurement values is to define your performance measurement periods. These are normally the same as the general ledger periods; however, the performance measurement periods are separate and distinct from the period data that you establish by using the CEA Period Table Setup program. The system uses these periods to separate performance measurement data so it can calculate values over a specific time period. These periods may be related to the general ledger periods, but only by nature. That is, there may be the same number of performance measurement periods as there are general ledger periods, but there is no software link between the two.

Viewing measurement values

Performance measurement data can be used to produce either a table of values or a bar graph. Each option offers a side-by-side comparison of actual to budget values, by period.

System flow

Maintenance programs

The following programs must be run in sequence:

1. PRF100--Performance Measurement Parameters. This defines the performance measurement settings as well as the user-defined measurements and ratios. PRF110 will list these parameters.

2. PRF140--Period Master Maintenance This defines the performance measurement periods by warehouse.

3. PRF120--Budget Maintenance. This enables the direct loading of "Budget A" and "Budget B."

4. PRF130--Actuals Maintenance. This enables the direct loading of "Actual" values.

   Note: User-defined measurement "Actuals" must be loaded by this program. They are never calculated by the system.

Reports and Inquiries

To view the calculated performance measurements, you can use either the Performance Inquiry program (PRF300), for on-line viewing of the values, or the Performance Reports program (PRF200), to generate a hard copy of the results. Both programs offer two report formats: bar graph and value table. Each format provides a side-by-side comparison of actual to budget values.

Close Programs

Performance measurement values are generated for any open period through the Period End Close program (PRF900). Values are generated at the warehouse/period/year level. Once these values are calculated, they can be modified through PRF Actuals Maintenance (PRF130).

Once the entire year has been closed, the "Actuals" can be loaded to "Budget B" (PRF930) and "Budget B" can be loaded to "Budget A" (PRF920). It is up to your business's discretion which order is used.

Performance measurement values

1. PRF Vendor Reject Percentage by Item Type:

   This measurement counts the number of vendor reject transactions from the Transaction History file within the period. It then counts the number of purchase order receipt transactions within the period. It calculates a percentage of vendor reject transactions to the total number of purchase order receipt transactions. The system records this value to the appropriate performance measurement period. The system also calculates a reject percentage for each item type.

   - Calculation:

     If we establish the following conventions:

     - **A** = # Rejects in period (transactions set up to affect Purchase Orders through Transaction Effects Maintenance -- INV150, and negative quantity), and
     - **B** = # Receipts in period (transactions set up to affect Purchase Orders through Transaction Effects Maintenance -- INV150, and positive quantity), then, the measurement is calculated by the following method:

       ```
       Vendor Reject % = (A / B) X 100
       ```

2. PRF Vendor Delivery Percentage by Item Type:

   This measurement reads through the Transaction History file for purchase order receipts within the period -- transactions for positive quantities that are set up to affect purchase orders. The system compares the transaction date with the requested date to compute the number of days that each transaction took place either before or after the request date. It then compares this number with the days tolerance (plus/ minus) in the Performance Measurement Parameter file to determine whether the purchase order was early or late. The system then calculates the percentage of on-time purchase order receipts to all P.O. receipts for the period. It records this value to the appropriate performance measurement period. The system also calculates an on-time percentage for each item type.

3. PRF Component Availability Percentage by Item Type:

   This measure reads the Transaction History file for issues to shop orders within the period and calculates the number of shop calendar days between

the transaction date and the material need date. It then keeps a count of how many single and multiple issues are within the number of tolerance days (plus/minus) that you established through the Performance Measurement Parameters program (PRF100). Then, it computes a percentage of the issues that are within the tolerance limit to the total number of issues. The system also calculates a similar percentage for each item type and records the values to the appropriate performance measurement period.

This measure does not include negative issues or finished goods in the multiple issue receipts.

4 PRF Inventory Value by Item Type:

This measure reads through the Warehouse Inventory file and calculates the quantity of the various items on hand by adding the opening balance to all receipts and adjustments and then subtracting the issues from this amount. The system then multiplies the individual on hand quantities by the respective item's cost, adds the individual values, and computes a total inventory value. The value is then summarized by item type. Both the total inventory value and the value of each item type are recorded to the Performance Measurement file. The system will use either the item's actual, standard, or frozen standard cost, depending on the type of cost you specified through the PRF Parameter Maintenance program (PRF100).

5 PRF Inventory Turns by Item Type:

This measure reads through the Inventory Warehouse file and calculates the quantity of the various items on hand. The system then multiplies the individual on hand quantities by the respective item's cost, adds the individual values, and computes a total inventory value. The value is calculated for each item type. In addition, the system calculates a total for all types taken together.

The system then reads through the Transaction History file to determine the number and quantity for all Issue transactions that are set up to affect issues or multiple issues within the period. The issued quantities are then multiplied by the respective item's cost. These totals are then summarized by item type.

The system will use either actual, standard, or frozen standard costs to determine these values, depending on the type of cost you specified that it should use through the PRF Parameter Maintenance program (PRF100).

With these two values, the system then calculates the number of inventory turns by multiplying the usage for each item type by the portion of the year and dividing by the on-hand value for the item type. The system records these values to the appropriate performance measurement period. It also records an inventory turn value to the Performance Measurement file for the entire inventory.

- Calculation:
- Part of Year = 365 / (End Date - Beginning Period Date + 1)
- Inventory Turns = (Total issues / Total on Hand) X Part of Year

6 PRF Component Availability Percentage by Planner:

This measurement reads the Transaction History file for issues to shop orders within the period and calculates the number of shop calendar days between the transaction date and the material need date. It keeps a count of the number of single or multiple issues that are within the number of tolerance days (plus/minus) that you specified through the PRF Parameter Maintenance program (PRF100). This total is summarized by planner code. The system then computes a percentage of shop order issues within the tolerance to the total number of shop order issues for each planner. It records these percentages to the appropriate performance measurement period and also records a percentage for the total number of issues to the Performance Measurement file.

This measure does not include negative issues or finished goods in multiple issue receipts in this calculation.

7 PRF Reschedule Reliability Percentage by Planner:

This measurement reads both the Shop Order file and the Purchase Order file for open orders and requisitions. It compares the scheduled receipt due date for each of these orders, or requisitions, to the system date to determine if the order is past due. Then, it calculates a percentage for each planner of the scheduled receipts that are past due to the total number of scheduled receipts and records this percentage to the appropriate performance measurement period. The system also computes and records a percentage for a total of all planners.

8 PRF Lead Time Violation % of Purchase Orders by Planner:

This measure reads through the Purchase Order file and calculates the number of days between the entered date and the due date of the purchase order. Then, it compares the days difference with the lead time for the item, as recorded in the Item Master file. The system then calculates a percentage of purchase orders with the days difference less than the item's lead time versus the total number of purchase orders for each planner. It records this value to the appropriate performance measurement period for each planner. The system also calculates a total for all planners and records the value in the Performance Measurement file.

- Calculation:

  If we establish the following conventions:

- **A =** Total non-deleted Purchase Orders where the number of days between the release date and the due date is less than the lead time for that item (Item Master file).
- **B =** Total non-deleted Purchase Orders

  L.T. Violation Measurement = (A / B) X 100

9 PRF Lead Time Violation % of Shop Orders by Planner

This measure reads through the Shop Order file and calculates the number of shop order days between the release date and the due date for the shop orders. Then, it compares the days difference with the lead time for the item, as recorded in the Item Master file. The system then calculates a percentage of shop orders with the days difference less than the item lead time versus the total number of shop orders for each planner. It records this value to the appropriate performance measurement period for each planner. The system also calculates a total for all planners and records the value in the Performance Measurement file.

- Calculation:

  If we establish the following conventions:

  - **A =** Total non-deleted Shop Orders where the number of days between the release date and the due date is less than the lead time for that item (Item Master file).
  - **B =** Total non-deleted Shop Orders

    L.T. Violation Measurement = (A / B) X 100

10 PRF Total Cost by Transaction Effect Code:

This measure reads through the Transaction History file and multiplies the quantity of each transaction in the period by the respective item's cost to determine the total amount of the transactions for that period. This measurement is then summarized by transaction code and recorded to the appropriate performance measurement period. The system uses either the item's actual, standard, or frozen standard cost, depending on the type you specified that it should use through the PRF Parameter Maintenance program (PRF100).

11 Inventory Accuracy %:

- Calculation:

  If we establish the following conventions:

  - **A =** Number of cycle counts within the item type tolerance

- **B =** Number of cycle counts within period (transaction must be set up for cycle counts through Transaction Effect Maintenance -- INV150) then, the value of this measure is calculated by

  Inventory Accuracy = (A X 100) / B

12 PRF Master Production Schedule Performance Percentage:

This measurement reads the Transaction History file for shop order receipt transactions with positive values. These are transactions that are set up to affect shop orders within the period. The system then accesses the item Master file to determine whether the item is a master production scheduled item.

For MPS items, the system compares the actual receipt date with the shop order due date to get the number of work days between the two. This number is compared with the number of days tolerance that you specified through the PRF Parameter Maintenance program (PRF100) to determine if the receipt was either early or late. The system calculates a percentage of on-time receipts to the total number of receipts and records this value to the Performance Measurement file.

This measure does not include negative receipts in the calculation. Furthermore, backflush transactions (multiple issue and receipt) must be finished goods to be included here.

13 PRF Manufacturing Performance Percentage:

This measurement reads through the Transaction History file for shop order receipt transactions with positive values. These are transactions that are set up to affect shop orders within the period. The system then accesses the Item Master file to determine whether the item is a master production scheduled item.

If the item is not an MPS item, the system compares the actual receipt date to the shop order due date and calculates the difference in days. The days difference is then compared to the number of days tolerance you established from the PRF Parameters Maintenance program (PRF100) to determine if the receipt was either early or late. It then calculates a percent of on-time receipts to the total number of receipts and records that value to the Performance Measurement file.

This measure does not include negative receipts in the calculation. Furthermore, backflush transactions (multiple issue and receipt) must be finished goods to be included here.

14 PRF Shipping Performance %:

This measure reads through the Transaction History file and compares the transaction date for all type "B" transactions to the period end dates to confirm that the transaction occurred during the specified period. Then, it compares the transaction date with the request date plus or minus the tolerance days to compute the number of days that the actual shipment took place. This determines if the transaction occurred within the target range. If the difference between the two dates is greater than the days tolerance (plus/minus) that you established through the PRF Parameters Maintenance program (PRF100), the shipment is counted as either early or late, respectively. The system then calculates a percentage of on-time shipments to total shipments for the period and records that value to the Performance Measurement file.

Note: Transaction type "B" is reserved for shipments. See Transaction Effect Maintenance (INV150) for further details.

15 PRF User-Defined Performance Ratios:

You name, set up, and define each of these ratios to meet the needs of your business. Each of these measures reads the System Parameter file to retrieve the ratio transaction types within the period. It also reads the Transaction History file to accumulate the transaction totals for the transaction type. The system then computes a ratio of either a number, amount, or quantity, depending on the entries made for each respective ratio.

16 PRF Shipping Amount:

This measure reads through the Transaction History file and compares the invoice dates for all "B" transactions to the period end dates to determine if the invoice was issued during the specified period. The system keeps a running total of the period's invoice total amount and records the total amount to the Performance Measurement file.

17 PRF Bookings Amount:

This measure reads through the Customer Order Line file and compares the order entry date for each line to the period end date to see if the order occurred during the specified period. Lines are processed even if they have been shipped.

The system processes regular order lines differently than it processes special lines:

- regular line: quantity X price
- special line: special charge amount
- deleted line: 0

The system keeps a running total of the order amount and records that value to the Performance Measurement file. If you are running performance measurement by warehouse, the special lines are included in the warehouse specified in the order header, since no warehouse is kept on special lines. The order header charge is not included in bookings amount.

18 PRF Backlog Amount:

This measurement reads through the Customer Order Line files and keeps a running total of all open order amounts. It uses both regular and special lines, but they are processed differently:

- regular line: quantity X price
- special line: special charge rate

  The system records this value to the Performance Measurement file. If you are running performance measurement by warehouse, the special line is included in the header warehouse, since no warehouse is kept on special lines. Order header charge is not included in bookings amount.

19 PRF Backorder Amount:

This measure reads through the Warehouse Inventory file to determine the amount of items on hand. The on-hand inventory is consumed by active material allocations and customer line items in request date sequence. When no inventory remains, the remaining customer order lines are summed at actual prices. This value is recorded to the Performance Measurement file. Order types 5, 6, 7, and 8 are skipped since they do not affect inventory.

20 PRF Bill of Material Accuracy Percentage:

This measurement reads the Shop Order file for closed shop orders that were not previously processed by PRF. These shop orders cannot be for parent planning bill items. It then compares the shop order release date to the effective date on the bill of material records and explodes through the bill of material. The system compares the components on the Material Allocation file to the bill of material items effective on the shop order release date.

A record on the Material Allocation file with a zero issued quantity is ignored by this measure. If the bill of material contains a component that does not appear on the Material Requirement file, the bill of material is still considered accurate. A bill of material is considered inaccurate only if it does not contain a component that appears on the Material Allocations file. This measure also handles multi-level phantoms with or without inventory.

The measure is calculated by the following equation:

- If we establish the following conventions,

- A = Total Closed Shop Orders where each component is in the BOM, and
- B = Total closed Shop Orders.

  then Bill of Material Accuracy = (A / B) X 100.

21 PRF Routing Accuracy Percent:

This measure reads through the Shop Order file for closed shop orders that were not previously processed by PRF. It then compares each operation for a shop order in the Shop Order Detail file with the entries on the Shop Floor Routing Master file to see if a matching record exists. The system checks the routing effective dates against the shop order release date to determine if the routing step was in effect at the time of the shop order. It then calculates a percentage of the shop orders with matching operation detail records to the total number of closed shop orders.

It is possible to have a routing step and not have an operation on the shop order, but still count the shop order as accurate. The hours posted do not need to match. Shop orders with zero labor hours are not considered.

- Calculation:

  If we establish the following conventions:

  - **A =** Total closed shop orders where each operation with labor is in the item's routing (and which are effective at release date of the shop order), and
  - **B =** Total closed shop orders.

    then, PRF Routing Accuracy Percent = (A / B) X 100

You can specify which user-defined budget (A and B), or that both budgets should be included on this report. The system will supply data for the desired budgets to give you a side-by-side comparison of the actual and budget values. If you print a bar graph with this report, the system will supply one graph for each budget that you include on the report. These graphs also provide side-by-side comparisons of actual and budget data.

If you want to include both Budget A and Budget B on the report, leave the default values of "Y" in these fields. Otherwise, key in an "N" to either, or to both, of these fields to exclude that type of information from the report. These are the only two valid entries for these fields.

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Chapter 10
Quality Management System

10

The part consists of the following topics:

Overview

The SSA ERP$_{LX}$ Quality Management System (QMS) is fully integrated with the SSA ERP$_{LX}$ Manufacturing and Distribution product lines. QMS uses the SSA ERP$_{LX}$ Archival and Security programs and the Item Type, Work Center, Department and Calendar Validation tables. The QMS Item (QMS165), Lot (QMS590), and Customer master files access the same master files as INV/API100, INV130, and ACR100.

Manufacturers

You must maintain both the manufacturer and the vendor master files, even when the vendor and manufacturer are the same. This effectively separates QMS activities from other SSA ERP$_{LX}$ activities, by enabling QMS control of manufacturers and Purchasing control of vendors.

Manufacturer/item relationships

The Manufacturer/Item master (QMS105) links an item, manufacturer, and specification. You can link a single item with multiple manufacturers, and you can have multiple item/manufacturer relationships call the same specification. You can define the following testing levels in QMS105, then apply them to sample and test relationships to define the degree of testing on manufacturer/item lots:

- Current levels apply to the primary disposition used to release inventory, and an optional secondary disposition to allow for fuller testing with a longer lead time or more strenuous testing than the primary.
- Subsequent levels allow reduced testing on subsequent receipts of lots you already tested and accepted.
- Retesting is allowed under conditions that require it.
- Cyclic controls allow you to base a testing schedule on a time frequency and/or a lot frequency.
- Probation controls enable stricter testing for uncertified manufacturers or those whose quality history is in question.

You can enable the Automatic Approval feature in the Manufacturer/Item master to allow automatic approval (QMS540) for lot dispositions. All values you define in the Manufacturer/Item master override those in the item file INV/API100.

Customer/item relationships

You can match all quality controlled items with customer requirements, using the Customer/Item master file (QMS136). This contains the specification, customer certificate format, and customer expiration date requirements. Customer Candidate and Lot Candidate search programs enable you to review the relationships in preparation for lot dispositions.

Receipt processing

All QMS activity begins with receipt transactions in a SSA ERP_{LX} trigger point. These trigger points are Inventory Transaction Posting (INV500), Purchase Order Receipts (PUR550), Material Backflush Labor Posting (JIT500), or CIMPath Inventory Transactions (CIM600). The following conditions exist in order for receipt records to transfer successfully to QMS:

- The trigger QA Activity field must be Y in Inventory Transaction Maintenance (INV150) for your selected transactions,
- The item must be quality controlled and lot controlled,
- The item, and manufacturer fields must be entered and validated,
- The default lot status in API820 cannot be Q.
- A record cannot already exist in QTR, the work file that is the bridge between the SSA ERP_{LX} trigger points and the QMS target program (QMS599).

Sample and test triggers

Target program QMS599 calls batch program QMS535 to generate the lot dispositions. This occurs automatically if you turn on Quality Action Trigger Processing (a system parameter in QMS820). Leaving this indicator off requires that you verify every item and manually generate the dispositions in Quality Transaction Processing (QMS595). Whether generated automatically or manually in QMS595, the dispositions use the samples, tests, and other requirements you defined in the Manufacturer/Item (QMS105) and Item Master (QMS165).

Status update as a result of QA activity

SSA ERP_{LX} assigns the default status from the ZPA file to new lots. When quality activity is triggered, SSA ERP_{LX} changes the status to "Q". You cannot change the "Q" status for that lot if there is quality activity in QMS until you perform the lot disposition. Final disposition sets the lot status to the disposition code you define in QMS System Table 310.

Location and lot/location inventory transfer and status

You can move quantities within an existing lot for a quality controlled item. You can also transfer lots in quality hold status from one lot/location to another. SSA ERP_{LX} identifies each of these inventory quantity transfers with inventory transaction code "QT" defined in INV150.

Lot/location status is an add-on to the lot status, providing an extra level of control. You can change the lot/location status codes (Hold, Quality Hold, Conditional Pass, Rejected, Active, Used In Sample, Scrapped, Return To Vendor and Waiting Inspection).

QMS item maintenance

You must maintain every QA item with QMS Item Master (QMS165). Auto Stability Select enables you to place an item on a stability program for future sampling and testing if the LMS product is installed. This feature generates an additional disposition with code 99.

Security

You can create groups in Security Group Maintenance (SYS603) and activate security for each program, action code and function key for each user profile that you assign to the group.

Additional security measures are available by limiting the authorized users for sample and item types, methods, instruments, verifications, and approvals. See the individual controls in the Specification, Sample, Test, and Method master files.

System tables

Tables drive the field validation in QMS maintenance and processing programs. In SYS105, you can define tables for validation of test results, lot processing, and lot dispositioning. You can add new tables and add codes to existing tables, but you cannot delete any of the SSA ERP_{LX}-defined tables listed below.

ID	Description/Attribute	Type	Langth
001	Boolean	4	1
110	Sample Types	1	1
120	Testing Levels	1	1
130	Languages	2	3
135	Countries	2	3
140	Reject Disposal Table	2	3

ID	Description/Attribute	Type	Langth
150	Labor Groups	1	1
165	Bulk Item Types	1	1
166	Standard Reagent Items	1	1
180	Comment Types	2	3
185	Comment Sub-Types	2	3
190	Inventory Usage Codes	2	3
200	Numeric Operators	2	3
210	Item Cost Centers	5	15
215	Item Corporate Codes	5	15
250	Non-Testing Activity	2	3
260	Instrument Types	2	3
310	Lot Disposition Codes	3	3
320	Sample Disposition Codes	3	3
330	Disposition Status Codes	2	3
340	Specification Types	1	1
350	Method Types	1	1
410	Storage Temperature	2	3
420	Storage Humidity & Air Conditions	2	3
430	Storage Position	2	3
440	Storage Lighting	2	3
510	Sample Label Definitions	2	3

Table types identify the table category and the number of characters allowed in its codes: Type 1 is for one character code tables, 2 is for three character code tables, 3 is for three character disposition code tables, 4 is for one character result type code tables and 5 is for 15 character code tables. Please note the following information about user defined codes that are required for table types 3 and 4.

User Defined Code 1 is required for a table type 3 or type 4 code to define the pass flag.

For table type 3 (disposition codes) valid codes are:

0 No. A lot disposition can be completed even if processing is incomplete or has exceptions. No audit is required.

1 Yes. The disposition will be audited to ensure that all required test results have passed.

For table type 4 (result type codes) valid codes for the pass flag are:

0 fail

1 pass

2 marginal within test specification limits but not within control limits

This table must be specified in the test master (QMS125) and the appropriate code must be selected during result entry (QMS545).

User Defined Code 2 is required for a table type 3 code to define the type of audit:

0 None: No audit is performed

1 No fails: Every disposition that is assigned this disposition code is audited to ensure that processing is complete with no exceptions. Marginal pass records are allowed.

2 No marginals: Every disposition that is assigned this disposition code is audited to ensure that processing is complete with no exceptions. Marginal result records are not allowed.

User Defined Code 3 is required for a table type 3 code to define the lot disposition status.

SSA ERP$_{LX}$ will update the lot record in INV130 to this status for every item/lot assigned this disposition code in QMS550:

1 available

2 conditional

3 hold

4 quarantine

5	reject
6	archived
7	deleted/completed
8	expired

Automated processing

Audit reports exist at every level of QMS to track all maintenance and processing programs. You can automate the procedures for processing acceptance samples through testing, entering results, making dispositions, and updating the lot status. The degree of automation depends on your documentation, verification, control, and auditing requirements.

Specification master

Specifications link manufacturer/item requirements with samples and tests to form the basis of all quality activity. The Specification master is shipped with a central repository master called SuperSpec. All tests and samples must reside in SYS100 before you can use them in an item's specification.

Specifications must be approved before they can be used. You can select specifications for review on a cyclic basis. Specifications can be superseded; when you need to create a new specification, you can copy the specification itself or mass replace all associated tests from an existing specification. Use Specification Change Control (QMS565) when you need to change a specification for open lots.

A specification type table (table 340) is included in the System Tables. These user defined types are useful for assigning specifications to item, facility, or manufacturer groupings. They enable easy look-up of each type and prevent duplicating test and sample identifiers when you create specifications.

Sample and test relations

Define sample relations in the Sample master (QMS120) to relate the sample to a specification at a certain manufacturer/item testing level. For each sample relation, define a Sampling Rule (QMS135) to describe how to derive the number of physical samples, a sample cost, lead-time, and a quantity.

Define testing relations in the Test master (QMS125) to require the test be performed for a specified sample when taken at a specified manufacturer/item testing level. This manufacturer/item testing level displays for each lot record in Dispositions (QMS550).

Sample master

The Sample master contains all operational characteristics assigned to a sample. Use the Sample Record Required field to automatically generate sample records when a lot is received. If you set this indicator off, you must manually enter the samples in QMS500. Use the Multiple Add feature to automatically generate additional sample records during Result Entry.

Three sample levels are possible: Primary samples are portions of the item selected for evaluation.

Composite samples are a mix of primary samples that form a pool of the primary samples. Aliquot samples are a portion of the composite sample that is removed for evaluation purposes. You are required to define the origin of each primary to composite to aliquot sample relationship.

Sample audit conditions include a log requirement, (sample must be received by a valid user) the assignment requirement (sample must be assigned to a valid user) and disposition requirement (disposal conditions must be met before the lot is released following disposition).

Define sample types (A = analytical, P = physical, etc.) in table 110 in SYS105. Define sampling rules (all, square root, constant, factor, user table, or multiply) in QMS135. You can specify whether to use a quantity or container for sample input and a number or quantity of samples for sample output. These rules support full user-defined, Mil-Std 105E, type sampling decisions.

Test master

Test Masters describe the tests to perform on samples for each specification. You can set specification and control limits, the method number, and the nature of the test (required or information only, etc.).

Type 1 is for numeric tests. These are evaluated to specification and/or control limits that are also assigned a numeric value. Numeric values outside the specification range are flagged as a fail. Values inside the specification limits, but outside the control limits are flagged as marginal. Values in all limits are flagged as pass.

Type 2 is for tabular results. You can use the Boolean table (table 001) for a simple pass/fail criteria. You can also define your own tables for visual inspections, function testing, etc.,

You can assign both types 1 and 2 to the same test master. That allows numeric input with the flexibility of switching to a table value if samples are TNC (too numerous to count) for example.

Type 3 is for testing potency items. API must be installed and you must have defined the item as a potency item in INV. Following disposition, SSA ERP$_{LX}$ automatically updates the actual potency field in INV130 and updates the lot master record with the QA Approved Date. Please note the following conditions:

You must define result type 3 on the result record for a test with a potency result type.

- The Results field on QMS125D2-01 must be 1 (only one result can update potency).
- The Sequence field on QMS125D2-01 must be 1 (only the first potency test updates the file).
- The Precision field on QMS125D2-01 cannot exceed 4, based the decimal precision of potency items in INV130.
- The test must be linked with a sample with a rule of one per lot to ensure there is only one type 3 test.

You can assign a six decimal place precision and three different rounding methods for numeric test results. If you select a rounding method, the maximum decimal places is five. If a potency item, the maximum decimal places is four. 4 is for the Lot Release Process

This test allows you to run lot release processing when you begin disposition of a lot, and before the remainder of the QMS processing is performed. If you use Result 4 in a Test Master record, the table must be 200 and the Pass required value, the Result required value and the result value must all be set to 1=Yes. The Verify required value must be set to 0=No.

Test work centers

You can use the test's load function to identify the work center to which testing will be charged during Result Entry (disposition 0 calls every test assigned to that work center). QMS labor and instrument work centers equate to loading codes defined in SSA ERP$_{LX}$ Capacity Planning (CAP100). For Instrument-type work centers, use codes 1 (machine) and 3 (set up and machine). For Labor type work centers, use codes 2 (set up), 4 (labor), and 5 (set up and labor).

Worksheets

You can generate worksheets (QMS160) by labor work center and user ID listing all tests that must be run. A Worksheet Number is assigned and a printed Worksheet (QMS274) is automatically generated for the analyst. You can enter test results by worksheet number during Results Entry (QMS545).

Method master

A method is a unique procedure for recording test data and calculating the results. You assign methods and alternate methods to tests. You can associate them with method variables for instruments, raw data, and lot information. You can print all resulting calculations on your data sheets and certificates.

The Empirical Table feature enables you to define one-way or two-way empirical tables for use during result data entry. These if/then tables provide an alternate means for testing item conformance. Method maintenance types for calibrated instruments, standard solutions/reagents, and empirical tables prevents un-calibrated instruments from being used, prevents out-of-date standard solutions from being used, and allows for empirically validated test results.

When you select a result with an associated method during Result Entry, the **General Calculation** panel displays so you enter the required input for “keyboard entry” method variables (defined in QMS198). After you enter all required values, the method runs and the calculated results display for your validation.

If you allow Multiple Values for a method variable master, you can call the Multiple Values Entry panel from General Calculations. This allows you to enter an unlimited number of numeric or alpha lines of result data for that particular method variable.

You can display and/or print Method Datasheets to prepare for data-entry or to review entered data. Control the method datasheet format in the Format master (QMS176).

Result entry

Physical samples must be measured for conformance, using one or more tests attached to each sample record generated in a disposition. Result Entry displays all samples and their associated tests. Selecting 11 to enter the results will bring up an entry screen for any test defined for direct entry of results that are numeric or tabular. A test that is both numeric and tabular can capture table results if numeric tests prove unsatisfactory.

This screen represents a data entry worksheet defined by the user in the Method Variables Maintenance program. If the primary method is unavailable, e.g. instrument not available, then the user may switch to the alternate method with action code 12. This action will force the program to now view the worksheet screen for any alternate method defined.

Disposition numbers 3 through 10 are reserved for your ad hoc samples. These special samples (pre-shipment, R&D, or anything appropriate for your data base) can be tested against any specification.

Result copy

QMS supports re-designate transactions in INV500. After an item is redesignated in INV500, you can copy the result in QMS515 attaching all sample and test results to the re-designated item and lot combination. This feature also allows you to update selected result records. You must create a disposition for the new item with the Reopen option (QMS550).

Certificate maintenance

Certificates can be created against any specification. Item, lot, and customer queries can be performed during lot disposition that will compare the actual lot results against customer-specific requirements.

Extended descriptions

Extended descriptions are available for specifications, samples, tests, and instruments. These are separate text files which allow for over 59,000 characters of narrative in support the file to which they are attached.

Translations

Multi-language support for Item and Test information is assigned to a system level program in Multi-Language Support.

Instrument maintenance

Instrument Maintenance supports date and time stamped calibration intervals. You can define major and minor calibration levels for each testing instrument, based on a time and/or usage frequency. Test methods that attempt to use an out-of-calibration instrument will not update test results. Instrument Maintenance also supports date and time stamped standard solutions/reagents.

Lot processing

You can specify tests assigned to work center during result entry. Result entry combines data entry with running a method. If a method is defined in the test master, the method will be run from the same enter action. The method formulas enable you to further standardize your testing results while protecting your data integrity.

Lot disposition

Selecting an customer and item combination with the Customer/Item feature displays a list of customers of this item. Using their specification, the program rates the particular lot against each customer. Results display as passes, fails, waiting results, needs additional test, and waiting verification.

Selecting a item and lot number with the Lot/Item feature displays a list of all lots with quantities available in the system.

Archiving

You can use Archival Selection (SYS905) to archive vital QMS records along with records from the transaction file. A central repository is available for all lot sensitive information. A system level parameter in SYS824 allows you to select archiving at month-end closing. This feature matches QMS records with ITH records in the QLT file for lot controlled items. Archived records remain on-line in an archived log until you physically delete and store them on magnetic media.

Reports

Report ID/Report Name	Access
QMS107 Probation Review Report	QMS06-30
QMS202 Worksheet	QMS06-10
QMS204 Disposition Report	QMS07-17
QMS206 Sample Status Report	QMS06-25
Resample Status Report	QMS06-26
In-Transit Sample Status Report	QMS06-27
QMS208 Sampling Worklist	QMS06-23
QMS210 Inventory Status Report	QMS07-16
QMS216 Inventory Status Change	QMS07-15
QMS222 Clear for Approval Report	QMS07-23
QMS242 Corporate Report	QMS07-21
QMS246 Test Exception Report	QMS06-28
QMS248 Brief Report	QMS06-21
QMS250 Detail Report	QMS06-22

Report ID/Report Name	Access
QMS256 Lot Status Report	QMS06-24
QMS264 Leadtime Analysis	QMS06-29
QMS266 Cost Center Report	QMS07-20
QMS395 QA Trigger Inquiry Report	QMS06-02
QMS525 Automatic Approval Report	QMS07-03
API200 Lot Traceability Report	QMS07-24
API210 Lots by Expiration Date	QMS07-19
API230 Lots by Retest Date	QMS07-18
ACR100 Customer Master	QMS02-04
ACR105 Customer Listing	QMS02-17
CAP130 Department List	QMS04-11
CAP110 Work Center List	QMS04-12
SFC130 Calendar Print	QMS04-13
SYS205 Table Listing	SYS03-10
QMS905 Copy to Archives Selection	SYS03-05
QMS906 Archive Log Inquiry	SYS03-07
QMS907 Delete from Archive	SYS03

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Define, revise, review specifications	QMS115
List specifications	QMS117
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List test masters, relations, descriptions	QMS127
Define, revise, review user/instrument combinations	QMS132
List user/instrument combinations	QMS133
Define, revise, review samples	QMS135
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Report on QA lead time	QMS264
Print hours and batch totals for cost center codes	QMS266
Edit a certificate of analysis	QMS280
Customer candidate search	QMS300
Lot candidate search	QMS320
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Glossary

The following terms are specific to the QMS product:

Ad Hoc Sample
A sample, required for a unique purpose, that is not tied to inventory.

Aliquot
This is the third level of sampling. You take an aliquot from a composite sample. See also primary and composite.

Analysis number
A sequential number that SSA ERP$_{LX}$ automatically assigns to each lot.

Approval
This is the sign-off for methods and specifications. You can use approvals to secure specific tasks to selected users.

Archival
Removing data from the database and storing it in a special archival file so you can retrieve it if needed.

Assignment
A sample attribute that controls whether or not the Assigned to and date fields are required in sample entry. The sample will fail an audit if Assignment is required but not entered.

Audited Disposition
Disposition of a lot/item for which verification is required in the Item Master file.

Automatic Approval
You can designate lot dispositions for automatic approval when they meet conditions that you define in the Item Master and the disposition code table. You define the records that are eligible for automatic approval in the Manufacturer/Item master (QMS105). Process the automatic approvals and print the audit trail with QMS540 (QMS07 menu option 3).

Automatic lot status update
After you process an acceptance disposition, SSA ERP$_{LX}$ automatically updates the Lot Status in INV130 with the status code from disposition table 310.

Automatic sampling
SSA ERP$_{LX}$ streamlines your audit process by automatically adding the sample record when a lot record is triggered for QMS. You activate automatic sampling (using the sample record required field) in the Sample Master (QMS120).

Automatic second disposition
System initiated testing for second disposition activities related to non-essential testing done after acceptance of the lot.

Automatic trigger
Setting the quality action trigger processing flag in the Quality System Parameters (QMS820) will automatically generate QMS disposition records for quality control item receipts processed in CIM600, INV500, JIT500, and PUR550.

Certificate
Generic term for document text formats that you control for specific purposes. You define the certificates within specifications, and then incorporate test results. See Certificate of Analysis.

Certificate of analysis (also CoA)
A document confirming test results that can go to the customer separately or with the invoice or bill of lading. See Format for information about customizing a CoA.

Composite sample
A sample obtained by mixing portions of primary samples taken for quality measurements.

Container
A logical view of a quantity. QMS uses the number of containers to generate samples.

Control limit
A test requirement with tighter boundaries than the specification limits.

Cost center report
You can combine all department or work center costs on this report.

Cyclic testing
Testing performed on a lot frequency and/or a time frequency.

Disposition
A way to subdivide specification requirements into tests that: are required for product release (Disposition 1), can wait until later (Disposition 2), are applied to interval testing (Disposition 99). Disposition is a sample attribute

that controls whether or not the Disposition field is required in sample entry. The sample will fail an audit if Disposition is required but not entered.

Extended Description
Text files that you can use to explain specifications, samples, tests, methods, and instruments.

Firm Date
A code that defines whether the disposition projected date is firmly agreed upon or the default scheduled date.

Footer text
Text defined for a format which prints on the last page of all documents that use that format.

Format
A standardized way of presenting certificates, work lists, and datasheets.

Group
A way of subsetting functions for allocation to users who do not need, or are not eligible to use, the full functionality of QMS.

Header text
Text defined for a format that prints on the first page of all documents that use that format.

Instrument
Any device that collects or records measurements or data for a test. You can periodically verify its accuracy and recalibrate the device.

Instrument center
Type "I" work center used for instrument resources. QMS instrument work centers equate to loading codes defined in SSA ERP_{LX} Capacity Planning (CAP100). For Instrument-type work centers, use codes 1 (machine) and 3 (set up and machine).

Interval
A period of time between tests, used to define test cycles for stability and life testing.

Item class
A logical grouping of items by function, cost, allocations, customers, etc.

Item type
A logical grouping of item by function.

Labor center
Type "L" work center used for labor resources. QMS labor and work centers equate to loading codes defined in SSA ERP_{LX} Capacity Planning (CAP100). For Labor type work centers, use codes 2 (set up), 4 (labor), and 5 (set up and labor).

Language table
A method used to assign different languages to documents.

Log
A sample attribute that controls whether or not the Received by and date fields in the sample entry panel are required. The sample will fail an audit if logging is required but not entered,

Lot
A generic term used for lot control and the quantity of an item under this control, whether you purchased or produced it.

Lot number
A way to identify items manufactured or received at the same time and that share testing characteristics.

Manufacturer
The original manufacturer of an item.

Method
A procedure assigned to tests and used for recording measurements and calculating results. A method can have linked variables, can be associated with a datasheet, and can be restricted.

Method variable
A variable defined in a method that can be attached to a datasheet or certificate to extract and print data.

Open Code
A system code that shows whether a disposition is original (1), retest (2), special testing (3), stability sampling (4), or stability testing (5).

Operand
A number, generic variable, or multiple value variable that works with method variables to calculate test results. Numeric operands can be weight or volume, etc. Generic variables use a wild card (* at the end of the name) to refer to all variables with like names up to, but not including, the asterisk. Multiple value variables have 1 (yes) in the multiple values field. One or two operands are required, depending on the type of operator.

Operator
A mathematical function, stored in Table 200, that uses one or two operands to calculate variables. Examples include add, subtract, multiply, divide, reciprocal, and absolute.

Overflow text
Text defined for a format that prints at the top of each page following the first page of all documents that use that format.

Quantitative test
A measurement that results in a numerical value (weight, length, width, etc.) of the item's features.

Pack description
A definition of the packaging for a finished item used in Certificates of Analysis and regulatory reporting.

Primary sample
A sample taken directly from a lot or container that can be tested or combined into a composite sample.

Probationary testing
A user-definable level of criticality applied to manufacturers with poor quality performance.

Reject Disposal
A client designed table of codes that represent the means of disposal for material that does not conform to specifications.

Resample
The process of taking additional samples for product acceptance.

Result
A system-calculated value that determines the pass/fail of a test, based on single or multiple readings and the defined acceptance range or allowable variance percentage.

Results entry
Data entry of test results on a lot basis.

Retest

- A test repeated when a lot fails acceptance testing (Disposition 1)
- A test conducted to repass a lot and extend its expiration date for remaining inventory. You must trigger the retest in manual entry (QMS500) using an unassigned special disposition code from 11-98. If testing is successful, enter the new expiration date in the lot record in Lot

Master Maintenance (INV130). Following that, you can enter a new retest date if you need to repeat the retesting cycle.

Sample
Product or substance used in testing can be primary, a composite of the primary, or aliquots made up of one or more composites.

Sample Disposition
The default assumption for disposal of samples is that they are returned to stock with the lot from which they were taken. In those cases where this assumption does not apply, the sample itself must be treated as a part of a lot and separately processed to dispose of it.

Sample function
The formula selected in a sampling rule that is used to compute the number of containers to sample (1=all, 2=square root, 3=factor, 4=constant, 5=table, 6=multiply).

Sample type
A client-definable code used as a quick reference for sample definitions (analytical, physical, etc.).

Sampling method
A client-definable code used as a quick reference for the quantity of samples and method of sampling. For example, H could mean 100% sampling of a lot.

Second disposition
See Dispositions.

Specification
The header for test plans defining the samples, tests, and levels of testing in specific situations for any Manufacturer/Item relationship. Each specification applies to only one test object from a test plan.

Specification change control
The review of a disposition when its specification changes and further processing is prohibited until all mandatory adjustments to paperwork are made.

Specification limit
Extremes within which a test result can vary and still be acceptable.

Stability sampling
Sampling of perishable items/lots during the item's shelf life.

Stability testing
Testing performed on perishable items/lots during the item's shelf life. Stability testing specifications, methods, sampling rules, etc. can be separate

from acceptance and process control testing. Available only if LMS is installed.

Supersede
A maintenance option that allows you to replace an obsolete specification or method with a copy that you can modify for future use. The status of the superseded record is set to 1.

SuperSpec
A specification master shipped with the system. All tests and samples must reside in SuperSpec before you can use them in an item's specification. Note that you can change this name in SYS100.

Status
The condition of a sample, result, item, lot, or test.

Test
The procedure performed on a request substance, consisting of a definition and results. Test can be grouped together on test plans and specifications.

Test level
A code that identifies testing required for the same item from different manufacturers or intended for different markets. For example, testing level 1 could mean reduced testing, 2 normal testing, 3 tightened testing, etc.

Test results entry
See Result Entry.

Test status
The condition of a test based on its result values (pass, fail, pending, error). A test can have multiple results, but all results must pass for the test to pass.

Turnaround number
Sequential numbers that SSA ERP_{LX} assigns to each sample taken.

Verification
The process of proving that a sample was taken, an item processed, or a result was made properly.

Work center
A grouping of laboratory instruments or labor resources for planning and costing.

Worksheet
A user selection of tests to be completed at the same time or at the same work center.

Notes

Chapter 11
Shop Floor Control

11

This chapter provides a high-level overview of Shop Floor Control.The chapter consists of the following topics:

Overview

The Shop Floor Control product provides production management with accurate, timely, and concise information on production activity and status. Use this product for detailed planning and scheduling and for highlighting shop floor problems as they occur. The Shop Floor Control program provides management with logistical control over material, scheduling, capacity, and efficiency functions.

SSA ERP$_{LX}$ includes full support for dates up to and beyond the year 2000. Although most date fields display as 6 characters, SSA ERP$_{LX}$ records the date as 8 characters. Refer to Company Name and Date Format (SYS820) in the System Parameters Generation program (SYS800) for information on configuring Century Dating and entering dates beyond 1999.

The following is a brief description of the main programs in SFC.

You enter (and maintain) shop orders using SFC500 Shop Order Entry Maintenance. These orders use the standard bill of material (BOM) as the base list of components. You can also set up standard routings, which list the operations (work steps) involved in manufacturing.

To release shop orders, you use the Shop Order Release program (SFC505). SSA ERP$_{LX}$ groups them by user ID for batch processing. Only orders you requested to print will actually print, using Shop Packet Print (SFC520).

SFC530 allows you to create multi-level shop orders to link shop orders together with a common end item parent. Linking multiple shop orders together for a final assembly product provides support for make-to-order and engineer-to-order manufacturing environments which need to schedule these multiple orders together or as a vertical slice in the production schedule.

Once they have printed, you can still make changes to shop orders using Shop Order Entry/Maintenance (SFC500). Changes are immediately visible on the inquiry panels (SFC300 and 350). If you need to reprint the shop packet, you can, using Reprint Shop Packet (SFC560).

Once the components have been picked, you record the inventory transactions using Inventory Transactions (INV500). The Shop Floor Posting (SFC600) program is how you enter labor tickets to record work. When the item is complete, you use Inventory Transactions (INV500) to receive it into stock.

Several reports and inquiries are available through the Reports and Inquiries menu (SFC01). These programs are numbered in the 200s and 300s, such as Shop Order Inquiry (SFC300) and Open Orders by Order Number (SFC210).

System highlights

- Detail open shop order inquiry by item number, order number, or transaction detail
- On-line modification of components OR operations required for an order during order release
- Ability to copy BOM from another item, another facility/item combination or another facility/item/method code combination
- Ability to copy routing from another item, another facility/item combination or another facility/item/method code combination
- Ability to tie material components to operations for picking components by current operation
- Picking lists and shop packets printed
- Backward scheduling of operations from shop order due date or forward scheduling from release date
- Schedule dates for material issues from stock
- Shortage list by component or by order
- Releasable orders inquiry for material and capacity
- On-line labor posting and shop order release
- Create and release multi-level shop orders
- Multiple print of labor tickets depending on the length of order (optional)
- Supports setup, run, machine, indirect, and downtime hours
- Work center loads by setup, run, machine hours, crew size, or any combination
- Machine file
- Work center and tooling where used
- Employee and work center efficiencies
- Shop calendar by work center
- Department and work center summaries
- Automatic close of operations

- Implied moves
- Alternate routings and additional routing description
- Routing copy and maintenance on-line (same as except)
- Detail allocation of components at the location/lot level at picking time
- On-line manual component allocation supported
- Downtime and reject reports with reason codes
- Allocate future production of lots to higher level shop or customer orders

Suggested implementation plan

1. Read documentation. Read specifically the Inventory and Manufacturing Data Management overviews, as well as this overview.

2. Review Existing System. Review your existing shop floor system. Consider the following:

    - Source documents - What is evidence of a shop order? Is the amount of information collected enough? Are process sheets and component lists accurate?
    - Work flow - Where do jobs originate, and how do they travel through the shop? What is the timing involved? For instance, how are jobs tracked through the shop, and how is work recorded? Where are the bottlenecks? Which work centers are the most heavily loaded? What are the critical centers? How is material drawn from store, and what shortages arise? How do you know when to start a job, and how does a rush job affect other work in progress?
    - Stationery - What forms are used for tracking work and issuing or receiving stock? Are design changes necessary?

3. Requirements Review:

    Total current and projected volume of traffic - How many orders are processed daily and monthly? Include an estimate for backlogs. How many work centers do you have? How many items do you make? How many components per item, and how many operations per item? How many employees?

    - Procedures and forms - consider any changes to shop procedures or forms.
    - Work Centers - Define work centers and hours accumulation methods - whether machine hours, run hours, setup hours or some combination of each should be reported.
    - Employees (not necessarily persons) - assign rates for each.
    - Shop calendar - If you want the scheduling calculations to include non-working days, decide on these days for the current year. Include planned shutdowns for plant maintenance.

4. Routings. Review operations and manufacturing methods. "Deluxe" models or "one-off" variations can be handled at data entry time. Set up realistic expected hours, and allow for jobs moving between work centers or queuing

up for operations. Decide whether the expected hours for each operation are to be hours per piece or a multiple of pieces, hours per standard batch size, cost per piece (outside work) or pieces per hour.

- Shop Order numbers - SSA ERP_{LX} maintains shop order numbers, but you can supply a starting number (See System Parameters section).

Reporting requirements and timing - This will depend upon the flow of work, and the way material is handled. Various shop order, material shortage, scheduling reports, work center and employee efficiency reports are available.

5 Resource Review. Review the staff and time available for implementation. Consider the activities in this list, in addition to normal business operations.

6 Implementation Timetable. Schedule the implementation activities in your calendar to provide a realistic go live date.

7 System Definition. If Shop Floor Control is not be installed as an active product in your system, it can be activated now (see SYS800-Parameters Maintenance).

8 Inventory and Mfg. Data Management Products. Install first.

9 Office and Shop Integration. Define new system procedures and communicate them to users. System education should begin early if changes to the work flow pattern are made.

10 Operator Training. Operators should be familiar with Inventory and Manufacturing Data Management processing.

11 Master File Data Loading. An accurate routings list is essential to shop floor control and requirements planning. It must reflect the way product manufacturing is actually scheduled, and should be changed if necessary to represent actual practice. The system makes it easy to copy whole structures and make minor changes (for example - An item is the same as item xxx, except for an extra operation, nnn, and a skipped operation mmm). Employees have to be coded, loaded and checked. The shop calendar needs to be specified for the year. Before going live, load shop orders for all work in progress. Review current work, specify work performed, and estimate future work.

12 Parallel Running. True parallel running may be difficult in a production environment. Run samples and dummy shop orders before going live. If you have more than one facility, implement the system one facility at a time.

13 System Review. Review system and implement requests for changes.

Prerequisites

Inventory transactions

Define Inventory transactions for issuing components to the shop and receiving finished items. Examples of transactions are in the Inventory Guide.

Transaction type I- single issue to shop order.

This transaction is used to issue one component at a time. Use this particularly for high-value items which have been marked on the Item Master file as "Must single issue."

Transaction type M - multiple issue to shop order.

This transaction is used to issue all the components as listed in the Shop Order, in one transaction. Note that "must single issue" items are NOT issued by this transaction.

Transaction type S - receipt from shop.

This transaction is used to receive the finished item into stock and update the shop order accordingly.

You may want some other types of inventory transaction -- read the examples carefully.

The Shop Order Lot/Location Allocation program is an alternative to using the above Inventory transactions. Use this when the item is finished, and you want to review exactly what was used to make it. You can review the components as allocated, make any changes, and finally accept the finished order.

There are no other prerequisites, if all the files have been correctly set up. Test your shop order processing carefully before you run live. Setup errors may cause production problems.

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Function	Program
Shop order detail and status	SFC300
Multi-level shop order inquiry	SFC330
Display capacity availability	SFC350
Material availability	SFC350
Release shop orders	SFC500
Define operations to existing shop orders	SFC500
Material allocations to existing shop orders	SFC500
Operation dates or work remaining or existing shop orders	SFC500
Operations from existing work orders	SFC500
Shop orders	SFC500
Shop orders dates or work remaining	SFC500
Shop order material allocations	SFC500
Shop order quantities	SFC500
Multi-level shop order release	SFC530
Released planned orders	SFC550
Reprint shop packets	SFC560
Post labor tickets	SFC600
Shop Order Labor Posting	SFC650
Add detail location/lot allocations	SFC720
Delete detail location/lot allocations	SFC720
Detail location/lot allocations	SFC720
Purge deleted shop orders	SFC900
Backup labor tickets	SFC905

Note: SFC700 is called from SFC723, lot/location pre-allocation, and SFC722, lot/location allocation/inquiry.

System functions

Shop calendar

A detail shop calendar is available, which specifies the capacity for each day and for any work center (or all work centers). Shutdowns, holidays, and double shifts, are all indicated using the calendar. Shop floor scheduling uses the shop calendar whenever encountering a work center that is coded to use it. This includes calculation of operation start and end dates and material need dates. Global, facility and work center-specific calendars may be defined.

Work centers

Each work center may have a different loading code indicating how the total backlog and scheduled work at the work center should be measured. Loading options include: run hours, run plus setup hours, machine hours, machine plus setup hours, and no loading. Each work center also has an assigned method for standard and actual overhead costing with assigned rates/percentages for each. A standard labor cost is also available (see Cost Accounting for details). Each work center may or may not be coded to use the shop calendar when scheduling work. For details, see Manufacturing Data Management (MDM), shifts, machines, 'to'-location.

Routings

The routing function allows for active operations, alternate operations, and additional descriptive operations. Each routing step contains the operation number, the operation description, the standard run, setup, and machine hours, and the basis code for interpreting those hours. It also contains standard move and queue times, the number of operators and the tooling (or a comment).

You can set up the routings so you can backflush them. You can backflush from the warehouse and location.

Standard costs for labor and overhead may be created automatically from routing data using the cost accounting CST600, load standards from routings.

Shop order release

Shop orders are released by specifying the item to be made, the required quantity, the scheduled completion date, and the manufacturing warehouse. Optionally, each shop order may be tied directly to a customer order. The system copies the standard bill of material and routing for the manufactured item and allows these to be modified on-line as the order is being released. The standard bill of material and routing can be overridden by facility, item or method code to vary materials and operations based on staffing (method code) or different materials (facility). The shop packet is printed for an entire batch of released orders. The shop packet consists of a process sheet (with any modifications), a picking slip (with any modifications) and labor tickets.

Planned shop orders from the MRP system may be released by selection through the planned order release program in MRP (MRP540). This allows for changes in the planned orders dates and quantities and the deletion of planned orders (with or without creating a shop order). Note that MRP must be installed for this function. The planned shop order release functions are on menu MRP. Shop orders can also be released from Finite Forward Scheduling (MRP640).

Final assembly orders from the customer order entry system may be released through Final Assembly Release (FAS500) and Final Assembly Shop Order Print (FAS510) on the MPS menu. Note that Order Entry and Master Scheduling must be installed for this function.

Shop packets may be reprinted at any time with the current shop order information.

Batch shop orders

The system will allow for the release of orders by material batches. For this mode of processing, the system interprets the quantity input as the number of material batches and extends it by the batch size for the order.

Lot allocations

Specific lots may be allocated manually to orders either before or after printing the shop packet. Allocation occurs at the expiration date, and then the lot number.

Backward scheduling

Operations are automatically backward scheduled at shop order release time. The backward scheduling algorithm starts with the shop order due date and schedules each operation based upon the standard move and queue times in the routings and the number of days the job is expected to run at standard. The system calculates and stores the operation scheduled start date. The dates may be modified by the shop order maintenance program. The number of days that a job is expected to run an operation is dependent upon the available capacity for that work center and the total hours scheduled for that operation.

The backward scheduling algorithm also considers the shop calendar for weekends, shutdown, holidays, and partial days.

Backward scheduling process

The algorithm starts with the due date of the shop order or planned order. Then for each operation in reverse sequence, the following calculations are made:

- The number of move days is subtracted from the due date (or initial date of the previous operation) to get the due date for this operation. The move days are only used on valid shop calendar days.
- The number of clock hours for the operation is calculated as:

```
standard run or machine hrs / # operators + setup hours
```

The number of clock hours is spread over the available daily capacity of the work center for those given days. The daily capacity of the work center is calculated as:

```
# shifts * hours per shift * average efficiency / 100
```

- Each day is checked against the shop calendar; the calculation will bypass inactive days or adjust for any changes in the work center capacity for that day.

Queue time days are subtracted in the same manner as move time days. The resulting date is the operation start date.

The algorithm then goes to the previous operation. When all operations have been included, the resulting date is the scheduled start date the shop order. Note that MRP uses the item lead time to determine material requirement dates on planned orders.

Remarks

- A Shop order is considered due at the end of the day of the due date of the shop order.
- The operation end date is the date that machine time, run time, and setup time are complete; not the date that move time is complete.

Negative move and queue times are supported. This function can be used to construct overlapping or concurrent operations (see examples). Negative queue and move times support up to 100% overlap.

- If an operation is scheduled to end at the end of a work day, the next operation will be scheduled to start at the beginning of the next shop calendar work day.
- Setup time is considered to take place only at the beginning of an operation and is not distributed.

Backward scheduling is supported in all shop order release programs (SFC500, SFC550, and FAS510). Backward scheduling is recalculated if a shop order is maintained through SFC500 when the due date or the required quantity is changed; however, you cannot enter move and queue times through the maintenance program when adding an operation to the shop order.

- Items that have co-products in their Bill of Material have their routing merged into the shop orders routing.

In the following illustrations, hypothetical shop order schedules are charted across a nine-day span. Order schedule begins at the due date and is backward-scheduled to the start of the first operation. The arrows indicate the direction in time that the scheduling is performed (which may be forward or backward for move and queue times).

Arrows also indicate the relative position in time that the schedule is placed. For simplicity, operation times (which are shown as R/M/S for Run / Machine / Setup) are grouped together and translated to days instead of hours.

Note: The standard backward-scheduling application will start from the end of the due date and calculate the operations starting with the last operation number from the item routing.

Move and queue times can be added to the life span of a shop order, not only in terms of labor activity, but the real time required to produce the product. Move time at the end of the last operation may be used to schedule shop orders when final quality control activities must be accounted for but are not considered directly a part of shop floor production. Note that queue time appears within the operation and the move time appears outside of the operation.

Negative move time and negative queue time reduce cumulative lead time by overlapping operations. Overlapping is accomplished by forwarding a partial amount of a shop order to the next operation while the balance of the order is being run at the previous operation. In other words, the output of one operation feeds the next while the first operation is still running. The shop packet process sheets will print the correct start time for the operations.

Note: When setting up concurrent operations by using negative move times, an operation with a negative move time will not have a completion date prior to the previous operation's completion date.

SSA ERP$_{LX}$ places no restrictions on use of negative move times. A negative move time on the last operation of an order is allowed but will cause an order to be completed after it is due. This may be useful if the terminating operation(s) of a shop order involve post-operation tearing down of equipment, clean-up or by-product recovery after the item is complete. Do not allow receipt of finished material to close the order before labor for the final operation is complete.

Negative queue times

Unlike negative move time, negative queue time directly affects the time span of an operation rather than repositioning the operation. Defining either a positive or negative value to the queue time of an operation will either add to or subtract from the calculated start date of an operation.

Positive queue times will cause the start date of an operation to be set earlier. Materials required for the operation will be scheduled to coincide with the start of the queue time.

Negative queue times will cause the start date of an operation to be artificially advanced. This feature may be used to schedule material for an operation to coincide with the actual beginning of run-time if the setup of an operation is so involved as to make the issue of materials premature during setup. The negative queue time would need to be compensated by additional move time in the previous operation to keep the scheduling logic intact.

Labor ticket posting

Hours are posted and edited on-line. Possible types of hours entry are run hours, setup hours, machine hours, and indirect labor hours. Each of these hours requires different information. Run, setup, and machine hours require a shop order and an operation. Run and setup require an employee/clock number. Production standards are calculated at entry time and stored in the labor ticket posting file along with the actual hours and pieces and the actual and standard costs.

Any labor ticket in a batch may be changed or deleted before posting, or the entire batch may be deleted before posting. An optional employee edit list allows hours to be reconciled by employee before updating the shop order status.

When the shop order status is updated, the hours entry is posted to the labor ticket history file where it can be used for efficiency and cost analysis. In addition, the operation and shop status are updated with the standard hours. If the production quantity is greater than or equal to the required quantity at that operation, the system tags the operation closed. Simultaneously, the shop order labor and overhead costs are updated.

SFC650 allows you to backflush both labor and material. For material backflushing to occur, you must link material to a routing operation in BOM500.

Inquiries

The shop order inquiry will display all shop orders which affect a given item (either as allocations or orders) and then allow access to the desired order detail. Alternatively, the detail may be displayed directly if the shop order number is known. The detail panels display the status and progress of all operations and also display the material component status on the order.

A Material/Capacity Availability inquiry checks the availability of material and capacity. For any given item and quantity, it displays an exploded bill of

material which indicates which items may be short, considering current inventory balances and allocations. The inquiry also displays the required operations and work centers and the current and total backlogs at those work centers.

Scheduling/dispatch report

Work center scheduling and dispatch reports are available based on operation dates. There is also an additional priority field which can be used to mark shop orders. The scheduling report indicates orders in process, waiting, or scheduled yet to come to the work center.

Shortages

Shortage reports are available which indicate material shortages by either component item number or shop order number. Allocation detail is also available on-line with scheduled receipts.

System flow

The Shop Floor Control product allows you to plan, trace and control the production process.

The Inventory Master file holds details of all manufactured items. The Bill of Material shows the content of all finished items, lists the component items and how much of each component is required. A Shop Order (instruction to manufacture) is released in Shop Floor Control. Enter the item to be made, the quantity required, the scheduled completion date, and the manufacturing warehouse. If the item is to be made specially to customer order, you may input the Customer Order Number. The system will copy the standard Bill of Material for the item, and let you make any changes (substitute a component or make quantity changes). You can also add components if the finished item varies from the standard. The system checks whether stock is available to manufacture the item, and will mark any shortages. You then print a shop packet which contains the shop picking slip or list of components needed from the warehouse.

Once the components have been picked, you enter Inventory Issue to Shop transactions for what was actually taken from stock. This can be done with one Multiple-Issue transaction. For examples, see Inventory Transaction Type "M" for multiple-issue, type "I" for single issues, in the Inventory guide.

When the item is finished, you receive it into stock with another Inventory transaction, the Receipt From Shop. See Transaction Type "R" in the Inventory Operator Run Instructions.

You need to specify the work to be done to make an item, not just the materials involved. The factory floor is divided into departments and within each department are work centers. A work center is a logical unit (a particular machine or a particular job like quality inspection). You accumulate the hours worked at any work center, on a basis of machine run-time, total hours spent on a job by staff, set up and clean-up hours, or some combination.

The Routing Master file holds the operations (work steps) needed to make each finished item. Each operation takes place at a work center, and is expected to require predetermined standard hours based on pieces per hour, hours per multiple pieces, hours per standard batch size, or costs (for outside work). You can allow for queuing time and move time between work centers. The system then has a complete description of the manufacturing process.

When you release a shop order, the system copies the standard routing for the item and method code. If the facility and/or method code is blank, the

system uses global routing for the operations. You can change operations in the same way as materials (adding an extra feature to the final product). The shop packet contains the shop picking slip, a process sheet - which can be used in the factory to direct the flow of work, and labor tickets on which the actual hours worked can be reported. These hours are entered to the system so that actual production time and progress can be compared with what was expected. A variety of reports list the results.

Scheduling is done automatically, based on the date the finished item is required, allowing for the expected time required for each operation. You may indicate a start date instead, and the system will forward schedule to a completion date. The anticipated time is converted into days, producing a start date for the given shop order. You can specify the number of hours per day worked at any work center. There is a shop calendar on which you specify holidays, weekends and any other non-working days, and the system will allow for these when calculating schedules.

A shop order is complete when the item is finished and all labor tickets have been entered. You then receive the finished item into stock with an Inventory Receipt from Shop transaction, which also allows you to close the shop order. Closed shop orders are purged later, during the end-of-month Shop Order Close (SFC900).

Daily procedures

- Shop Orders: Program SFC500 Shop Order Entry/Maintenance. Entering or maintaining shop orders. The system creates a workflow for the work station and the whole session is placed on the workfile until shop packets are printed.
- Releasing Shop Orders: Program SFC505D1 Order Release. Shop Orders are grouped for batch processing by User ID. From this list panel, the system selects all shop orders to be processed as a batch for the current User ID.
- Printing Shop Packets: Program SFC520B1 Shop Order Print. Only Shop Orders selected by the User ID requesting the print process will produce shop packets. During the print process, the system updates the inventory files for the quantity allocated to shop orders information, and the system automatically allocates lots if any component is subject to lot control.
- Shop Packet Changes: Program SFC500D1 Shop Order Entry/Maintenance. Once shop packets have been printed, you may still make changes, using Shop Order (optional) Maintenance. It does NOT change lot allocations. Use Reprint Shop Packets to complete the update.

- Reprint Shop Packet: Program SFC560B1 Reprint Shop Packet. If you made changes, you may reprint (optional) Shop Packets for the amended orders. Reprinting changes lot allocations if the shop order has been maintained since printing.
- Inventory Issues: Program INV500 Inventory Transactions. When components have been picked according to the shop picking slips, inventory issue transactions must be entered. Use ONE of the following methods:
  - A Multiple-Issue (type "M") transaction, if the components have been picked as printed and none are special "must single-issue" component.
  - Several Single-Issue (type "I") transactions to issue the components singularly. Use this when the Multiple-Issue does not apply; either because the warehouse could not supply what was on the picking slip, or because some components are special.
- Entry of Labor Time: Program SFC600 Shop Floor Posting. Entering the labor tickets to record work activity. The system creates a workfile for workstation, and the whole session is placed on the workfile until the shop update register is printed.
- Inventory Receipts: Program INV500 Inventory Transactions. When the finished item is complete, receive it into stock. Use a Shop Order Receipt (type "R"). This updates the inventory files and allows you to mark the shop order as closed.
- Reports and Inquiries (as required): Program SFC2XX, SFC3XX Reports and Inquiries.

Period-end

Run reports and Inquiries as required.

- Post to Costing: Program CST900: Post Shop Orders to Costing. If you are using the Cost Accounting product, remember to Post Shop Orders to Costing.
- Purge Closed Orders: ProgramSFC900: Shop Order Closeout. Run this to remove completed and closed shop orders from the file.
- Save Labor Tickets: ProgramSFC905__Save Labor Tickets. This saves labor tickets from the system on tape or diskette.

Glossary

Shop Order

An order to the factory to begin the manufacture of a given item. It specifies the item to be made, the quantity required, the scheduled completion date, and it can be linked to a customer order. The shop order lists the:

- component items in the quantities required
- work to be done as a set of operations
- expected time for the operations

The system uses this information to calculate a scheduled starting date for the job.

Shop Packet

- A set of documents printed for a shop order consisting of:
- Shop picking slip (list of components to be taken from the warehouse)
- Process sheet (list of work to be done)
- Labor tickets (for recording the work performed in each operation)

Operation

A single work step (cutting out)

Work Center

A specific machine (drill press) or a function (quality inspection). Standard hours are interpreted according to work center. (whether to use machine hours, setup hours, run hours, or some combination). Work centers are facility-specific and each work center code must be unique.

Department

Work centers may be grouped into logical units as departments for reporting purposes.

Routing

The list of operations needed to complete a given item. Standard routings are held on file and automatically copied when a shop order is entered. You can make changes allowing for variations on the basic finished item (extras and features).

Phantom Item

An item that is not stocked or sold but is used to represent a collection of parts regularly used in the manufacture of more than one assembly. You may include a phantom in the bill of materials for a parent item. When the shop order is entered, the phantom can be exploded to show the individual parts in the collection. If one of the parts is also a phantom, it will also be exploded. The shop picking list will show actual parts to be drawn from stock. Phantom items are Item Type 0 in the Item Master file. If there is on-hand inventory for the phantom item, the phantom will show when the shop order is entered.

Standard Hours

The hours an operation is expected to take, in terms of hours per piece, hours per standard batch, cost per piece, pieces per hour, or hours per some multiple of pieces. Standard hour values are used in capacity and scheduling calculations.

Labor Tickets

Records of actual work performed. You enter labor ticket values to update hours, costs, quantity finished and operations completed. Labor tickets are used to monitor all work-in-progress and work center loading.

Employee
A person, crew, clock number, code for outside work, or a code used for entering actual costs rather than hours.

Standard Costs

Depend upon the standard cost fields in the work center file. (See the Costing guide.)

Actual Costs

Calculated from actual material purchasing costs and actual hours/costs from the labor tickets. Actual hours can be interpreted in various ways, depending on the work center costing codes (see Costing guides).

Shop Calendar
A file holding all non-standard working days, weekends, holidays, planned shutdown, and overtime days.

Scheduling calculations will use the shop calendar and not plan work for those days. Individual work centers can be marked to take notice of the calendar. Global, facility and work center-specific calendars may be defined.