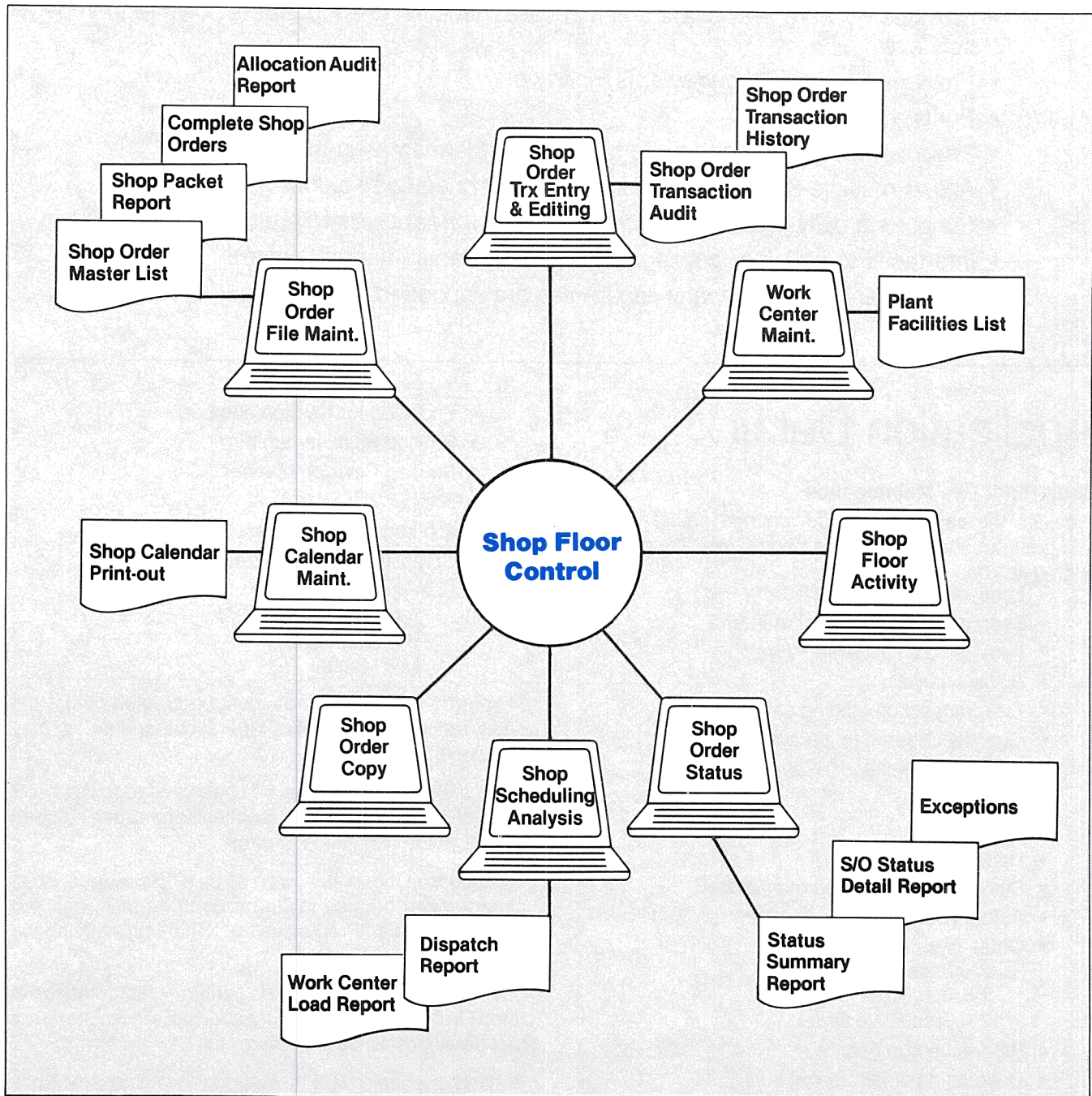


# SHOP FLOOR CONTROL

with Capacity Requirements Planning  
in DIBOL<sup>®</sup> for DEC<sup>®</sup> PDP<sup>®</sup>-11s



# Application Overview

This stand alone application is a comprehensive and practical Shop Floor tool used for the creation and monitoring of shop orders and related shop floor activity. It has the following capabilities:

- Interactive entry and editing of shop orders.
- Supports “Shop Bills” and “Shop Routings.”
- Provides operation level controls.
- Records scrap and rejects.
- Accommodates shop notes.
- Records and accumulates actual material used and labor hours expended.
- Provides Forward, Backward and Manual scheduling of shop orders down to the operation level.
- Provides *Capacity Requirements Planning*.
- Prints a dispatch list.
- Provides exception reporting to highlight problem areas in the shop.
- Allows multiple Shop Orders to be directly connected to a Job.
- Supports a daily calendar in Month-Day-Year format cross-referenced to shop days.
- Interfaces to six other packages in MCBA's Manufacturing System.
- Security and multi-company capabilities are supported.

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## Application Detail

### Shop Floor File Maintenance

Provides the capability to add, change/inquire, delete and print out shop orders. The Shop Order file contains such fields as:

- Location of shop order (plant)
- Shop order number (9 characters)
- Item being built (parent item)
- Buyer/Analyst
- Last transaction posting date
- Quantity Ordered (of parent)
- Quantity Completed (of parent)
- Start date
- Due date
- Unit of measure
- Standard accumulated man-hours
- Actual accumulated man-hours
- Order Type
  - B = Base Order
  - T = Trial Order
  - P = Productive Order
- Reference number
- Description of item being built
- Engineering Release number

- Engineering Revision number
- Routing Release number
- Routing Revision number
- Job number
- Job sequence number
- Completion date
- Scheduling method
  - F = Forward
  - B = Backward
  - M = Manual

Shop order header records must be created before the detail records, i.e. material, operations and notes, may be added.

Once a shop order header has been added to the file, a copy of it (with a different location/shop order number) can be made with minimal effort.

This option is most often used when a “Base Order” has already been created for the item to be built, and you wish to create a “Productive” or “Trial” order using the Base Order as a model.

Change and Delete function is generally restricted to the Shop Order header records for shop orders that have not had detail posted against them.

Printing of shop orders is straightforward, and includes several powerful run-time options. For example, the user

## Shop Scheduling Analysis

SFC provides the user with various ways to perform detailed scheduling.

*Change Operation Schedule*—allows the user to manually change the start/due date or priority of any operation. It is also used to review operation dates set by automatic scheduling.

SFC supports three scheduling methods at the shop order level:

M—Manually scheduled. The user must maintain all scheduled dates for the shop order.

B—Backward scheduled. The user provides the due date of the shop order and the *Work Center Load Calculation* application schedules all operation and material dates by backing off from this date.

F—Forward scheduled. The user provides the start date of the shop order and the *Work Center Load Distribution* application schedules all operation and material dates by moving forward from this date.

Note—Scheduling method **B** or **F** may be used to set original schedule dates and then the user may switch to method **M** to lock in these dates, so that they would not be rescheduled in a later W/C load calculation.

*Change Job/Shop Order Schedule*—allows the user to change the schedule for all operations and materials within a shop order or group of shop orders making up a job. This is done by moving all detail dates within a shop order (or Job) forward or backward by a specified number of days (Note: A Job may be made up of one or more shop orders and requires that MCBA's Job Costing be installed.)

This option also allows the user to change the order quantity of a shop order and have that change reflected in its operations and materials; or to change the quantity ordered for a job and have this reflected in all related shop orders. This procedure can be applied to any shop order, even those that are released and active.

*Print Dispatch List*—The Dispatch List and the Shop Packet Report together provide the basic shop paperwork needed at most facilities. The Shop Packet report shows all the operations and materials required to manufacture the product. It is printed at order release time and stays with the product as it travels through the shop. However, it does not include the schedule dates of the shop order or the operations since these often change several times between order release and order completion. The Dispatch List includes schedule dates and is used to show the operations to be performed in each Department/Work Center in prioritized sequence. The sequence of the report, within Department/Work Center is:

- Due Date (what is due to finish first)
- Start Date (what needs to be started first)
- Priority (user-entered tie-breaker)

This Dispatch list is sent to each work center and gives the foreman a detailed schedule of what shop orders to work on for the day or for the week, etc.

## Capacity Requirements Planning

*Work Center Load Calculation*—This is also referred to as Capacity Requirements Planning and is normally run weekly in order to:

- determine the capacity available at each work center
- based on the capacity, determine the time required to perform each operation in released, trial, and productive shop orders
- copy each operation record into a *what if* file, providing the user with the capability to analyze the calculated loads and dates without affecting the present schedule

*Work Center Load Reporting*—This application inspects the results of the *Work Center Load Calculation* and provides a summary or detail report of the projected load on each work center within the department. This report uses the *what if* file created in the *Work Center Load Calculation*, not the actual shop order files. Therefore, the report shows what the load *will be* if the user accepts the results.

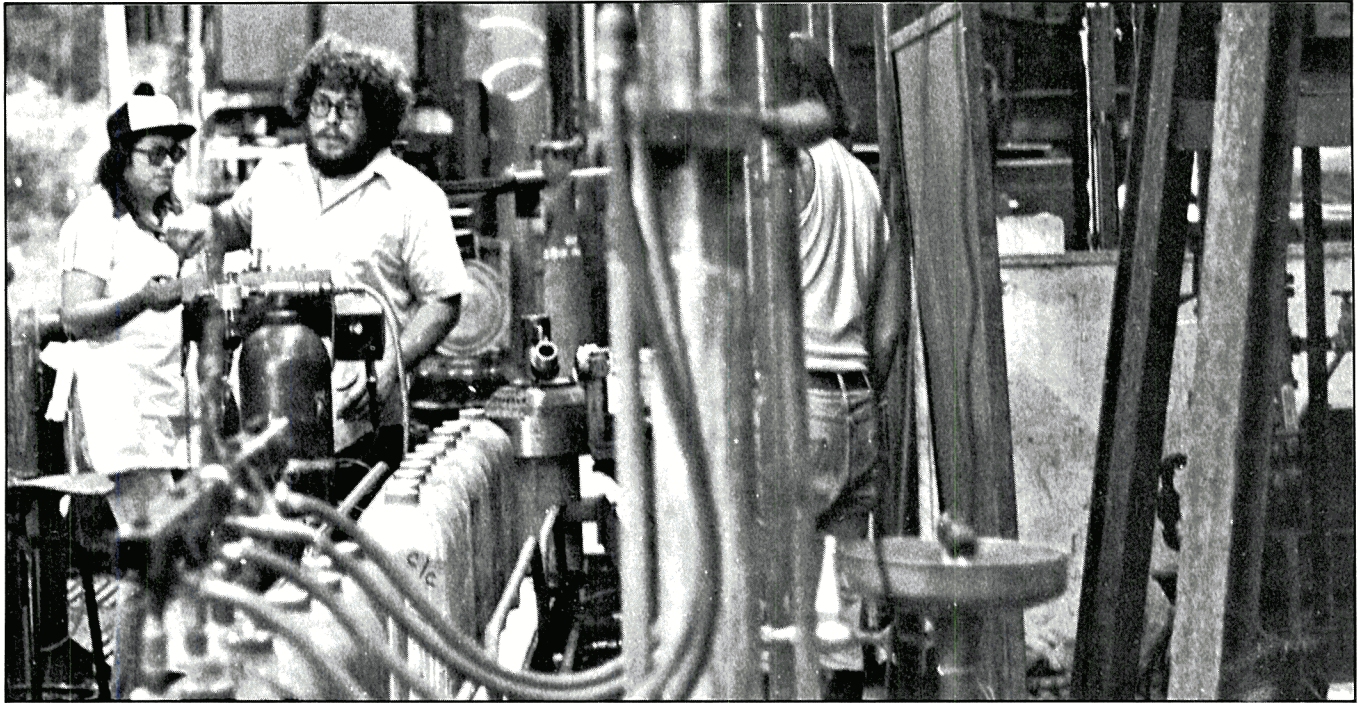
The suggested approach to using these reports is:

- a) Run a Summary report for all time periods for all Shop Orders. Note any departments and work centers that are near or above capacity in either man-hours or machine-hours.
- b) Use the Detail report to locate specific departments and work centers that have capacity problems. Several types of reports are available:
  - by time period to isolate the period having the capacity problem. This allows the user to analyze the effect of shifting the load forward or backward in time in order to level the load.
  - separate reports for released and unreleased shop orders. Typically, unreleased shop orders can be shifted forward or backward in the schedule with much less concern than released shop orders can.
  - separate reports for trial orders and productive orders.

If there are few or no capacity problems, you may accept the projected schedule by running the *Post Calculated Dates* option. (Many new users of SFC always accept the entire new schedule without change, since the benefits associated with working to an up-to-date and easily re-creatable schedule far exceed any problems associated with capacity.)

If capacity problems are severe, the user would consider some of the following alternatives:

- General overtime—everyone works beyond normal hours.
- Specific overtime—only work extra hours in bottleneck work centers.



- efficiency factor
- setup class code
- work center load code

The work center file represents the production facility and its capacities. In normal situations, the W/C record can be created for each unique combination of location/department/workcenter. The machine number is not part of the key to the W/C file, but if the user wants detailed information and work-load reports (capacity requirements) at the machine level he can code each machine with a unique W/C number.

### Shop Floor Activity Reporting

SFC provides the capability to record the labor and materials actually used in working on a shop order. Data collection from the shop floor is usually done by one of the following four methods:

- 1) Hardware device—these generally take the form of some type of input terminal on the shop floor, for example, a badge reader. This would be a customized approach and is not covered here.
- 2) Normal CRT terminal on the shop floor—the user can train all shop personnel to use the screen displays or train only a few *authorized* shop personnel, for example, timekeepers, stock room attendants, etc., who are then responsible for entering shop activity data.
- 3) Collection of data via Labor Tickets and Material Requisitions (manually)—the office personnel then enter this data at a later time. This approach is used in many smaller installations.
- 4) Automatic (assumed) reporting—this approach is often used when absolute accuracy is not re-

quired and the user does not want to enter a lot of shop activity. It is most often used for material transactions. At a user-designated point (usually the first operation) SFC takes the quantity completed, assumes that the components used were exactly those specified in the shop order, and generates the material transactions necessary to relieve inventory. This provides timely relief of on-hand inventory without having to enter a lot of data.

SFC separately tracks Quantity Rejected and Quantity Scrapped. Component substitution is also allowed.

### Shop Floor Status

SFC provides the user with a variety of status reports regarding shop orders.

Prints the *Shop Order Status Summary*—a listing of the important scheduling fields from the Shop Order header records.

Prints the *Shop Order Detail Report*—a full print-out of all the fields in all the records (header, operations, materials and notes) for the Shop Order. This report is extremely useful when inspecting base orders, and also as a historical record of closed shop orders.

Prints *Operation Exception Reports*—gives any of four operation exception reports:

- Quantity Variance
- Hours Variance
- Scrap Variance
- Schedule Variance (selections differ depending on scheduling method i.e. Forward or Backward)

In all four cases above, only those operations that exceed a user-entered limit will print.

can ask for a print-out of all ended orders (status = E) to find out what shop orders should be *completed* that day and are ready for shipment or ready to be put in finished goods inventory.

Shop Floor File Maintenance allows the user to complete, cancel or purge shop orders which have had activity posted against them.

This application also provides for the releasing of Shop Orders. After a shop order is entered it must be "released" to indicate to SFC that actual usage of material and labor can now be tracked for this shop order.

The user may allocate material at release time automatically, or he may allocate materials for individual Shop Orders as a separate option. The user does not have to allocate at all if it is not desired. Allocation is most useful in shops that use a large number of common parts. Lastly, the user also has the option to deallocate if he is short component parts he needs to begin a shop order or that will be needed before he can get them.

### Shop Order Transaction Entry and Editing

This on-request function is used to build the details of a Shop Order. The detail records of a Shop Order include:

- operations
- materials (component parts)
- notes (specifications, comments, etc.)

They are entered into a transaction file which may be printed, verified, and changed before the detail records actually update the Shop Order via a posting run.

The posting run updates all pertinent fields in the Shop Order file and Item Master file. Transactions are selected for posting by date range. This may be quite useful when the user wants to post yesterday's shop activity (which has now been verified) but not today's activity.

For each selected material transaction that is issuing material to a Shop Order, an *Issue* transaction is written to I/M's Inventory Transaction file (if I/M is installed). When this is posted, it will relieve the On-Hand values for that item (to ensure a single and complete audit trail for variations in On-Hand). In addition, if the materials issued have been allocated to the Shop Order, these are now deallocated.

After posting is complete, the user has the option to print an audit report of the action taken with all transactions. All transactions that were selected for posting are saved in the Transaction History file. This file can then be used to review all activity for a shop order as long as that shop order is on file. This review can be directed at a single shop order or a user-selected range of shop orders and can include:

- the initial specification of the shop order
- modifications to the shop order
- all shop activity posted to the shop order

The user has the choice of printing:

- operation records only

- material records only
- note records only
- all of the above

Each transaction history record is date-stamped with the date that the activity actually occurred and the date the transaction was posted to the Shop Order file. The transaction history may be printed on request.

### Sequence of a Shop Order

To be useful, a shop order must be set up so that the operations, materials and notes all show up in the sequence the shop actually does it. SFC allows the user to set up the sequence in two ways called Format A and Format B:

#### Format A Sequence

- Shop Order Header (parent item number, quantity, start/due date, etc.)
- Each component item (material) to be used in making the Shop Order
- Each operation to be performed, in the sequence they are to be done. (Format A does not specify what materials are to be used at each operation. It is assumed that this is obvious.)
- Notes (these may be placed anywhere in the report)

The benefit of this format for a shop order is the clean division between materials and operations. It is shorter than Format B.

#### Format B Sequence

- Shop Order Header
- The first operation followed by all materials used at this operation
- The second operation followed by all materials used at this operation
- etc.
- Notes (these may be placed anywhere in the report)

The benefit of this format is that it specifies where all component material is to be used.

### Work Center Maintenance

Provides the capability to add, change/inquire, delete and print out work center (W/C) records. The work center contains such fields as:

- location
- department number (2 characters)
- work center number (2 characters)
- machine number (4 characters)
- work center description (30 characters)
- labor grade
- setup (labor) grade
- number of men (crew size)
- queue time
- capacity (hours/day)

- Make major changes to schedule dates of selected Shop Orders.
- Subcontract out some of the work.
- Capital investment in new machines.
- Hire more manpower—part or full-time, experienced or not experienced.

The options that make up the W/C loading and automatic scheduling features of the Shop Floor Control package again are:

- Work Center Load Calculation
- Work Center Load Reporting
- Post Calculated Dates

These options, when run in series, allow the user to analyze his W/C loading based on infinite scheduling techniques, calculate start/due dates for each shop order (and each operation within the shop order), and compare these with available capacity and need dates for the finished product of the shop order.

If the projections are out of line with reality (for example, not enough capacity, too many shop orders will be late, etc.), SFC provides tools to change the schedule or the capacity by:

- rescheduling Shop Order to begin earlier or later
- expanding capacity in terms of men or machines, that is, overtime, subcontract, extra manpower, etc.

Results of these tentative decisions can be determined by re-running the Work Center Load Calculation as often as desired. In manufacturing literature this repetitive cycle is referred to as a combination of *Finite and Infinite Capacity Requirements Planning*.

### Shop Order Copy

SFC provides the ability to copy the detail for a shop order, including materials, operations and notes, from the Base (shop) order file. This is a Same-as-Except function which not only allows modifications to the new shop order but accommodates extensions by the order quantity (base orders are set up for a quantity of one).

In a typical installation, the user will create base orders with all the operations, materials and notes for those types of products that are commonly made. These may be finished products, major sub-assemblies, or whatever else is common in the shop. These may then be used to quickly create a new, actual shop order with a minimum of data entry. The user never intends to use this Base Order to actually build anything in the factory; rather it is a model of how the item is to be built.

For the user who also has MCBA's Bill of Material Processor (BOMP) package, SFC's copy function provides the option of retrieving material component records from the Product Structure file in place of, or in addition to,

those from the Base Order file. This is a great convenience for those users with large Product Structure files. It also provides the user with the traditional benefits of BOMP (where-used reporting, MRP, etc.).

When MCBA's Standard Product Routing (SPR) package is also installed, SFC's Copy function provides a similar capability regarding operation records from the Routing file.

### Calendar File Maintenance

SFC allows the user to add/change/purge years to the Calendar File, and to print the Shop Calendar. This is a normal mm/dd/yy with corresponding shop days.

The user can set up the Calendar file for 8 years. Typically, 3 years are used. Any number of days can be specified as Closed (or non-working days).

### Interfaces to Six Other Packages in MCBA's Manufacturing System

Shop Floor Control is a stand-alone package. However, it can be interfaced to six other MCBA packages, namely:

- Inventory Management (I/M)
- Bill of Materials Processor (BOMP)
- Job Costing (J/C)
- Base/Full Material Requirements Planning (MRP)
- Standard Product Routing (SPR)
- Labor Performance (L/P)

### Security

The security system allows up to 200 passwords which provide access restrictions at the file level, by company code.

### Multiple Companies

Multiple company support is provided with up to eight companies supported. Most users do not have this many but still find this feature very useful for test files and/or for operator training.

### Record Sizes

Calendar record . . . . .	380 characters
Work Center . . . . .	65 characters
Shop Order record (contains Headers, Materials, Operations and notes) . . . . .	172 characters
Shop Floor Transaction record . . . . .	183 characters
Job/Shop Order Cross Reference record . . . . .	59 characters

### Run-Time Size

Approximate disk space requirements for SFC executable modules is 953 KB.