ABC Planner™

Version 2.0

User’s Manual

Published by MultiCIM Technologies Inc., 640 Bord du Lac, Suite # 101, Dorval, QC, H9S 2B6, Canada.

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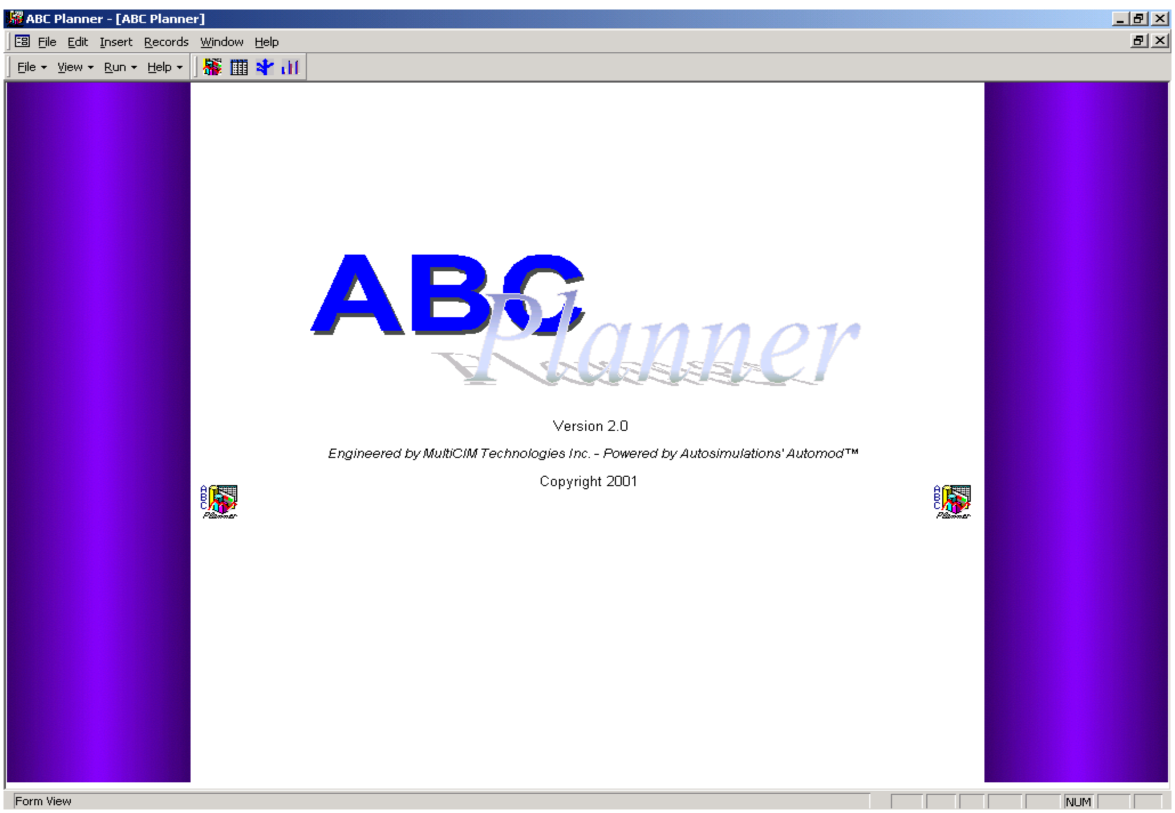
INTRODUCTION

ABC Planner: the concept

ABC Planner™ is an entry level Decision Support System designed to solve planning, scheduling or costing problems. It works on top of a world-renowned simulation engine, AutoMod™, a discrete-event simulation package that is recognized for its flexibility and speed of execution. Enabling one to do multi-criteria simulations, ABC Planner combines ease of use with a powerful simulation engine. A user can quickly develop, test and analyze different industrial or business scenarios. With minimum effort, requiring no technical expertise, one can represent an actual work environment (with a model) and execute all company activities and operations in high-speed simulation mode. The results of a simulation enable one to foresee the events and consequences of all activities of the analyzed process. Therefore, intelligent decisions can be made based on results to achieve greater productivity at the least cost.

ABC Planner uses technologies and functionalities similar to ones found in AutoSched™, a full scale industrial finite capacity planning and scheduling software used by Fortune 500 companies for planning and scheduling. ABC Planner can be successfully applied to a wide variety of environments (manufacturing and services) and processes (fabrication, industrial, administrative). Taking advantage of user-defined entities, the specific vocabulary of a company or profession can be used in ABC Planner's headers, making it extremely familiar and easy to use. Similarly, the reports can be tailored with custom headers and contents. English and French language support is built-in; other languages can easily be added.



Welcome Window

Applications of ABC Planner

ABC Planner can be tailored to the “language” used in your business or industrial situation. Indeed, what traditional simulation tools call a “resource” can more easily be identified by “machine”, “doctor”, “pilot”, “vehicle”, etc. depending on the situation.

The following list presents some possible applications of ABC Planner:

- capacity planning (e.g. : # work centers in a factory, # beds in an hospital)
- finite capacity planning and scheduling
- Activity Based Costing – ABC
- simulation of Business Process Reengineering scenarios
- short, medium and long term forecasting
- simultaneous management of projects (with Gantt IT™)

Decision support with ABC Planner

Performance measures in ABC Planner’s reports provide information on:

- quantities (e.g. : inventories)
- duration (e.g. : mean time per order)
- costs and added value (e.g. : expected inventory cost for a specific order)

All these measurements are collected during a simulation run by “virtual instruments” embedded in the simulation engine. Measurements are instantaneous (e.g. : step report for an activity, periodic inventory status) or computed at the end of the simulation (e.g. : average, current and total quantity of items in inventory).

ABC Planner supports multi-dimensional accounting analysis using these metrics. Analysis can be made at different levels of aggregation, and intangibles as well as opportunity costs, that may be difficult to evaluate using static spreadsheets, can be estimated.

What is discrete-event simulation?

Discrete-event simulation is the missing link in the structure of traditional spreadsheet applications. Discrete-event simulation allows one to consider the time dimension in any functional, operational or economic evaluation.

Indeed, with simulation, the dynamic behavior of a system as well as the interactions between its components can be studied over a period of time and unexpected situations can be easily identified. Applied to discrete systems (i.e. the opposite of continuous processes such as chemical manufacturing plants), simulation is used for the designing of new facilities (plants, hospitals, airports, etc.), emulating the behavior of systems to validate the control algorithms, as well as managing these facilities (planning, scheduling, and even real time dispatching).

When compared to Monte Carlo simulation, often given in example for explaining simulation, discrete-event simulation (the approach chosen for ABC Planner) uses a more realistic model of the system studied and allows for more detailed analysis.

A simulation calendar is used to manage discrete events, which are sequenced according to their date of occurrence and respective priority. Every time an event is executed, the interactions between the components of the systems are modified and new events are added to the calendar. As the simulation goes on, the “virtual instruments” keep on updating and compiling the performance measurements.

The key interest of simulation is its unique ability to evaluate the dynamics of a system without disturbing its operation or even before it exists. One can quickly establish the short term and long term impact of changes made to the system without risking a major problem. “What ifs” are thus made easier and analysis becomes more accurate due to the time dimension, which allows the representation of seasonal demand and dynamic interactions between internal and external elements.

CHAPTER 1: INSTALLATION

Please read the file “readme.txt” for the last minute changes and FAQ.

1.1 Installing and using ABC Planner Version 2.0 for the first time

Insert the CD-Rom labeled ABC Planner into the drive; the automatic installer should start within a few seconds.

If the installer does not start, follow these steps:

1. From Windows Explorer or File Manager, double click on “abc_init.exe”
2. Follow the installation steps
3. AutoMod installation:
    - Administrator right is needed for Windows NT/2000 to install AutoMod.
    - If AutoMod is already present on the computer ABC Planner is being installed to, you may select "Skip" in the AutoMod installation dialog to continue using the current version (provided the version is 9.1 or later), otherwise select "Next" and install AutoMod Version in a different directory.
    - You will be required to restart your computer after AutoMod has finished installing. ABC Planner's installer will continue after rebooting

N.B.: To change version of AutoMod you need to change the system variable. Also please be aware that although ABC Planner version works on top of all current versions of AutoMod including the Student Version. Brooks Inc. strictly prohibits the use of the AutoMod Student Version for non-educational purposes.

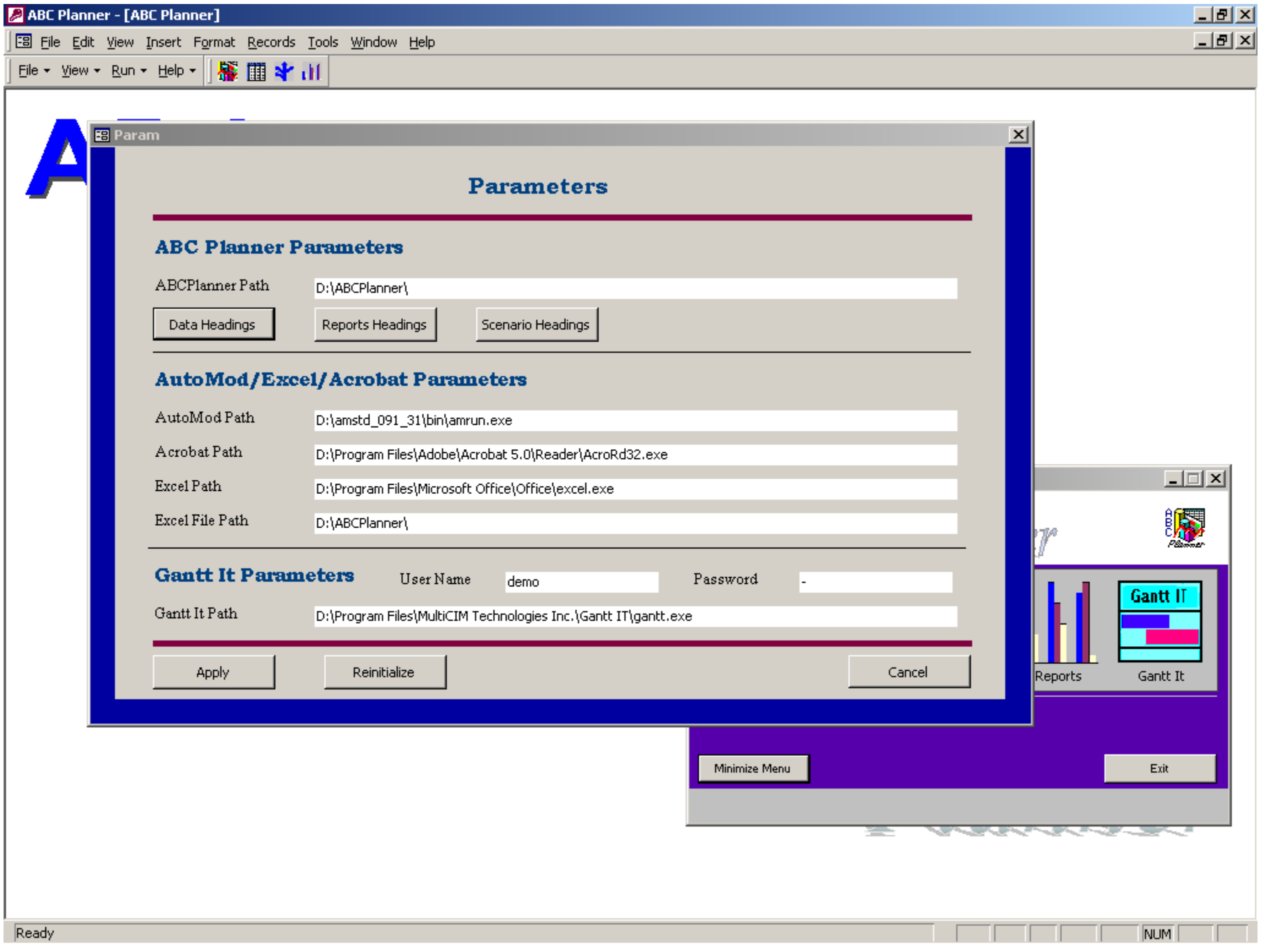
For NT/2000 (Start/Settings/Control Panel/System/Environment/Advance), select ASI, change the value (ex: am_100), set, apply and reboot the computer.

For 95/98 (Start/Run) type sysedit, select the autoexec.bat change the value of set ASI = *to the new value* and reboot the computer. For information regarding AutoMod see AutoMod’s reference book on page 6.

The user must use the Parameter Form if he changes, after installation, the directory of one of the applications used by ABC Planner or the location of ABC Planner itself in order to provide the new path. The appropriate path of the referenced applications must be entered in the Parameter form. The ABC Planner application path must be entered in the ABC Planner Path field. The AutoMod, Acrobat and Excel paths must be entered in their respective fields. **Be sure to enter the name of the executable at the end of the path** as shown in the Figure that follows. The Excel File Path field contains the path of the DataReport.xls file provided with ABC Planner. It is recommended that this file be in the same directory as ABC Planner. Finally, Gantt It Path must also be provided (if Gantt IT is installed) in order to indicate ABC Planner its location on disk (**the path must contain the executable name**).

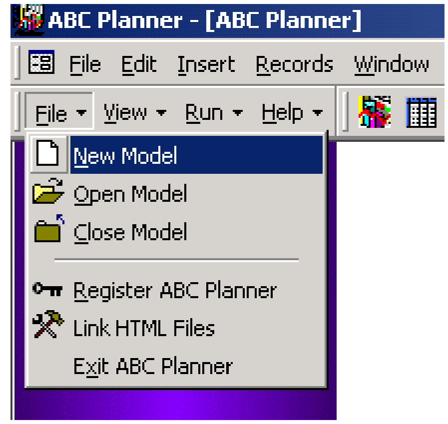
The Parameter Form can be accessed by selecting the Parameters Item from the View Menu.

The Link HTML Files button (command which can also be launched from the File Menu) must be used only during an initial installation or when ABC Planner, or the HTML files provided with it, has changed locations. ABC Planner comes bundled with 19 HTML files, which are used to display reports. It is recommended that these files stay in the same directory as the application. It is necessary for ABC Planner to know where these files are situated in order to launch them from the application. It is also necessary for the HTML files to know where ABC Planner is located in order for them to retrieve the information they need to create reports from the application. This command precisely indicates both to the application and the HTML files where they are respectively located on disk.



Parameter Form

To create a new model, follow these steps:



1. Start ABC Planner
2. Select File => New Model
3. Select the path and the model name in the pop-up Dialog

Note: **It is impossible to have two models in the same directory**

Model names must be continuous and therefore cannot contain spaces or tabulations

To open an existing model:

1. Select File => Open Model
2. Select the *.mfi file in the model directory

1.2 Files copied to the hard drive during the installation

- ABCPlanner	: Directory containing files related to ABCPlanner
- ABCPlanner.mdb	: ABC Planner Executable/Database file
- simcost.arc	: Directory containing simulation logic
- Models	: Directory containing ABCPlanner models/Demos
- Package	: Directory containing files needed for the installation
- DataReport.xls	: Excel file used to display report data
- AutoMod	: AutoMod executable and related files
- Gantt It	: Gantt It executable and related files
- *.htm files	: Multiple .htm files used to display reports
- help.pdf	: user's manual (this document)
- aide.pdf	: user's manual (French)
- readme.txt	: last minute changes and hints
- lisezmoi.txt	: last minute changes and hints (French)

CHAPTER 2: COMPONENTS AND INTEGRATION

2.1 Overview of the simulation engine

ABC Planner's simulation engine runs in finite capacity mode. Finite capacity means that it is impossible to overload a resource or to use a resource that is not available. This approach is closer to the reality of most industries, services and business activities, than the close-finite or infinite capacity modes offered by most time-buckets based approaches. Finite capacity with ABC Planner also means coordinating resources to work together towards the completion of an activity, and considering individual work calendars.

With ABC Planner, activities are ranked and executed by order of importance according to the decision rule associated with each individual resource.

ABC Planner's simulation engine, AutoMod, can be configured to use global and local decision rules. When used in conjunction with ABC Planner, AutoMod is started and stopped automatically through ABC Planner's interface. AutoMod can also be used without ABC Planner to perform any kind of simulation study, including material handling and warehousing studies.

Information regarding AutoMod can be obtained from MultiCIM's web site:

- http://www.multicim.com

or directly from Brooks Inc web site:

- http://www.automod.com

or by phone:

- (514) 633-6401 (MultiCIM – Canada)
- (801) 736-3201 (Brooks Inc. – USA)

2.2 Analysis Center - Gantt IT™

The analysis center's role is to provide an easy way to analyze the sequence of activities generated by ABC Planner with Gantt IT™, while ABC Planner's report viewer is used to present performance information from an operational and economical point of view. The analysis center is to be used by planners and schedulers whom would like to review and analyze the proposed sequence of activities through Gantt charts (with Gantt IT™) or activity reports. The sequence can then be sorted and printed by workcenter, order or product type.

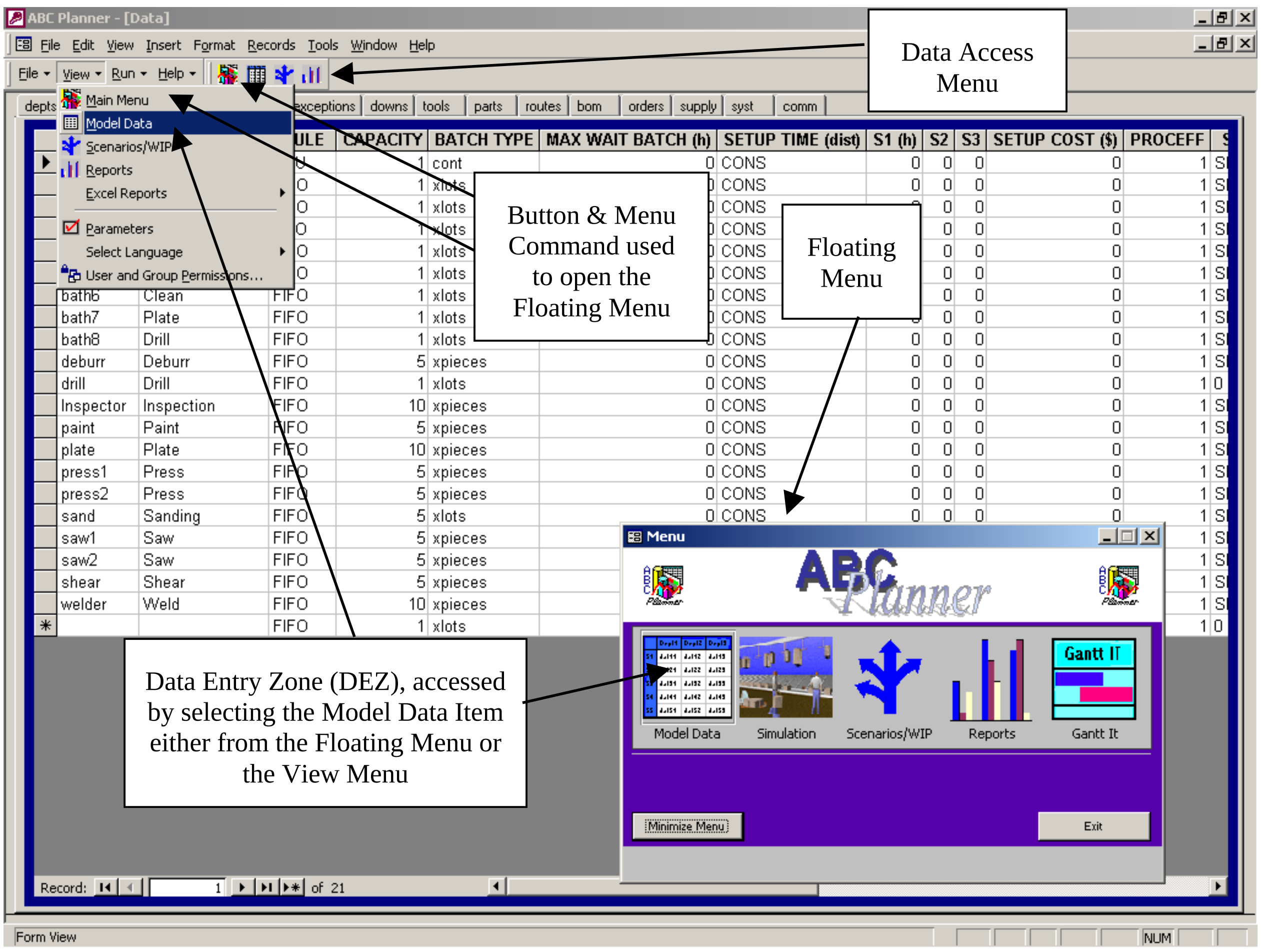
2.3 Compatibility and integration issues

Data and reports files are ASCII flat files and can be accessed/imported/generated/modified using any other application, as long as the expected file format (headers, # of columns and order of columns) is respected. For more information regarding integration and/or automatic simulation, please contact MultiCIM.

CHAPTER 3: OVERVIEW OF THE INTERFACE

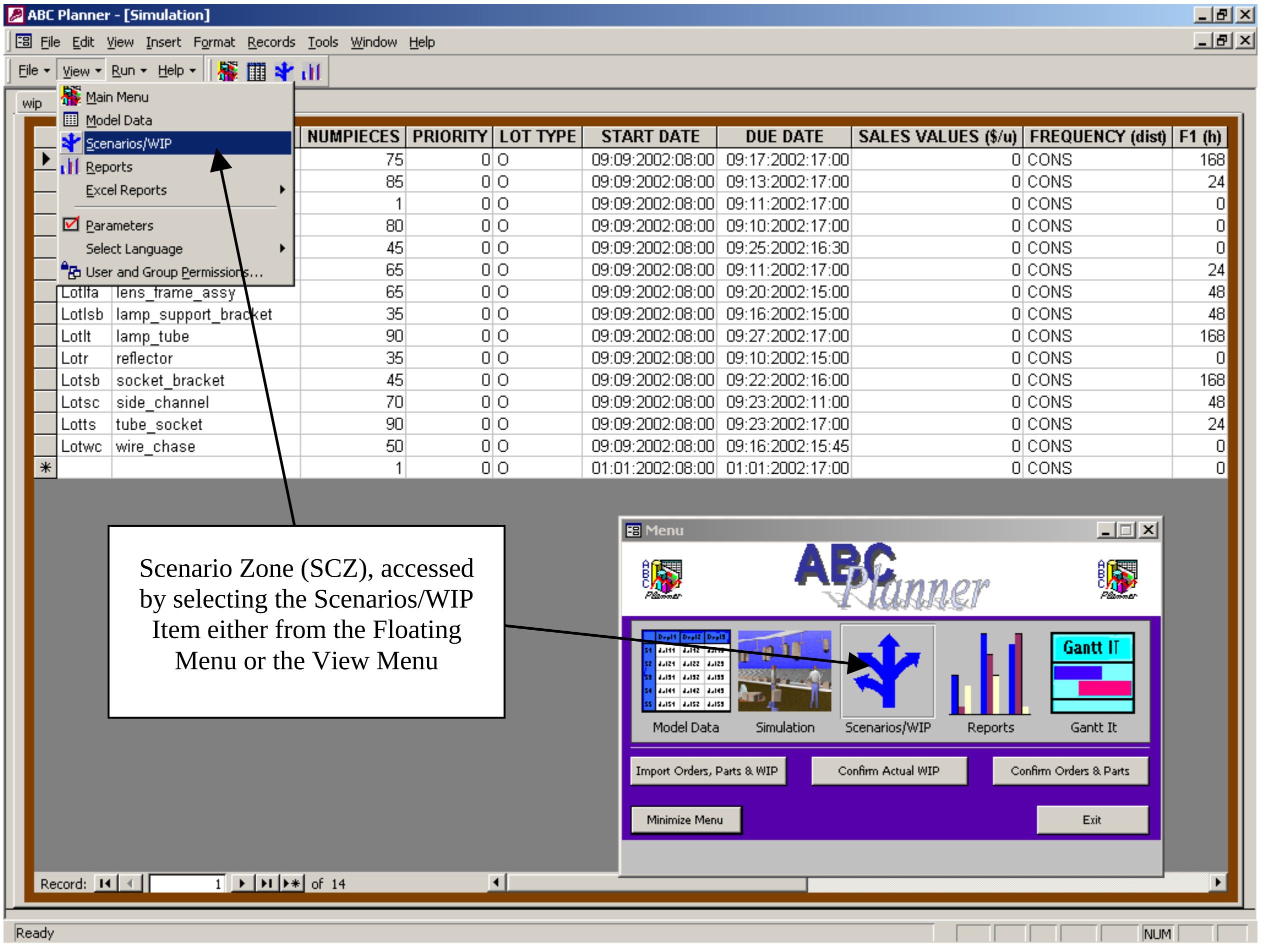
ABC Planner menus are bilingual (French and English) and the interface can be partially customized by the end user. The headers of data sheets (input files) and reports (output files) can be tailored for each project.

The interface provides traditional menus found on top of the application. Beside these menus, a toolbar floating on top of the application provides a way for the user to switch back and forth from the three ABC Planner zones: Data Entry Zone (DEZ), Scenario Zone (SCZ) and Data Report Zone (DRZ). The first button on the Data Access Menu bar and the first item of the View Menu enable the user to open this floating Main Menu. The top View Menu provides the same ability to navigate back and forth through ABC Planner's zones.

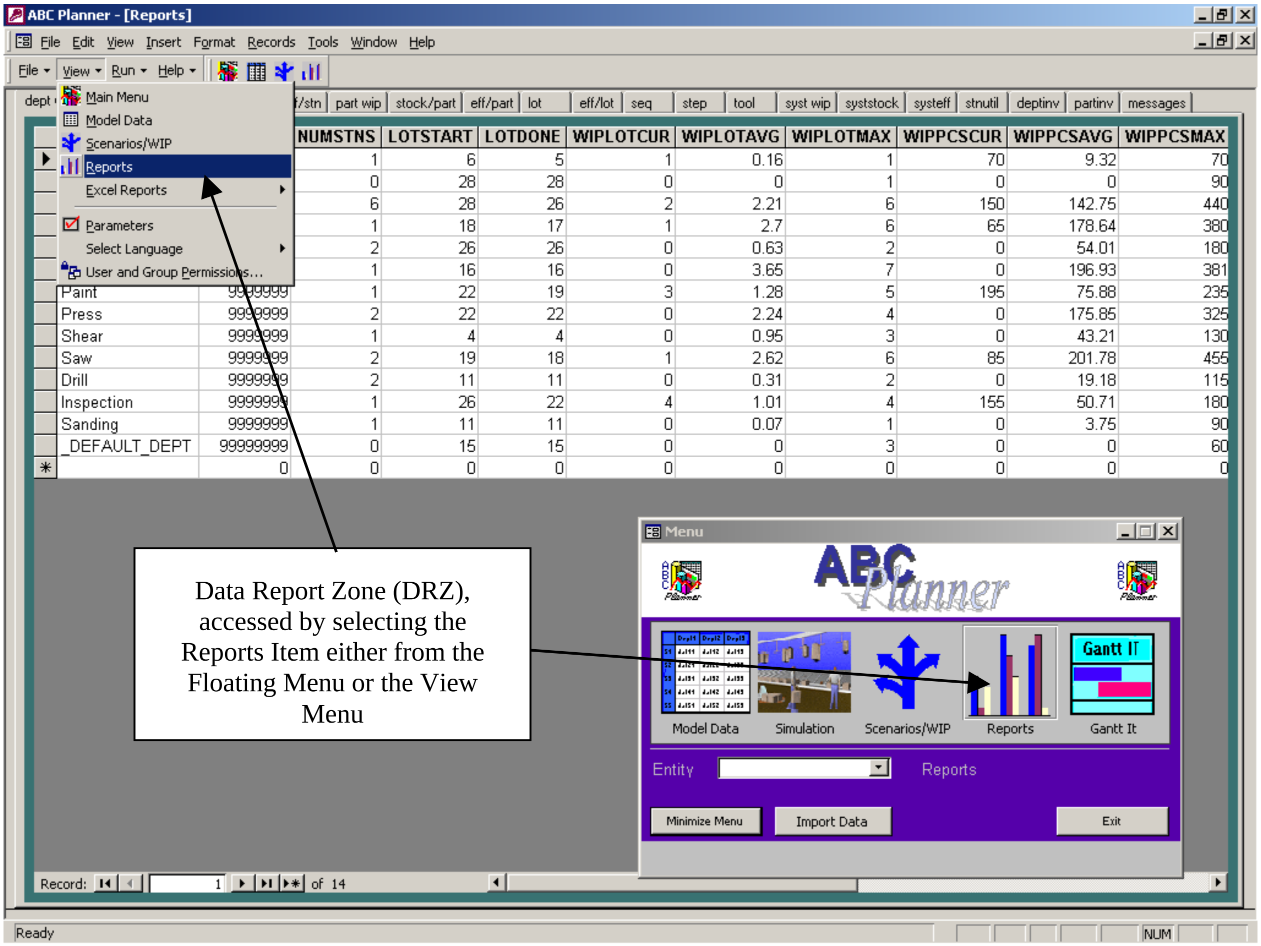


Data Entry Zone (DEZ)

One can access the Data Entry Zone (DEZ) by clicking either on the Model Data button of the Floating Menu or by selecting Model Data from the View Menu as shown in the previous Figure. The Scenario Zone (SCZ) of ABC Planner is access by clicking the Scenarios/WIP button from the Floating Menu or by selecting the Scenarios/WIP Sub-Menu from the View Menu, while the Data Report Zone (DRZ) is reached by either selecting the Reports Button or the Reports Item from the Floating Menu or the View Menu respectively.

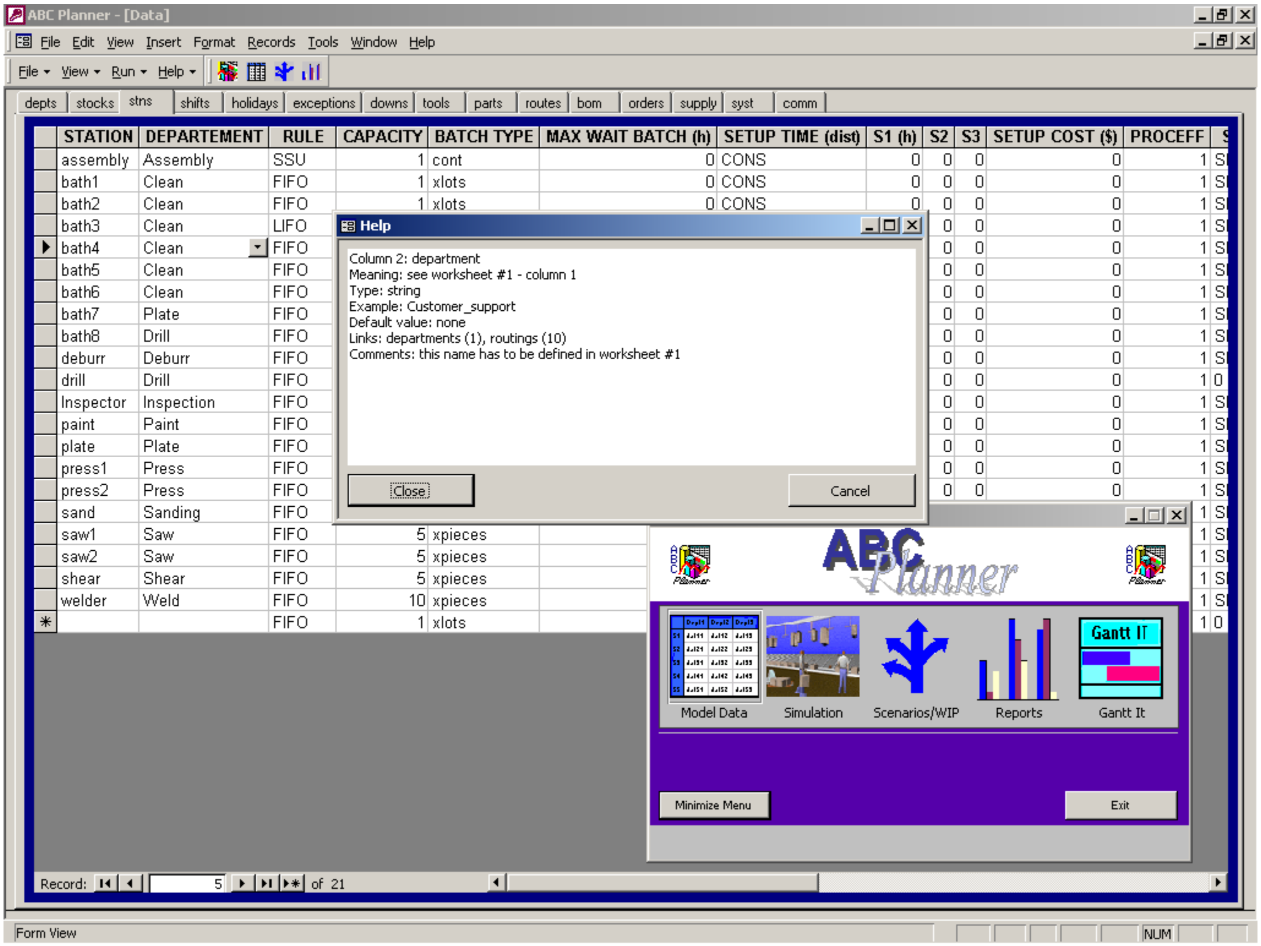


Scenarios Zone (SCZ)



Data Report Zone (DRZ)

 http://www.multicim.com/



Contextual Help

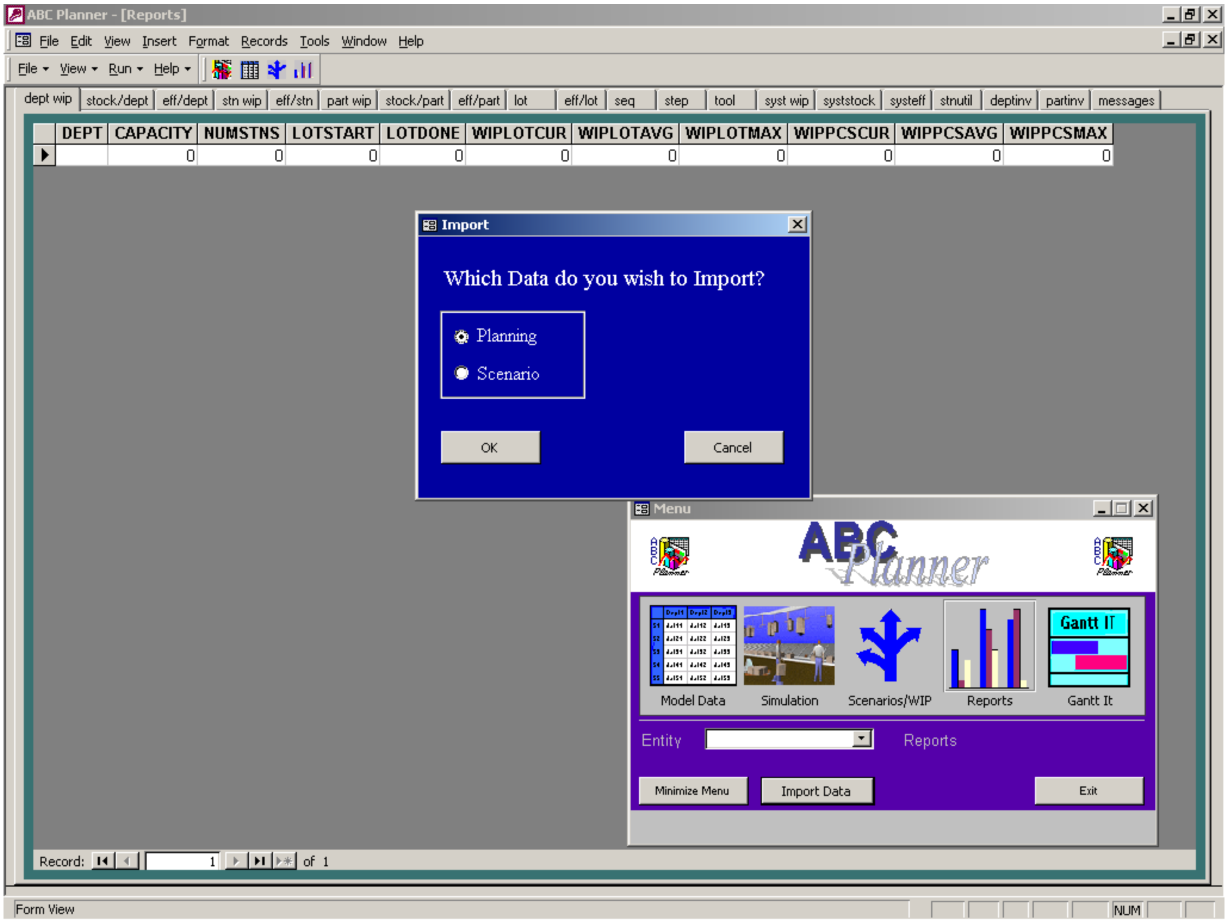
The user can obtain contextual help regarding a model data field by pressing the F1 key when position on the field for which he whishes to have information.

3.1 Menus

Floating Menu & Data Access Menu

As mentioned in the previous preamble, the Floating Menu contains buttons enabling the user to move back and forth from the three ABC Planner zones (DEZ, SCZ and DRZ). It is also possible for the user to switch from these three zones by using the Data Access Menu, indicated on the first Figure of the present chapter. The first button on the Data Access Menu bar and the first item of the View Menu enable the user to open the Floating Main Menu. The top View Menu provides the same ability to navigate back and forth through ABC Planner's zones.

The Floating Menu also contains a button used to launch a Simulation and a button to launch Gantt It. It is also possible to launch a Simulation from the Run Simulation Sub-Menu of the Run Menu. The Run Menu provides a second way to launch Gantt It.



Window enabling one to import Simulation Results

When a model is open, the user can import simulation results by clicking on the "Import Data" button. ABC Planner will ask the user to precise which data he whishes to import (Planning or Scenarios)?

File menu

New model

Used to create an ABC Planner Model. It gives access to a dialog window where the user can navigate in the directory structure and save his new model under the name he has chosen (WARNING: spaces and special characters are forbidden characters in a model name). There can only be one model per directory to prevent data files from being overwritten between models. Once the user validates the selected name of the Model, ABC Planner creates a folder in which the Model and its associated files will be saved. If ABC Planner already as a Model open and the user tries to create a new model, ABC Planner will ask the user to close the opened model prior to creating a new one.

Open model

When chosen, ABC Planner opens a dialog window where the user can look for an existing model. Once in the appropriate directory, the user must choose the NameOfModel.mfi file. If ABC Planner already has an open model, and the user tries to open a second model, ABC Planner will ask the user to close the opened model prior to opening a new one.

Close model

Allows the user to close the current model. By selecting this Menu Item, ABC Planner exports the data contained in the tables of the application to text files and empties ABC Planner's database, enabling the user to open another Model. The user does not have to close a model before exiting ABC Planner. The data will automatically be conserved in the database. The user needs to close a model only when he wants to create or open a new model.

Compact Database

It is recommended to use this function once in a while, depending on the size of one's model and the frequency of Simulations. Access, the database on which ABC Planner is built, accumulates a large amount of unnecessary data when exporting and importing data to and from text files (which occurs every time a simulation is launched). Thus, the size of the database will grow in size every time a simulation occurs. It is therefore necessary to compact the database once in a while in order to eliminate its unnecessary data in order to maintain a small or medium size database. The user should verify the initial size of its model and verify at times, to see if its size as grown by multiples of its original size. In this case, he should launch a compacting process (which takes only about half to one minute).

Link HTML Files

This command must be used only during an initial installation or when ABC Planner or the HTML files provided with it have changed directories. ABC Planner comes bundled with 19 HTML files, which are used to display reports. It is recommended that these files stay in the same directory as the application. It is necessary for ABC Planner to know where these files are situated in order to launch them from the application. It is also necessary for the HTML files to know where ABC Planner is located in order for them to retrieve the information they need to create reports from the application. This command precisely indicates to both the application and the HTML files where they are respectively located on the disk.

Exit ABC Planner

Closes the application.

View menu

Main Menu

Opens the Floating Menu. The items figuring on the Floating Menu are detailed in the "Floating Menu & Data Access Menu" sub-section here above.

Model Data

Opens the Data Entry Zone (DEZ). The DEZ zone is used to create a model representing one's manufacturing or business process. The information needed to create a model is detailed in Chapter IV.

Scenarios/WIP

Opens the Scenario Zone (SCZ). The functions related to this zone are explained in Chapter VII.

Reports

Opens the Data Report Zone (DRZ), explained in Chapter VI.

Excel Reports

This command enables the user to access two sub-menus; the Export Data in Excel and View Data in Excel menus. The sub-menus are used to export the Reports Data generated by the simulation into Excel and then launch Excel from ABC Planner in order to analyze these data from within this application. The View Data in Excel Menu opens the DataReport.xls file, which is provided with ABC Planner. The Excel file contains a macro, which is launch upon opening if the user has macros enabled in Excel or if he chooses to execute them. The macro displays the data in a preformatted way that facilitates the analysis of the simulation data.

Parameters

Opens the Parameter Form. Please refer to Chapter I regarding installation for more details concerning Parameter Form.

Select Language

Enables the user to select the language he prefers (only English and French at the moment). The menu items, the messages in dialogs and the help will be in the selected language. It is also possible for the user to choose the name of the column headings in both the Data Entry Zone (DEZ) and the Data Report Zone (DRZ) he whishes, by opening the Parameter Form and then clicking the Headings button.

User and Group Permissions

Used to manage user's rights.

Run menu

Run Simulation

Initiates the simulation in three steps:

1. the data are exported from ABC Planner to text files;
2. a dialog window appears asking for:
   - the simulation start date and the simulation duration;
   - the period in hours for continuous reports (0 means no report);
   - the random stream index (any value between 0 and 99).
3. AutoMod is launched and the simulation is run;

See chapter 5 for more details

Launch Gantt It

Launches Gantt It with the data from the last simulation. See Chapter VIII for more details.

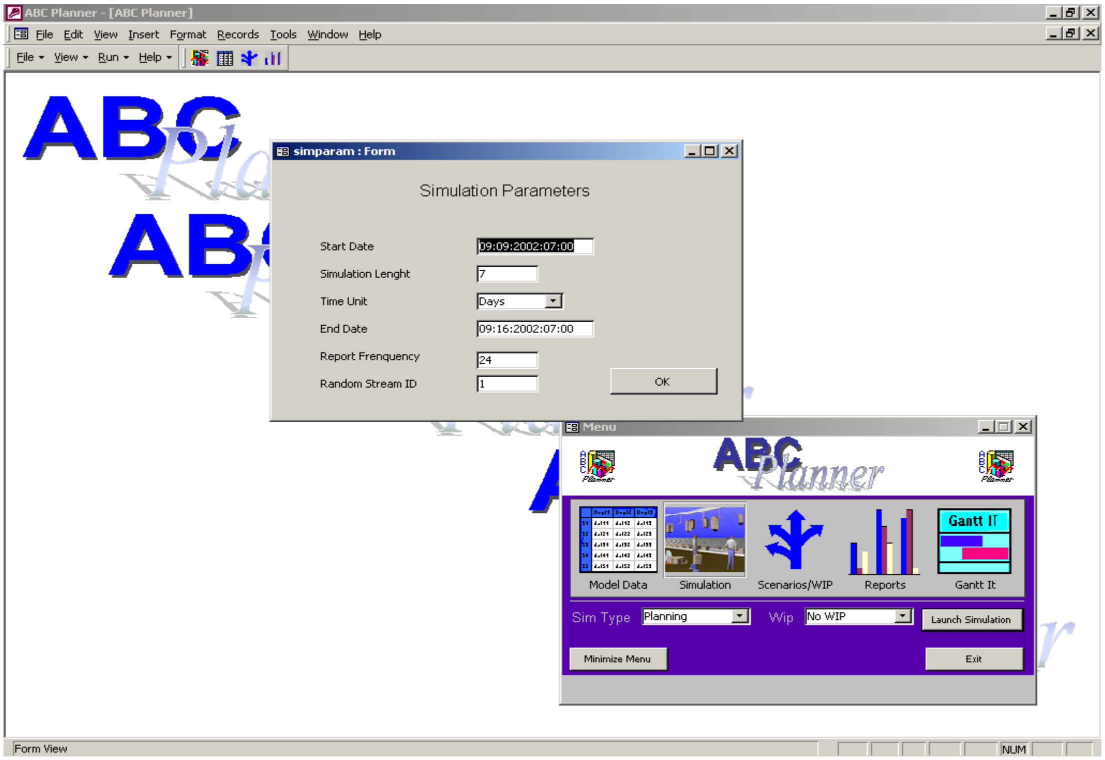
Stop Execution

Orders ABC Planner to stop waiting for the execution of the simulation. This Command will only tell ABC Planner to stop waiting for the results from AutoMod, which is executed in parallel. By selecting this Item, AutoMod will not be notified of the Command to stop its execution. The user must maximize the AutoMod execution window (if it is available) figuring in the state bar at the bottom of the window and manually stop the execution himself.

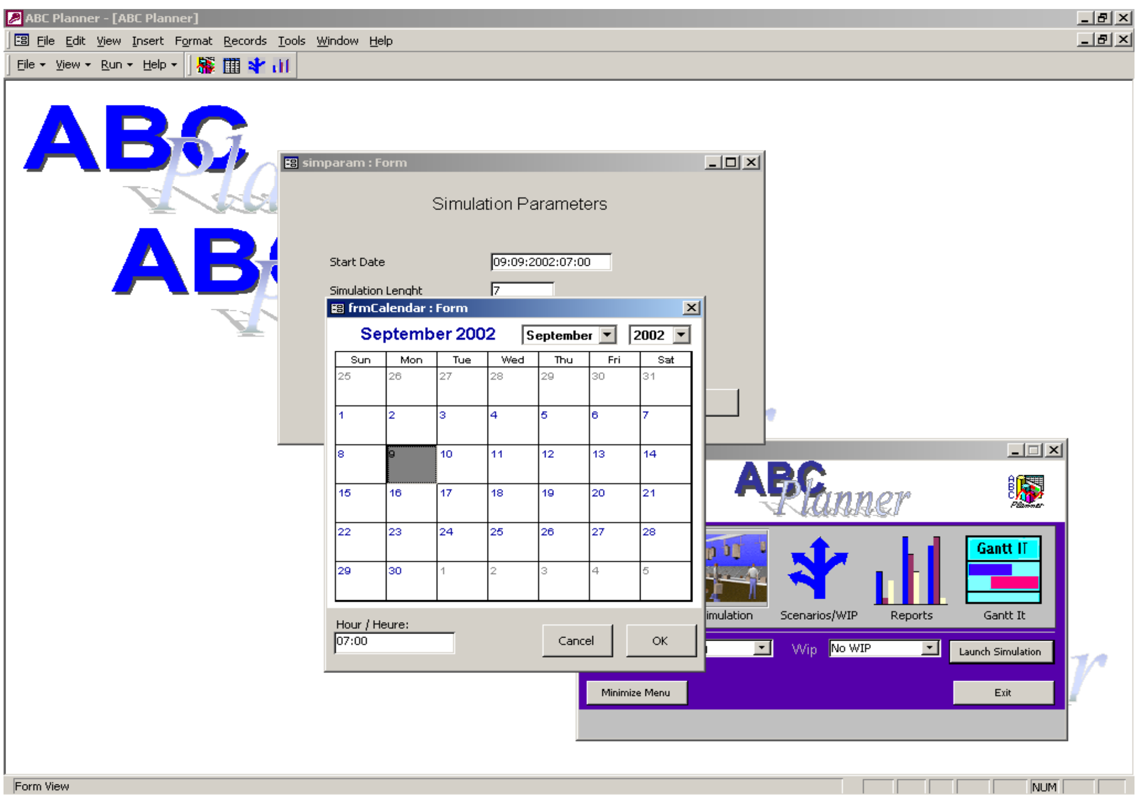
The user should use this command only when encountering a problem with the simulation process. Some logical errors in the construction of the model can be passed to the simulation engine (AutoMod) without being noticed. In some cases, these errors can make AutoMod crash without returning the control to ABC Planner. In these cases, ABC Planner will be waiting indefinitely for the response of AutoMod, indicating that the simulation has finished. Thus, the user has to manually indicate to ABC Planner that the simulation has terminated. In some rare cases it might be necessary for the user to use the Task Manager of Windows. Pressing and holding the Ctrl, Alt and Delete keys at the same instant can access this utility. Once the dialog appears, one must select the Processes Tab and then the amod.exe execution. Once selected, the End Process button must be clicked to definitely stop the execution of AutoMod.

The user can close the Simulation Parameters Dialog appearing just before launching AutoMod (seen in the next Figure) without clicking on OK if he whishes not to launch the simulation process. ABC Planner will not execute the simulation process when the Dialog is closed without confirming OK.

Clicking on the Stop Simulation button will only indicate ABC Planner to stop waiting for the results of the simulation and will not stop the launching process regardless of when it was clicked. This limitation is a way to preserve data integrity in the database and eliminate loss of data due to unfinished procedures that would result from stopping the execution process at any time. One has to note that the data are exported and imported to and from text files external to ABC Planner.



Simulation Parameters Window



Calendar used to precise Simulation Start Date

Help menu

ABC Planner Help

This Item launches Abobe Acrobat's Reader with the present document. If the selected language is English the present document will be opened, while if it is French, the French Help will be launched.

Contact Technical support

Opens a composition box with the default e-mail application used on the system in order to contact MultiCIM and get technical support for ABC Planner.

MultiCIM Technical support

Opens the default Browser of the system and connects to MultiCIM's home Page.

Get Latest Version

Opens the default Browser of the system and connects to MultiCIM's ABC Planner download page.

About this Program

Credits for the development of the software and Copyrighted statement regarding the Application.

Contextual Help

One can get information regarding any field in the Data Entry Zone (DEZ) by positioning oneself on the field and pressing F1. A dialog will open containing information related to the field on which the cursor is presently positioned. If the selected language is English the information will be displayed in English, while if French is selected as the preferred Language, the information will be in French.

Column headers

The column headers of the Data Entry Zone (DEZ) and the Data Report Zone (DRZ) can be modified by opening the Parameters Form and then the Headings Form.

CHAPTER 4: DATA FILES

4.1 Data Organization

There are three categories of information in ABC Planner:

1. resources and calendars
2. products or services
3. orders lists

#	Sheet	Tab name	Description
1	dept.txt	dept	*List of departments*
2	stock.txt	stock	*List of storage areas*
3	stn.txt	stn	*List of workstations*
4	shifts.txt	shifts	*List of shift calendars*
5	holidays.txt	holidays	*calendar of holidays*
6	exceptions.txt	exceptions	*calendar of exceptions (failures or illness for ex.)*
7	downs.txt	downs	*List of downs (Preventive Maintenance for ex.)*
8	tool.txt	tool	*List of auxiliary resources (tools, operators)*
9	part.txt	part	*List of products, services or customer classes*
10	route.txt	route	*List of production/service activities per product type*
11	bom.txt	bom	*List of components types and quantities per assembly step*
12	order.txt	order	*List of stock/customer orders*
13	supply.txt	supply	*List of orders to be received*
14	syst.txt	syst	*general information (overhead costs)*
15	comm.txt	comm	*user information*

Resources and calendars (sheets 1 to 8)

Resources are the components of the system used to produce goods and services. Examples of resources in different environments include:

Factory	Bank	Hospital	Transport
- machines	- cashiers	- physicians	- trucks
- operators	- managers	- nurses	- planes
- tools	- computers	- bedrooms	- docks
- vehicles	- bank vault	- scanners	- cranes

Resources can be viewed as main elements used to add value (or cost) to a product or service. Most of the time resources are available in limited quantities, meaning that some products or services can be delayed by an unavailable resource (e.g. people waiting in line at the bank).

Resources can also be grouped by "affinity" (e.g. type, process, etc.) in a system. These groups are sometimes called cells, departments or services (sheet 1 and 2).

Some activities require the use of more than one category of resources simultaneously. ABC Planner can consider auxiliary resources (sheet 8).

Calendars (sheets 4 to 7) are used to specify the periods of availability for resources. Fixed periods such as shifts, as well as stochastic periods representing breakdowns for machines can be defined.

Products and services (sheets 9, 10 and 11)

This category of information allows one to define the products or services (sheet 9) offered. Routings or recipes (sheet 10) and product's contents (sheet 11) can be detailed. The routings also refer to the resources used to complete the specific operation of each step.

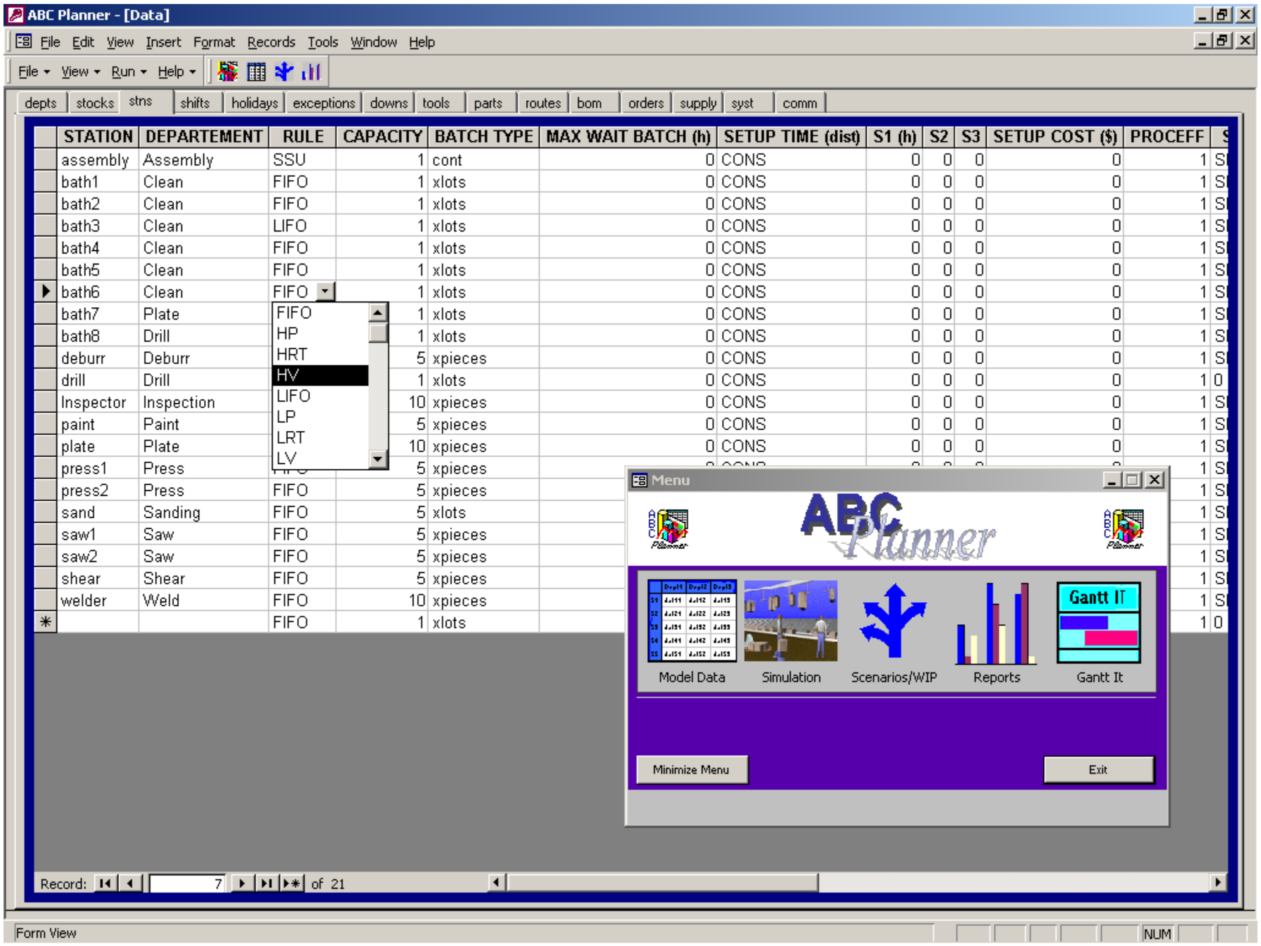
Orders or work agendas (sheets 12 and 13)

Resources, products and recipes only define "static" elements of a system. Without customers, a bank will not operate; without a demand, a factory cannot produce. Orders or work agendas make things happen in a model. Orders can be real work/stock/supply orders for a given period of time, with specific delivery dates or based on demand and components consumption forecasts. Repetitive orders can also be considered.

4.2 *Input data sheets*

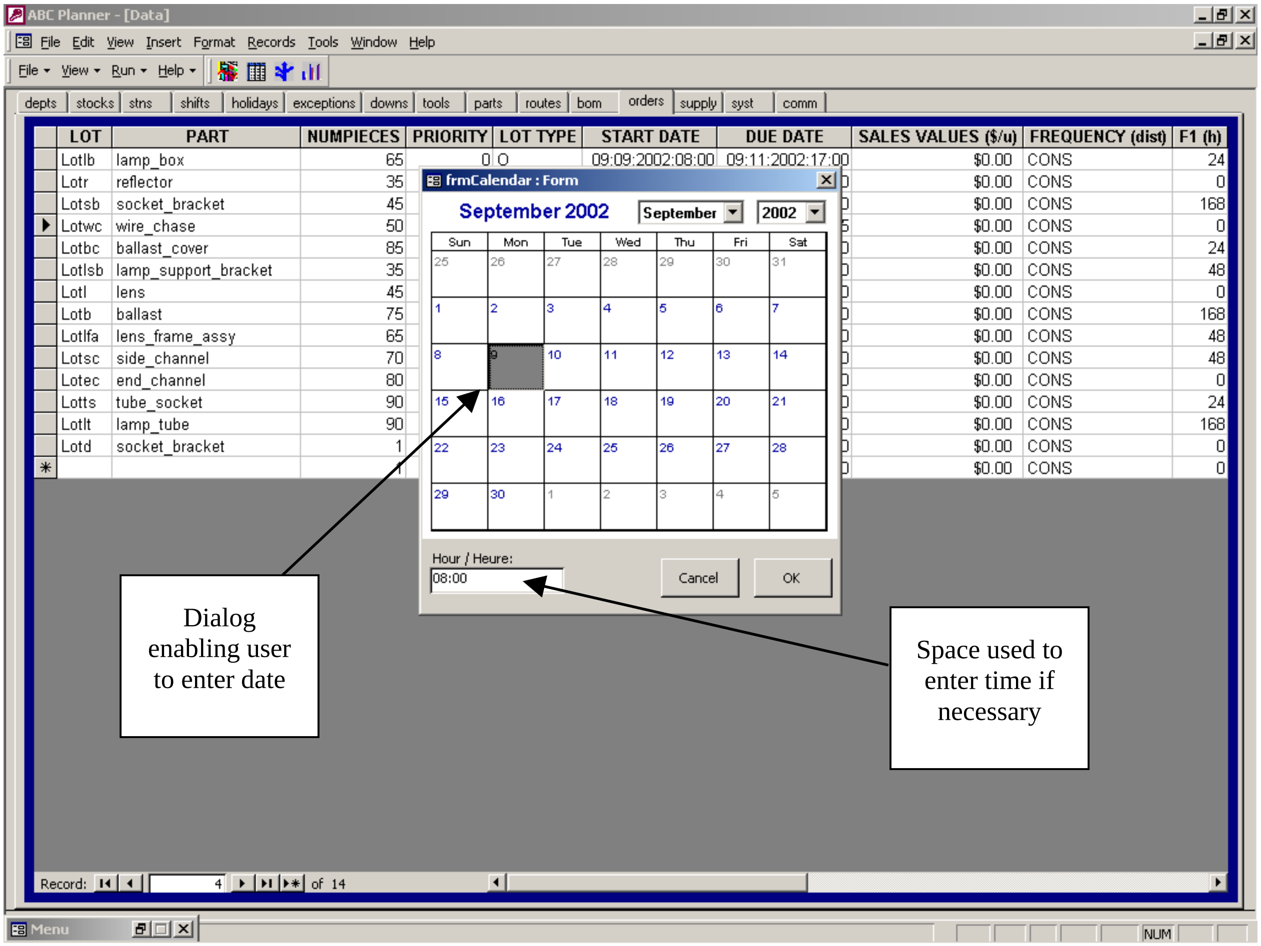
ABC Planner has many features to help the user to build their model. First, the sheets of the Data Entry Zone (DEZ) contain default values in many fields. This provides a default value that the user will sometimes want to use and indicates to him what type of data the field expects. Secondly, many fields contain a drop down list that are used to enter a value when one positions oneself on the field. The next Figure shows such a drop down list. These drop down lists appear in every field for which there exists a set of predefined values that can be entered in the field. For example, the RULE field (seen on the next Figure) regarding Stations contains a drop down list displaying all the valid Rules that can be entered in the field. The user just needs to select the desired RULE in order to enter it into the field.

Furthermore, ABC Planner also displays drop down lists on fields for which the possible values depend on data previously entered in fields of other sheets. For instance, the DEPARTMENT column of the Station Sheet contains a drop down list enumerating all the Departments that the user has previously entered in the first sheet, concerning Departments. The user just needs to select the desired Department in order to enter it in the field. He does not need to retype it again. These lists facilitate and accelerate data entry work and eliminate the risk of misspelling an entry. The program will not accept a name that is not in the drop down list, eliminating thus discrepancies. Only valid values will be able to be entered. Moreover, these lists are dynamic. If the user would go back for instance to the Department Sheet to add another Department, he would see the added Department in the drop down list when he would position himself again on the Department field of the Station Sheet.



Drop Down Menu used to enter Values

Finally, ABC Planner provides a dialog box from which the user selects a date for every date field in the DEZ. The user only needs to click on a date field for this dialog to appear. He then can select the appropriate date and time (if applicable) in order to enter the value in the desired field. The user does not have to worry about the proper format, which will be provided automatically by ABC Planner. All date field must be in the format mm:dd:yyyy:hh:nn (mm = Month in two digits, dd = Day in two digits, yyyy = Year in four digits, hh = Hour in 24 hours format and nn = Minutes in two digits) except for the start and finish date of calendars which are in the mm:dd:yyyy format. See following Figure.



Dialog enabling one to select a Date

Column types

Each column has a type. The different types are the following. The Contextual Help indicates what type of data the field expects.

String

- Alphanumeric characters without blanks (i.e. space, tabulation). The underscore character ("_") can be used to separate names in a string (except for the LOT name in the Order Sheet, which cannot contain an underscore character). Most of the time there is no default for string fields in ABC Planner.

Keyword

- String chosen from a list of valid strings. ABC Planner will provide a drop down list containing the valid strings.

Integer

- Positive or negative whole numeric value (without decimals).

Real

- Positive or negative whole or fractional numeric value (with or without decimals).

Currency

- Positive or null numeric value (with decimals).

Date

- Calendar date using the following format: mm:dd:yyyy:hh:nn

Interval

- Interval between two hours, separated by a dash: hh:mm- hh:mm
- Example: 08:00-17:00

Criterion (keyword)

- Example: STEP, ELAPSEDTIME or NOLAUNCH.
- See sheet BOM(7) for more details.

Distribution (keyword)

- Example: BETA, BINO, CONS, GAMM, EXPO, NORM, POIS, TRIA, UNIF, WEIB.
- See "Choosing a distribution" for details.

Combined fields

- When duration, prices or variable quantities have to be represented with probabilistic distributions, ABC Planner will combine the information contained in 4 consecutive data fields: **DIST, **1, **2, **3, where **DIST columns contains the name of the distributions to be used, and the other fields contain the parameters of the distribution (1, 2 or 3 parameters depending on the distribution).

4.3 Data field definitions

This section details the meanings of each column in the Data Entry Zone (DEZ). The format used in the section is the following:

Worksheet name (index)

- ***Column index: usual field name***

Meaning:	general definition.
Type:	string, integer, real, keyword, etc.
Example:	valid value.
Default value:	default value if no user entry.
Links:	other worksheets where this field is also referenced.
Comments:	detailed explanation or warning.

The two models detailed at the end of this manual illustrate further how the different data entry fields can be used.

Departments (1)

- ### *Column 1: department name*

Meaning:	unique name
Type:	string
Example:	CUSTOMER_SUPPORT
Default value:	no default;
Links:	stations (3), routings (10)
Comments:	this field cannot be left empty

- ### *Column 2: capacity*

Meaning:	maximum number of units that can be in the department at any time
Type:	positive integer
Example:	3
Default value:	9999999
Links:	none
Comments:	can also be interpreted as physical space available or number of seats

- ### *Column 3: inventory or waiting cost ($/u/h)*

Meaning:	cost for an unit waiting in the department without being served
Type:	real number
Example:	0.003
Default value:	0
Links:	none
Comments:	this cost is reported individually

Storage or waiting areas (2)

The only difference between storage areas and departments is that stations (3) can only be, and are always attached to departments that provide waiting space for the stations. Storage areas can be used to represent waiting rooms, warehouses, etc.

This sheet need not be completed if there is no Storage or waiting areas.

- ### *Column 1: waiting room or warehouse name*

Meaning:	unique name
Type:	string
Example:	FinishedGoodsWarehouse
Default value:	none
Links:	routings (10)
Comments:	no default value, the user cannot leave this field blank

- ### *Column 2: capacity*

Meaning:	maximum number of units in the area at any time
Type:	positive integer
Example:	3
Default value:	9999999
Links:	none

- ### *Column 3: storage or waiting cost ($/u/h)*

Meaning:	cost per unit
Type:	real
Example:	0.003
Default value:	0
Links:	none
Comments:	this cost is reported individually

Stations (3)

- ### *Column 1: workplace or employee*

Meaning:	unique name of a main resource (station or operator)
Type:	string
Example:	Lathe1
Default value:	none
Links:	exception (6), downs (7)
Comments:	no default value, the user cannot leave this field blank

- ### *Column 2: department*

Meaning:	see worksheet #1 - column 1
Type:	string
Example:	Customer_support
Default value:	none
Links:	departments (1), routings (10)
Comments:	this name has to be defined in worksheet #1

- ### *Column 3: sequencing rule*

Meaning:	rule used by the station to sort and select the activities to be performed
Type:	keyword (rule)
Example:	EDD
Default value:	FIFO
Links:	none
Comments:	see table below

Rule	Comments
FIFO	*First In First Out* – picks the first entity in line
LIFO	*Last In First Out* – picks the last entity in line
EDD	*Earliest Due Date* – selects the entity whose due date (worksheet 12 – column 7) is the closest in the future or is the more distant in the past
ESD	*Earliest Start Date* – selects the entity with the oldest start date (worksheet 12 – column 6)
HP	*Highest Priority* – selects the entity with the highest priority value (worksheet 12 – column 4)
LP	*Lowest Priority* – selects the entity whose priority value is the smallest
HV	*Highest value* – selects the entity whose current value is the highest
LV	*Lowest value* – selects the entity whose current value is the lowest
SSU	*Same Setup* – prioritizes the entity requesting the same setup (see worksheet #10 – column 6) as the previous entity processed at the station and uses FIFO to select in list of entities with same setup or the list of remaining entities if the first list is empty

Rule	Comments
SPT	*Shortest Processing Time* – selects the entity requesting the shortest processing time. The processing time is defined in worksheet #10 – columns 7 to 11
WINQ	*Work In Next Queue* – selects the entity whose next operation's queue is the shortest
CR	*Critical Ratio* – sorts the entity based on the remaining processing time versus the remaining time until their due date. The most urgent entity according to this ratio is then selected
HRT	*Highest Remaining Time* – selects the entity whose remaining processing time is the highest
LRT	*Lowest Remaining Time (slack)* – selects the entity whose remaining processing time is the lowest

- ### *Column 4: capacity*

Meaning:	maximum number of entities that can be processed simultaneously
Type:	positive integer
Example:	3
Default value:	1
Links:	none
Comments:	(please see columns 5 and 6). A lot of multiples units is considered as a unique entity (see order sheet) when the batch type (see column 5) is xlots, at the contrary to the department and storage sheets. The operation time can nevertheless be defined in function of the number of units (see route sheet), regardless of the batch type.

- ### *Column 5: batch type*

Meaning:	entities grouping when the capacity is greater than 1
Type:	keyword (batch type)
Example:	xpieces
Default value:	xlots
Links:	none

Type	Comments
xpieces	The capacity indicates the number of units that can be processed simultaneously. For example, with a capacity of 10 "xpieces" and an operation time (defined in the routing file, columns 7 to 11) of 2 min per piece, a lot of 43 units will require 10 minutes of processing (4 groups of 10 units + 1 group of 3 units).
Xlots	The capacity indicates the number of lots (regardless of how many units they are) that are to be batched for an operation on this station
Cont	The capacity indicates the maximum number of lots that can be treated simultaneously at the station. These lots are admitted one at a time (continuous loading).

- ### *Column 6: max. waiting time (h)*

Meaning:	maximum delay to wait before admitting a partial batch when the capacity is greater than 1 and the batch type is xlots
Type:	positive real
Example:	3
Default value:	0
Links:	none

- ### *Columns 7,8,9,10: setup time (h)*

Meaning:	time requested to (re)configure the station between two consecutive entities having a different setup code (worksheet 10 – column 6)
Type:	distribution
Example:	UNIF 3 / 2 / 0 (see section “choosing a distribution”)
Default value:	CONS 0 / 0 / 0 (see section “choosing a distribution”)
Links:	none
Comments:	see section “choosing a distribution”

- ### *Column 11: setup cost ($/h)*

Meaning:	cost of configuring the station
Type:	currency
Example:	0
Default value:	0
Links:	none
Comments:	this value is multiplied by the setup time to determine the setup cost.

- ### *Column 12: % efficiency*

Meaning:	the processing time is multiplied by this factor to determine how long it really takes on this station to complete the operation
Type:	positive real
Example:	0.95 (=95%)
Default value:	1 (=100%)
Links:	none
Comments:	[0-1[= underachiever;]1-∞[= overachiever

- ### *Columns 13 to 16: ShiftCal*

Meaning:	shift used by station (it is possible to attach up to 4 shifts to a station)
Type:	string
Example:	DayShift
Default value:	none
Links:	shifts(4)
Comments:	Please see “Shifts (4)” for more details regarding these fields.

Shifts (4)

Shifts are attached to stations (sheet 3).

- ### *Column 1: shift name*

Meaning:	unique name
Type:	string
Example:	DayShift
Default value:	none
Links:	station(3)
Comments:	no default value, the user cannot leave this field blank

- ### *Column 2: off cost ($/h)*

Meaning:	Hourly cost associated with the off duration
Type:	Real
Example:	0.5
Default value:	0
Links:	none

- ### *Column 3: start date*

Meaning:	Date when the calendar is to be started **The calendar start date has to be prior of at least one month to the simulation start date**
Type:	Date in the format mm:dd:yyyy
Example:	01:01:2002
Default value:	none
Links:	none
Comments:	The start date must correspond to the day of the week on which the calendar is due to start. If for example the calendar starts on a Monday and repeats itself five days out of seven (from Monday to Friday) during every cycle (see columns 5 and 6), the day of the starting date must be a Monday (previous of at least one month to the simulation start date).

- ### *Column 4: end date*

Meaning:	Date when calendar is to be stopped
Type:	Date in the format mm:dd:yyyy
Example:	12:31:2002
Default value:	none
Links:	none
Comments:	Date must be greater than the start date The simulation can actually end before the calendar's end date. (The simulation's end date can be prior to the calendar's end date.)

- ### *Column 5: cycle (days)*

Meaning:	Number of days in this shift
Type:	Positive integer
Example:	1
Default value:	7
Links:	none

- ### *Column 6: repeat (days)*

Meaning:	Number of consecutive days which the shift is repeated in the cycle
Type:	Positive integer
Example:	1
Default value:	5
Links:	none
Comments:	Must be less than Cycle

Important note concerning Calendars:

For every shift that has a number of repeat (column 6) which is less than the number of days in the cycle of column five (5 days out of 7 for example) the user must define a second shift indicating the number of days during which the station is not available (2 days out of 7 in our example). If the user does not define this second shift, the station will be available during the days not covered by the repeat period (2 days out of 7 in our example). The user will indicate ABC Planner that the station to which the calendar is attached is down (not available) during the period in question, by defining a second shift and indicating 00:00-00:00 as the ON period (leaving all the fields blank) for all the ON fields. Be careful to indicate a start date, which corresponds to the desired day. If the working calendar is from Monday to Friday for example, and the station is down during the weekend (Saturday and Sunday), the user will have to indicate a starting date for the second calendar that starts on a Saturday. This calendar will have a cycle (column 5) of 7 days and a repeat value of 2 days in column 6. The station will then be down (00:00-00:00) during 2 days out of 7. Be sure to attach the two shifts to the stations to which they apply.

- ### *Column 7 to 14: On time*

Meaning:	Time periods when the shift is operating
Type:	Interval
Example:	07:30-12:45
Default value:	none
Links:	none
Comments:	Use only as many as needed. Leave the rest blank.

Note regarding ON Fields:

The user must use the eight fields in order (ON1 to ON 8). If he skips a field ABC Planner will assume that there is no more data in the next fields. If the first field contains the shift 00:00-00:00, the station to which the calendar is attached will be off during the shift. ABC Planner will consider the interval between two time frames as down time. If for example, the user defines a shift that has the two following time frames 09:00-12:00 and 13:00-17:00, then ABC Planner will interpret that there is a “break” between 12:00 and 13:00 hours. Similarly, the stations to which the calendar is attached will be down from midnight to 9:00 and from 17:00 to midnight the next day. The stations will be on from 9 to 12 and from 13 to 17 hours.

Holidays (5)

Use this sheet to specify a list of Holidays. When multiple calendars are attached to a resource, the OFF state prevails over the ON state.

This sheet need not be completed if there is no holiday.

- ### *Column 1: holiday name*

Meaning: Name of the holiday or off period
Type: String (unique value)
Example: Christmas_2002
Default value: none
Links: none
Comments: no default value, the user cannot leave this field blank

- ### *Column 2: department*

Meaning: department that this holiday applies to
Type: String
Example: Customer_Support
Default value: ALL
Links: dept (1)
Comments: Select ALL to apply to all departments.

- ### *Column 3: off cost ($/h)*

Meaning: Hourly cost associated with the duration of the off period.
Type: Real
Example: 0.5
Default value: 0
Links: none

- ### *Column 4: start date*

Meaning: Date when the calendar is to be started
Type: Date with mm:dd:yyyy:hh:nn format
Example: 12:25:2002:00:00
Default value: none
Links: none

- ### *Column 5: end date*

Meaning: Date when calendar is to be stopped
Type: Date with mm:dd:yyyy:hh:nn format
Example: 12:26:2002:00:00
Default value: none
Links: none

Comments:	Date must be greater than start date

Exceptions (6)

Use this sheet to specify a list of Exceptions. When multiple calendars are attached to a resource, the OFF state prevails over the ON state.

This sheet need not be completed if there is no exception.

- ### *Column 1: exception name*

Meaning:	Name of the exception or off period
Type:	String (unique value)
Example:	Charlie_Dentist
Default value:	none
Links:	none
Comments:	no default value, the user cannot leave this field blank

- ### *Column 2: station*

Meaning:	station that this exception applies to
Type:	String
Example:	Saw1
Default value:	none
Links:	stn (3)

- ### *Column 3: off cost ($/h)*

Meaning:	Hourly cost associated with the duration of the off period.
Type:	Real
Example:	0.5
Default value:	0
Links:	none

- ### *Column 4: start date*

Meaning:	Date when the calendar is to be started
Type:	Date with mm:dd:yyyy:hh:nn format
Example:	07:01:2002:08:00
Default value:	none
Links:	none

- ### *Column 5: end date*

Meaning:	Date when calendar is to be stopped
Type:	Date with mm:dd:yyyy:hh:nn format
Example:	07:01:2002:10:00
Default value:	none
Links:	none

Comments: Date must be greater than start date

Downs (7)

Use this sheet to specify a list of Downs. Typically used to define a preventive maintenance or a breakdown period. When multiple calendars are attached to a resource, the OFF state prevails over the ON state.

This sheet need not be completed if there is no down.

- ### *Column 1: calendar name*

Meaning:	unique name
Type:	string
Example:	break1
Default value:	none
Links:	none
Comments:	no default value, the user cannot leave this field blank

- ### *Column 2: station or employee*

Meaning:	see worksheet #3 – column 1
Type:	string
Example:	Lathe1
Default value:	none
Links:	stations (3)
Comments:	no default value, the user cannot leave this field blank

- ### *Columns 3,4,5,6: ON period (h)*

Meaning:	duration of the period when the station is available
Type:	distribution
Example:	BETA / 2 / 0.8 / 720 (see section “choosing a distribution”)
Default value:	CONS / 0 / 0 / 0 (see section “choosing a distribution”)
Links:	none
Comments:	see section “choosing a distribution”

- ### *Columns 7,8,9,10: OFF period (h)*

Meaning:	duration of the period where the station is not available
Type:	distribution
Example:	CONS / 10 / 0 / 0 (see section “choosing a distribution”)
Default value:	CONS / 0 / 0 / 0 (see section “choosing a distribution”)
Links:	none
Comments:	see section “choosing a distribution”

- ### *Column 11: repair cost ($/h) (optional)*

Meaning: optional hourly cost associated with the OFF duration

Type:	real
Example:	0.5
Default value:	0
Links:	none

- ### *Column 12: start date*

Meaning:	Date when the calendar is to be started
Type:	Date with mm:dd:yyyy:hh:nn format
Example:	07:01:2002:08:00
Default value:	none
Links:	none

- ### *Column 13: end date*

Meaning:	Date when calendar is to be stopped
Type:	Date with mm:dd:yyyy:hh:nn format
Example:	07:01:2002:10:00
Default value:	none
Links:	none
Comments:	Date must be greater than start date

Tool – Auxiliary Resources (8)

This sheet need not be completed if there is no auxiliary resource.

- ***Column 1: tool, vehicle or employee name***

Meaning:	unique name of the resource
Type:	string
Example:	Oper_Stn1
Default value:	none
Links:	routings (10)
Comments:	identifies a resource needed at a certain step or for certain activity in the production process and available in limited quantity.

- ***Column 2: quantity***

Meaning:	number of resources available
Type:	integer
Example:	3
Default value:	1
Links:	none

Part (9)

- ### *Column 1: product or service name*

Meaning:	name of a product reference, a category of services or a type of activity
Type:	string
Example:	10345_WC34
Default value:	none
Links:	routings (10), BOM (11), orders (12), supplies (13)
Comments:	no default value; the user must provide a unique name for this field; used to identify a category of products or services that uses the resources of the system by following a detailed list of activities indicated in the route sheet.

- ### *Column 2,3,4,5: raw material cost ($/u)*

Meaning:	this cost will also be used as the initial value of an item of this product family when it enters the system.
Type:	distribution
Example:	CONS / 3.4 / 0 / 0 (see section "choosing a distribution")
Default value:	CONS / 0 / 0 / 0 (see section "choosing a distribution")
Links:	none
Comments:	see section "choosing a distribution"

- ### *Column 6: final value ($/u)*

Meaning:	default final value of an item of this product type. It can be overwritten by an order specific value (see worksheet 12 – column 8)
Type:	real
Example:	95.99
Default value:	0
Links:	none

- ### *Column 7: initial inventory*

Meaning:	quantity available at the beginning of the simulation
Type:	integer
Example:	3
Default value:	0
Links:	none
Comments:	this field is used only for products to be consumed in an assembly operation. It can also be used in a make-to-stock environment.

Route (10)

The combination of column 1 and column 2 has to be unique.

- ### *Column 1: step ID*

Meaning:	identifier for a step
Type:	string
Example:	10A
Default value:	none
Links:	BOM (11)
Comments:	no default value; the user must provide a value for this field; for readability, the steps for a given product should be listed sequentially in ascending order (without any interruption for any given product).

- ### *Column 2: product or service*

Meaning:	see worksheet #9 – column 1
Type:	string
Example:	10345_WC34
Default value:	none
Links:	part (9), BOM (11), order (12), supply (13)
Comments:	no default value; the user must provide a valid name for this field

- ### *Column 3: department/storage*

Meaning:	see worksheet #1 or #2 – column 1
Type:	string
Example:	Registration
Default value:	none
Links:	departments (1), storage (2)
Comments:	no default value; the user must provide a valid name for this field ; the department or the storage unit must have been identified previously.

- ### *Column 4: tool (auxiliary resources)*

Meaning:	optional, see worksheet #8 – column 1
Type:	string
Example:	Furnace_operator
Default value:	0, meaning that there is no auxiliary resource used at the step
Links:	tool (8)
Comments:	must have been previously identified in the tool sheet.

- ## *Column 5: amount of resources*

Meaning:	number of auxiliary resource(s) requested for the step: positive integer when there is an auxiliary resource attached to the step, 0 otherwise
Type:	integer
Example:	10
Default value:	0 when no auxiliary resource is attached to the step
Links:	none

- ## *Column 6: setup type (optional)*

Meaning:	setup code for the step. Used to decide when the setup time should be taken and for the SSU sequencing rule.
Type:	string
Example:	SET56
Default value:	0
Links:	none
Comments:	can be dependant of the product, tooling, material etc.

- ## *Columns 7,8,9,10: step throughput*

Meaning:	indicates the production rate in items/time or time/items depending on the contents of column 11
Type:	distribution
Example:	UNIF / 25 / 1 / 0 (see section "choosing a distribution")
Default value:	CONS / 0 / 0 / 0 (see section "choosing a distribution")
Links:	none
Comments:	see section "choosing a distribution"

- ## *Column 11: unit*

Meaning:	unit for the step throughput
Type:	keyword
Example:	hpp
Default value:	lph
Links:	none
Comments:	can take a value from the following list:

Unit	Definition	Comments
hpl	*Hour Per Lot*	see worksheet 3 (column 5) for the distinction between lot and piece
hpp	*Hour Per Piece*	
lph	*Lot Per Hour*	
pph	*Pieces per hour*	

- ### *Column 12: operation cost ($/h) (optional)*

Meaning:	optional hourly cost for performing this operation
Type:	currency
Example:	0.34
Default value:	0
Links:	none

- ### *Column 13: value added ($/u) (optional)*

Meaning:	optional value added to the entity for this step.
Type:	currency
Example:	0.45
Default value:	0
Links:	none

BOM (11)

BOM stands for Bill Of Material, it is a mean to detail the components required to build a product (quantities and step). It can be seen as a list of ingredients for a recipe.

This sheet need not be completed if there is no BOM.

- ### *Column 1: component name*

Meaning:	see worksheet #9 – column 1
Type:	string
Example:	BF_345_T1
Default value:	none
Links:	part (9), route (10), order (12), supply (13)
Comments:	no default value; the user must provide a valid name for this field; the name has to be identified in the part (9) sheet (first column).

- ### *Column 2: assembly name*

Meaning:	see worksheet #9 – column 1
Type:	string
Example:	BF_345
Default value:	none
Links:	part (9), route (10), order (12), supply (13)
Comments:	no default value; the user must provide a valid name for this field; the name has to be identified in the part (9) sheet (first column).

- ### *Column 3: components quantity*

Meaning:	number of components required per unit of assembly
Type:	integer
Example:	3
Default value:	1
Links:	none

- ### *Column 4: step*

Meaning:	step in the assembly routing where the component is consumed
Type:	string
Example:	ETAPE_18
Default value:	none
Links:	route (10)
Comments:	no default value; the user must provide a valid name for this field; must be identified in the route sheet (10) (first column).

- ## *Column 5: launch criteria for the components*

Meaning:	details how the components should be supplied for the assembly. ABC Planner supports the automatic launch of components (lot-for-lot method). The assembly lot can launch the components. See the following table for the possible values in this field.
Type:	keyword
Example:	STEP
Default value:	NOLAUNCH
Links:	none
Comment:	the component, which launch criterion is “STEP” or “ELAPSED TIME”, must have a route of at least one step.

Criterion	Comments
ELAPSEDTIME	Fixed delay between the start of the first operation for the assembly and the component start time (in hours)
STEP	Step of the assembly routing at which the component should be launched (“golf ball” concept)
NOLAUNCH	The assembly does not launch an order for the components. The user is responsible for specifying the initial inventory, scheduled supplies or make-to-stock orders for the component.

- ## *Column 6: launch parameter*

Meaning:	parameter used with the launch criterion
Type:	positive real for ELAPSEDTIME string for STEP 0 for NOLAUNCH
Example:	0
Default value:	0, associated with the NOLAUNCH criterion
Links:	none

Order (12)

Note: An order or lot can be a patient or a customer; it's an entity of a given product type (worksheet 9). A lot can be composed of more than 1 item or piece (e.g. an order for 10 pizzas in a restaurant).

- ### *Column 1: lot name*

Meaning:	unique name for the lot, task, person, etc.
Type:	string
Example:	OrderNum2357
Default value:	none
Links:	none
Comments:	no default value; the user must provide a value for this field

- ### *Column 2: product type (Part)*

Meaning:	see worksheet 9 – column 1
Type:	string
Example:	10345_WC34
Default value:	none
Links:	part (9), route (10), BOM (11), supply (13)

- ### *Column 3: quantity (Num Pieces)*

Meaning:	number of units of the product in this lot
Type:	positive integer
Example:	12
Default value:	1
Links:	none

- ### *Column 4: priority*

Meaning:	optional; used in the rules LP or HP
Type:	integer
Example:	1
Default value:	0
Links:	none

- ### *Column 5: category (Lot type)*

Meaning:	type of order
Type:	keyword
Example:	S
Default value:	O
Links:	none
Comments:	O = customer order, S = stock order. Stock orders are stored once completed. Customer orders are shipped immediately upon completion.

- *Column 6: start date*

Meaning:	launch date. Nothing will be attempted on the lot until this date is reached
Type:	date with format mm:dd:yyyy:hh:nn
Example:	12:21:2002:10:00
Default value:	01:01:2002:08:00
Links:	none
Comments:	used also by the ESD rule (see worksheet #3 – column 3).

- *Column 7: due date*

Meaning:	date the lot should be completed; this is a target, not a constraint
Type:	date with format mm:dd:yyyy:hh:nn
Example:	12:23:2002:15:00
Default value:	01:01:2002:08:00
Links:	none
Comments:	used also by the EDD rule (see worksheet #3 – column 3).

- *Column 8: price ($/u) (Sales Value)*

Meaning:	sales value; overwrites the product's sales value (see worksheet 9)
Type:	real
Example:	56.0
Default value:	0
Links:	none

- *Column 9,10,11,12: repeat frequency (h)*

Meaning:	Fixed or stochastic repeat rate for the lot (interval between two repetitions). Second and subsequent lots will have the name appearing in column 1 plus their ordinal index appended at the end.
Type:	distribution
Example:	NORM / 100 / 12 / 0 (see section "choosing a distribution")
Default value:	CONS / 0 / 0 / 0 (see section "choosing a distribution")
Links:	none
Comments:	see section "choosing a distribution"

- *Column 13: amount of repetitions*

Meaning:	number of repetitions when repeated
Type:	integer
Example:	1
Default value:	0
Links:	none

Supply (13)

This sheet need not be completed if there is no Supply order.

- ### *Column 1: order*

Meaning:	unique order reference
Type:	string
Example:	P3456
Default value:	none
Links:	none
Comments:	no default value; the user must provide a value for this field

- ### *Column 2: product*

Meaning:	see worksheet 9 – column 1
Type:	string
Example:	10345_WC34
Default value:	none
Links:	part (9), route (10), BOM (11), order (12)

- ### *Column 3: quantity ordered*

Meaning:	quantity ordered
Type:	positive integer
Example:	12
Default value:	1
Links:	none

- ### *Column 4: scheduled reception date*

Meaning:	date at which the units will be considered as available for processing
Type:	date with format mm:dd:yyyy:hh:nn
Example:	12:21:2002:08:30
Default value:	none
Links:	none

- ### *Column 5: order cost ($/u)*

Meaning:	ordering cost per unit
Type:	currency
Example:	12.5
Default value:	0
Links:	none

- ### *Column 6,7,8,9: repeat frequency (h)*

Meaning:	allows periodic reception of supplies
Type:	distribution
Example:	CONS / 10 / 0 / 0 (see section “choosing a distribution”)
Default value:	CONS / 0 / 0 / 0 (see section “choosing a distribution”)
Links:	none
Comments:	see section “choosing a distribution”

- ### *Column 10: amount of repetitions*

Meaning:	number of supply order repetitions
Type:	integer
Example:	1
Default value:	0
Links:	none
Comment:	When the last repetition is accomplished, the order is deactivated.

System Information (14)

- ### *Column 1: model name*

Meaning:	Name as it was spelled when the model was created. This value is added automatically at creation. The name cannot be modified.
Type:	string without space or special characters
Example:	ABCModel
Default value:	chosen name
Links:	none
Comments:	The user must not change the model name.

- ### *Column 2: indirect costs ($/h)*

Meaning:	Total indirect costs associated with the use of the system (calculated per hour)
Type:	real
Example:	2.45
Default value:	0
Links:	none
Comments:	calculated per hour simulated

Comments (15)

- ### *Column 1: Comments*

Meaning:	The user can use this field to enter comments regarding the model.
Type:	any alphanumeric character
Example:	Master Scheduling Model…
Default value:	none
Links:	none
Comments:	This sheet is not used by the simulation engine.

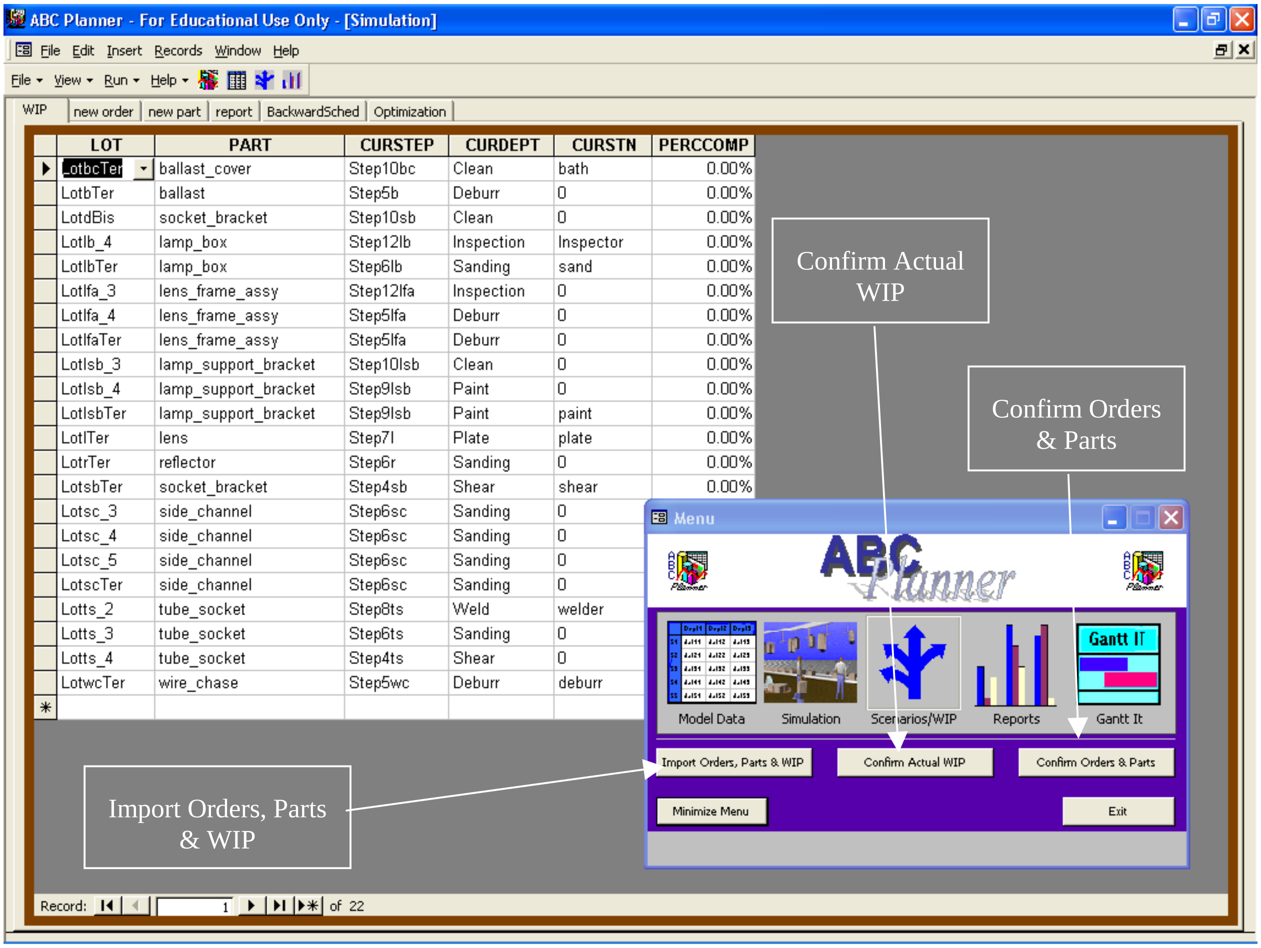
Scenarios/WIP Sheets

The WIP Sheet can be accessed by pressing the Scenarios/WIP Button of the Floating Menu (following figure) or through the View Menu. The WIP Sheet contains all the information regarding the Work In Process of the production system. The user can either use the real WIP, which needs to be entered on a daily bases (or imported from an ERP or a Shop Floor system) or use the simulated WIP. The simulated WIP is the WIP, which theoretically exists in the production system, based on the last simulation. The real WIP is created by saving the data entered in the WIP Sheet for later usage. The user must press the Confirm Actual WIP Button on the Floating Menu to save the entered WIP. To import the WIP (Simulated or Real), the user presses the Import Orders, Parts & WIP Button. The software will then ask the user if he “Would like to import the Actual WIP?” If the user accepts, the Real WIP will be imported into the WIP Sheet. If the user refuses, the simulated WIP will be imported. The user can then eventually make adjustments and save the WIP for future usage.

The following information needs to be provided to the system in order to use the WIP.

The Lot for which there is WIP must be entered in the first column. The Lot must exist in the main Orders Sheet. The Part corresponding to the Lot must be indicated. The user must indicate the Current Step (CURSTEP), the Current Department (CURDEPT) and the Current station (CURSTN) at which the Part is. If the Part is in a Department but not being processed, the value 0 must be entered. The user finally indicates the completion percentage of the Part at the corresponding Step. During a future Simulation using the WIP, the system will deduct the time for process at the appropriate step, corresponding to the completion percentage.

The Import Orders, Parts & WIP Button of the Floating Menu also imports the Orders and the Parts existing in the Main Orders and Parts Sheets into the Scenarios Orders and Parts Sheets. The user can use these sheets for what-if analysis, by adding new Orders and Parts without affecting the Main Orders and Parts Sheets. He can nevertheless export these new Scenario Orders and Parts into the Main Sheets if he whishes, by pressing the Confirm Orders and Parts Button.



Scenarios WIP Sheet

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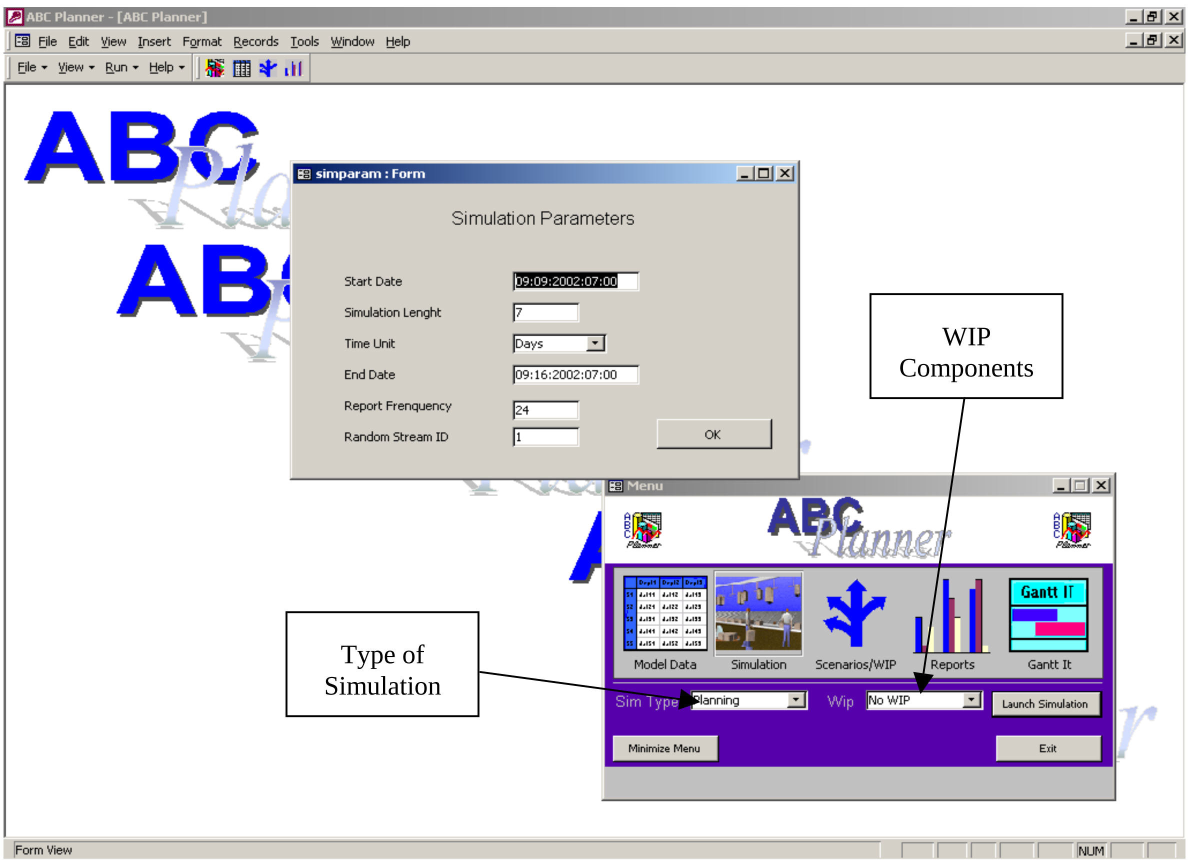
CHAPTER 5: RUNNING A SIMULATION

When the user launches a simulation, the software displays the dialog shown below into which the user must enter information regarding simulation parameters. Before launching the Simulation, the user must select the type of Simulation he wishes to execute: Planning or Scenario. The Planning alternative should be used for the operational Scheduling of activities, while the Scenario Simulation may be used for what-if analysis. When one selects the Scenario alternative, the Planning results of any previous Simulation are not overwritten by the Scenario execution. The user can thus proceed to multiple what-if analysis without overwriting the Planning scheduled. Furthermore, the user must indicate to the Simulator, if the WIP should be used or not for the Simulation.



Simulation Parameters Window

ABC Planner asks the user to provide it the following information:

1) Start Date of simulation;
2) Length of simulation, indicated either in days, hours, minutes or seconds;
3) Simulation end date will be calculated automatically by software based on start date and length of simulation;
4) The report frequency (in hours) is used to generate periodic snapshot of the inventory per product (partinv.gph) and per department (deptinv.gph) as well as the station utilization

(stnutil.gph). Value 0 means that no report will be produced. The snapshots are used for calculating aggregate data.

5) The random stream ID is used to pick a starting value in the random stream and leads to different simulation results between simulation runs when changed, when probabilistic distributions are used in the model. The user can enter any integer value between 0 and 99 (i.e. up to 100 different runs can be made with same data and other parameters unchanged).

When a simulation is launched, the model is validated. If an error occurs during the validation process, the simulation is interrupted. If no error is encountered, the simulation starts. To end the simulation before it completes, one can select the Stop Execution Sub Menu from the Run Menu. Meanwhile, this will only indicate ABC Planner to stop waiting for the end of the simulation, but does not stop the simulation process. To stop the simulation engine, one must cancel the amrun process through the Task Manager (accessed by simultaneously holding the Ctrl – Alt – Delete keys).

Once the simulation is completed, ABC Planner imports the report files that were generated during the simulation.

CHAPTER 6: REPORTS

6.1 Data Reports

There are 19 spreadsheet-like data reports in ABC Planner, which provide statistics regarding performance of the different components of the system and inventory and resource utilization. There is also a report that lists all the actions that have occurred during the simulation.

The information contained in the spreadsheet-like data reports give a global representation of the system and the activities that have been accomplished between the start and the end of the simulation. The information is compiled during the simulation. The reports integrate supplementary information regarding the simulation every time that a "notable" event occurs, like the exit of a lot of the system or the end of a production step for instance. These summary reports contain information on quantities, duration and minimum, maximum and average actual costs.

dept - dept wip	Information regarding WIP for department
dept - stock/dept	Information regarding stocks per department
dept - eff/dept	Information regarding efficiency per department
stn - stn wip	Information regarding WIP for stations
stn - eff/stn	Information regarding efficiency per station
part - part wip	Information regarding WIP for parts
part - stock/part	Information regarding stocks per part
part - eff/part	Information regarding efficiency per part
lot - lot	Information regarding lots
lot - eff/lot	Information regarding efficiency per lots
seq	Information regarding production sequence
step	Information regarding production steps
tool	Information regarding tools
syst - syst wip	Information regarding WIP for the production system
syst - syst stock	Information regarding stocks for the production system
syst - syst eff	Information regarding efficiency for the production system

The following tables contain the definition of each field of data:

Column	Report Category	Comments
%UTIL	stn	Percentage of use (average load / capacity)
%DOWN	stn	Percentage of time spent in mode *unavailable*
%IDLE	stn	Percentage of time spent in mode *available*
%PROC	dept, lot, part, stn, step, syst	Percentage of time spent in mode *processing* (from the lot perspective and regardless of the station capacity)
%SETUP	dept, lot, part, stn, step, syst	Percentage of time spent in mode *setup*
%WAITDOWNSTN	dept, lot, part, step, syst	Percentage of time spent in mode *wait for down station* (the operation is started, but the station becomes unavailable)
%WAITFORSTN	dept, lot, part, step, syst	Percentage of time spent in mode *wait for station* (the operation is not started yet and the lot waits for a station to be free)
%WAITINDEPT	dept, lot, part, step, syst	Percentage of time spent in mode *wait for next department* (the operation is completed and the lot waits for entering the next dept)
AVGCOST	dept, part, stn, step, syst	Average cost by lot produced
AVGEARLINESS	part, syst	Average lot completion earliness (hours)
AVGLATENESS	part, syst	Average lot completion tardiness (hours)
AVGPROC***	dept, part, stn, step, syst	*** = COST, TIME average processing time and cost per lot
AVGSETUP***	dept, part, stn, step, syst	*** = COST, TIME average setup time and cost per lot
AVGVALUEADDED	dept, part, stn, syst	Average value added per lot
AVGWAITDOWNSTN***	dept, part, step, syst	*** = COST, TIME average waiting for down station time and cost per lot
AVGWAITFORSTN***	dept, part, step, syst	*** = COST, TIME average waiting for station time and cost per lot
AVGWAITINDEPT***	dept, part, step, syst	*** = COST, TIME average waiting for next department time and cost per lot
CAPACITY	dept, stn	Storage capacity
COST	dept, lot, part, stn, step, syst	total production cost
DEPT	dept, step	Department or storage name
DOWNTIME	Stn	total down time (hours)
IDLETIME	Stn	total idle time (hours)
INDIRECTCOST	Syst	total indirect cost for the period of the simulation
INVVAL***	dept, part, syst	*** = CUR, AVG, MAX current, average and maximal value of the work in process
LOTDONE	dept, part, stn, step, syst, tool	Number of lots completed
LOTSTART	dept, part, stn, step, syst, tool	Number of lots started
NUMEARLY	part, syst	Number of lots completed early
NUMLATE	part, syst	Number of lots completed late
NUMRES	Tool	Number of auxiliary resources
PART	part, lot, step	Product or service name
PROCCOST	dept, lot, part, stn, step, syst	total processing cost

Column	Report Category	Comments
PROCTIME	lot, stn	total processing time (hours)
REPAIRCOST	Stn	total repair cost
SETUPCOST	dept, lot, part, stn, step, syst	total *setup* cost
#SETUP	Stn	Number of setups performed
SETUPTIME	lot, stn	total *setup* time (hours)
STEP	Step	step name
STN	Stn	station name
STOCKINIT	dept, part, syst	initial inventory on-hand
STOCK***	dept, part, syst	*** = CUR, AVG, MAX current, average and maximal inventory quantity (finished goods, components, raw material)
STOCKCOST	dept, part, syst	total stock cost
STOCKVALUE***	dept, part, syst	*** = CUR, AVG, MAX current average and maximal inventory value
STOCKPCSADDED	dept, part, syst	Quantity added to stock
STOCKPCSREMOVED	dept, part, syst	Quantity removed from stock
SUPPLYCOST	part, syst	raw material and supply cost
SYSTEM	Syst	model name
TIMEBEFORESYST	Lot	Waiting time before initial admission in the system (hours)
TIMINDEPT***	Dept	*** = AVG, MIN, MAX average, minimal and maximal time in a department (hours)
TIMINSTEP***	Step	*** = AVG, MIN, MAX average, minimal and maximal time to accomplish a step (hours)
TIMEINSTOCKAVG	dept, part, syst	Average time in stock per unit (hours)
TIMINSYST	Lot	time in system per lot (hours)
TIMINSYST***	part, syst	*** = AVG, MIN, MAX average, minimal and maximal time in system per lot (hours)
RESOURCE	Tool	Auxiliary resource name
VALUEADDED	dept, lot, part, stn, step, syst	total value added
WAITDOWNSTNCOST	dept, lot, part, step, syst	total down station cost
WAITDOWNSTNTIME	Lot	total wait for down station time (hours)
WAITFORSTNCOST	dept, lot, part, step, syst	total wait for station cost
WAITFORSTNTIME	Lot	total wait for station time (hours)
WAITINDEPTCOST	dept, lot, part, step, syst	total wait for next department cost
WAITINDEPTTIME	Lot	total wait for next department time (hours)
WIPLOT***	dept, part, stn, step, syst, tool	*** = CUR, AVG, MAX current, average and maximal inventory (measured in lots, regardless of their number of units)
WIPLOTDEPT***	Stn	*** = CUR, AVG, MAX current, average and maximal inventory in the station’s department (measured in lots, regardless of their number of units)
WIPPCS***	dept, part, step, syst	*** = CUR, AVG, MAX current, average and maximal inventory (measured in pieces)

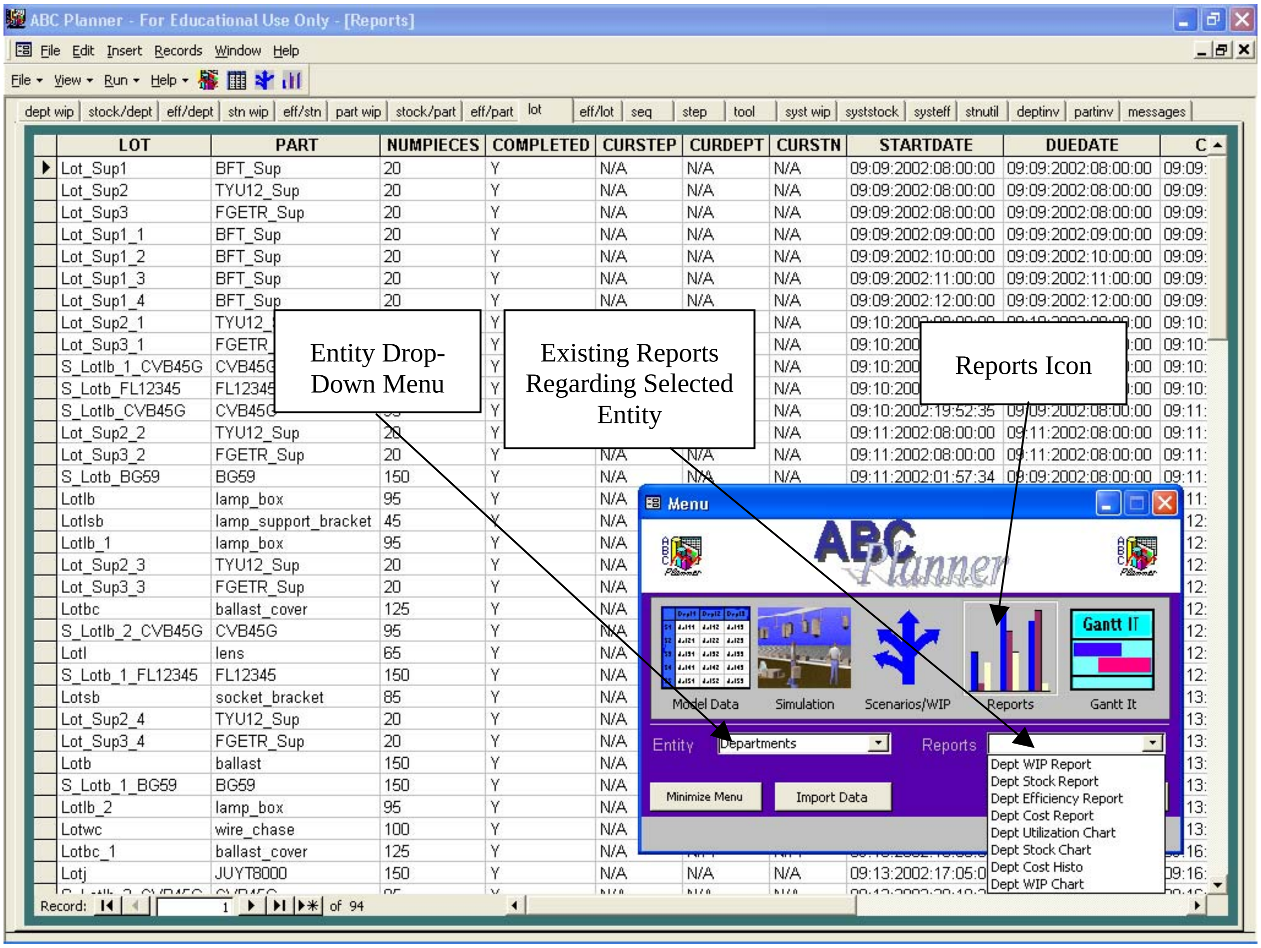
Note: if some activities are in progress when the simulation completes and the final reports are printed, these activities will not be accounted in the time, cost and quantity statistics except for the ***CUR and ***START <u>quantity</u> statistics.

Column	Report	Comments
COMPDATE	lot	completion date
COMPLETED	lot	flag: “Y” if the lot is completed, “N” if WIP
CURDEPT	lot	current department if WIP
CURSTEP	lot	current step if WIP
CURSTN	lot	current station if being processed
DEPT	seq	step’s department (I/O)
DUEDATE	lot	target due date
ENDDATE	seq	step’s completion date
LOT	lot, seq	lot’s name (I/O)
NUMPIECES	lot, seq	lot size (I/O)
PART	lot, seq	product type (I/O)
PROC	seq	total processing time for the step in hours
SETUP	seq	total setup time for the step in hours
STARTDATE	Lot	lot’s simulation start date
STEP	seq	step ID (I/O)
STN	seq	station where the operation has been done
WAITFORDOWNSTN	seq	total waiting for down station time in hours
WAITFORSTN	seq	total waiting for station time in hours
WAITINDEPT	seq	total waiting for next department time in hours

Column	Report	Comments
CAPACITY	stnutil, deptinv	Capacity (# of lots) (I/O)
CURUTIL	Stnutil	current utilization (# of lots)
CURWIPCOST	Deptinv	current inventory cost
CURWIPLOT	Deptinv	current inventory (# of lots)
CURWIPPCS	Deptinv	current inventory (# units)
CURWIPVAL	Deptinv	current inventory value
DEPT	Deptinv	department (I/O)
STN	Stnutil	station (I/O)
TIME	stnutil, deptinv	observation time (absolute value in seconds)
VALADDED	Stnutil	total value added to date

6.2 Reports, Histograms and Charts

Many of the data contained in the spreadsheet-like report can be visualized with the help of reports, histograms and charts. There are 5 entities for which one can obtain these types of report: Departments; Stations; Parts; Lots and Steps. The user accesses the reports by selecting the Reports Button of the Floating Menu as indicated in the figure here after.



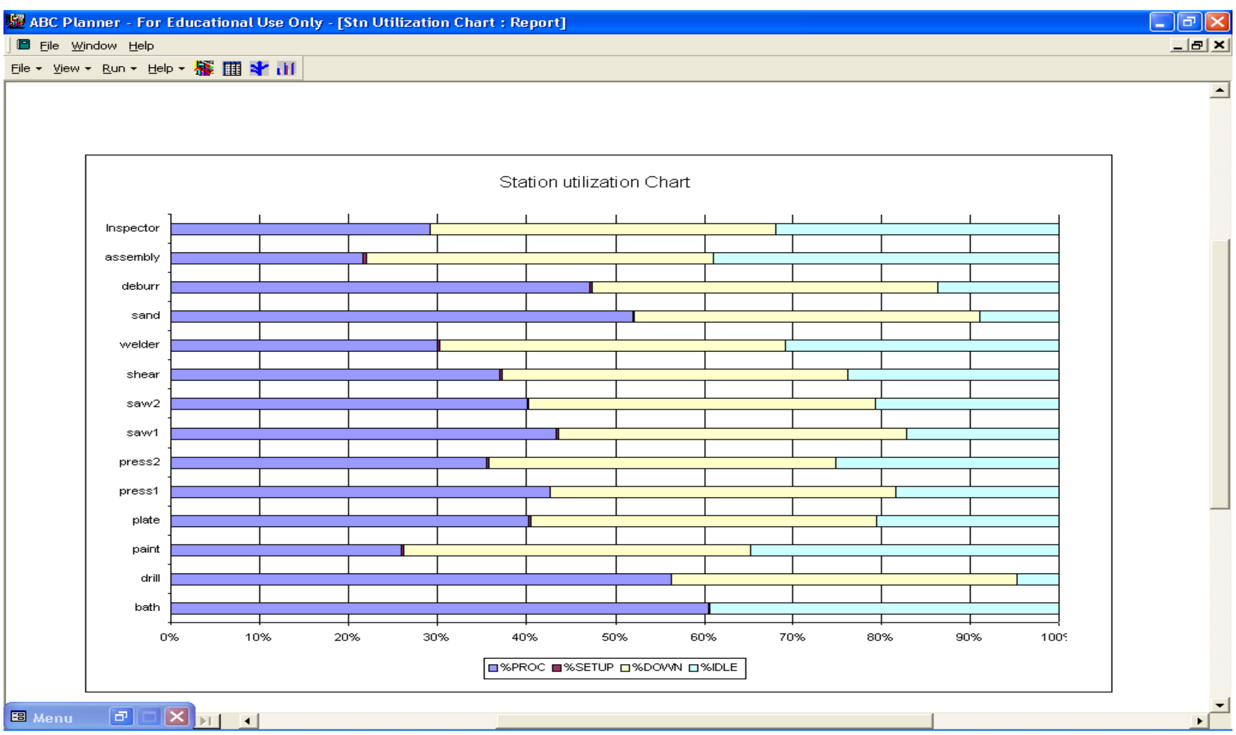
Once the user has selected the appropriate entity, he then must select the desired report displayed in the list of existing reports from the Reports drop-down Menu situated at the right of the Entity drop-down Menu on the Floating Menu. The list of existing reports changes based on the selected Entity.

The existing reports for each Entity are the following:

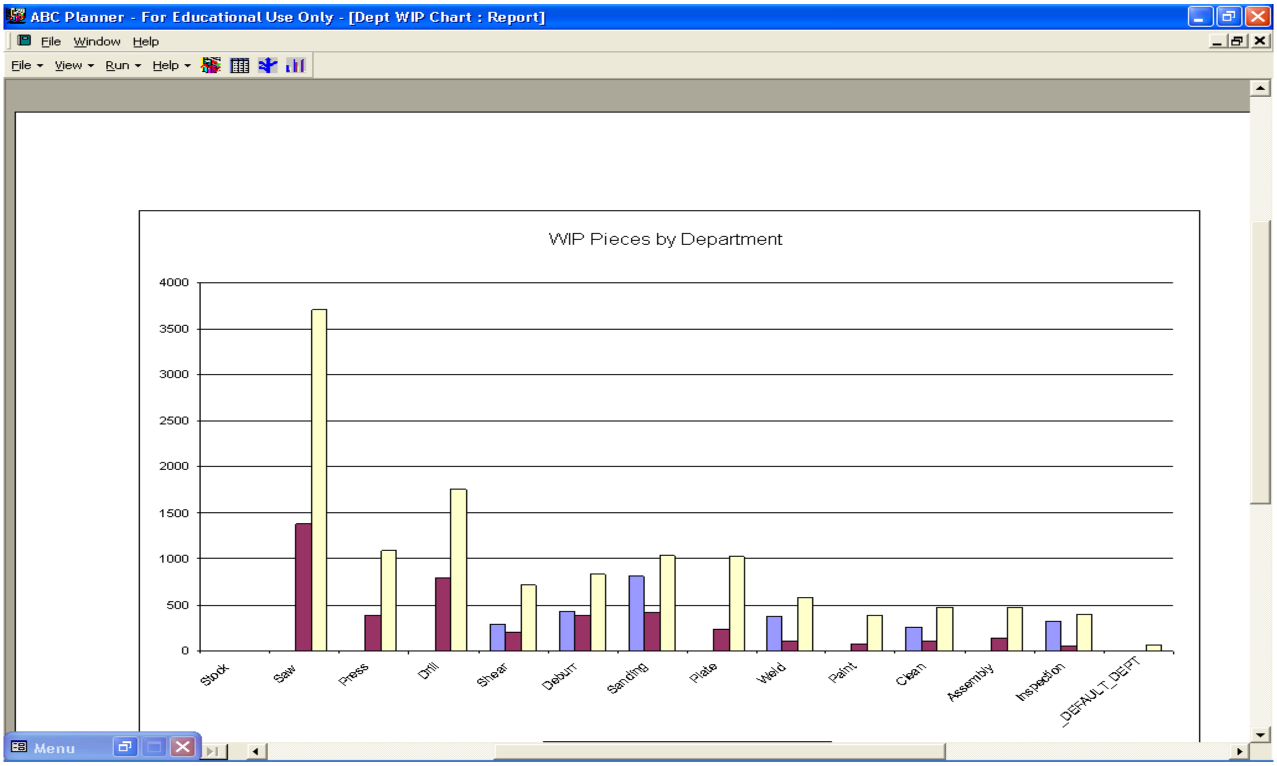
Entity	Report
Departments	Department WIP Report
Departments	Department Stock Report
Departments	Department Efficiency Report
Departments	Department Cost Report
Departments	Department Utilization Chart

Departments	Department Stock Chart
Departments	Department Cost Histogram
Departments	Department WIP Chart
Stations	Station WIP Report
Stations	Station Efficiency Report
Stations	Station Cost Report
Stations	Station Utilization Chart
Parts	Parts WIP Report
Parts	Parts Stock Report
Parts	Parts Efficiency Report
Parts	Parts Cost Report
Lots	Lots WIP Report
Lots	Lots Efficiency Report
Lots	Lots Cost Report
Steps	Steps WIP Report
Steps	Steps Efficiency Report
Steps	Steps Cost Report
Steps	Dispatch List

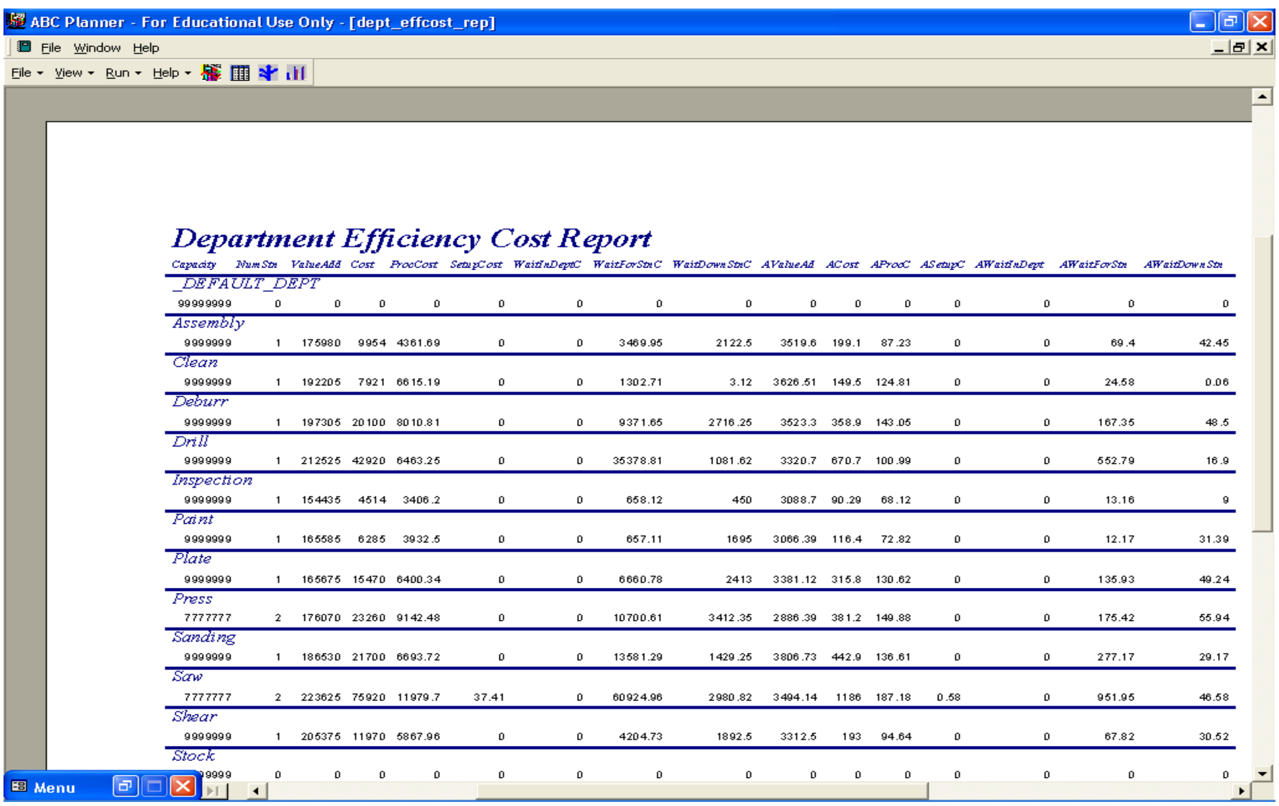
The following 4 figures display examples of Reports:



Station Utilization Chart



WIP Pieces by Department



Department Efficiency Cost Report

	Capacity	NumStn	ValueAdd	Cost	ProcCost	SetupCost	WaitInDeptC	WaitForStnC	WaitDownStnC	AValueAd	ACost	AProcC	ASetupC	AWaitInDept	AWaitForStn	AWaitDownStn
_DEFAULT_DEPT	99999999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Assembly	9999999	1	175980	9954	4361.69	0	0	3469.95	2122.5	3519.6	199.1	87.23	0	0	69.4	42.45
Clean	9999999	1	192205	7921	6615.19	0	0	1302.71	3.12	3626.51	149.5	124.81	0	0	24.58	0.06
Deburr	9999999	1	197305	20100	8010.81	0	0	9371.65	2716.25	3523.3	358.9	143.05	0	0	167.35	48.5
Drill	9999999	1	212525	42920	6463.25	0	0	35378.81	1081.62	3320.7	670.7	100.99	0	0	552.79	16.9
Inspection	9999999	1	154435	4514	3406.2	0	0	658.12	450	3088.7	90.29	68.12	0	0	13.16	9
Paint	9999999	1	165585	6285	3932.5	0	0	657.11	1695	3066.39	116.4	72.82	0	0	12.17	31.39
Plate	9999999	1	165675	15470	6400.34	0	0	6660.78	2413	3381.12	315.8	130.62	0	0	135.93	49.24
Press	7777777	2	176070	23260	9142.48	0	0	10700.61	3412.35	2886.39	381.2	149.88	0	0	175.42	55.94
Sanding	9999999	1	186530	21700	6693.72	0	0	13581.29	1429.25	3806.73	442.9	136.61	0	0	277.17	29.17
Saw	7777777	2	223625	75920	11979.7	37.41	0	60924.96	2980.82	3494.14	1186	187.18	0.58	0	951.95	46.58
Shear	9999999	1	205375	11970	5867.96	0	0	4204.73	1892.5	3312.5	193	94.64	0	0	67.82	30.52
Stock	9999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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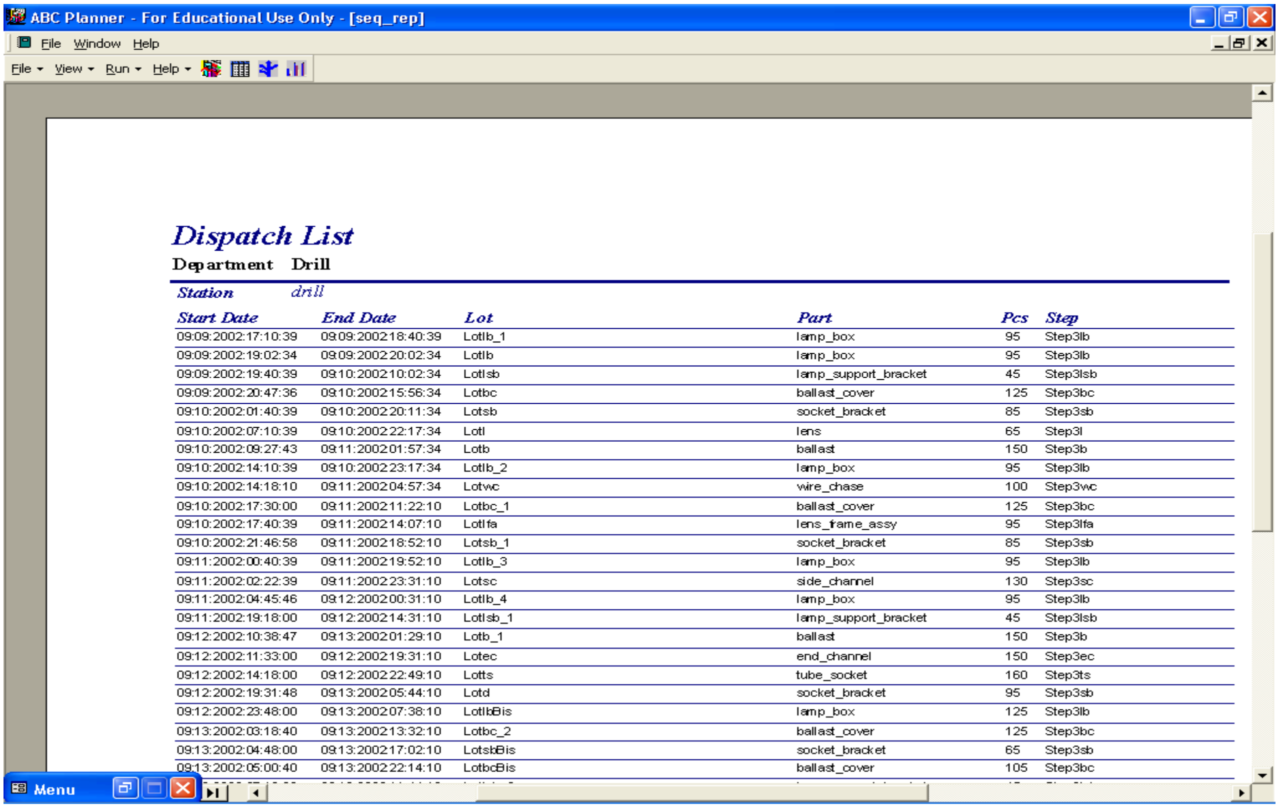
Department Efficiency Cost report



Dispatch List

Department Drill

Station *drill*

Start Date	End Date	Lot	Part	Pcs	Step
09:09:2002:17:10:39	09:09:200218:40:39	Lotlb_1	lamp_box	95	Step3lb
09:09:2002:19:02:34	09:09:200220:02:34	Lotlb	lamp_box	95	Step3lb
09:09:2002:19:40:39	09:10:200210:02:34	Lotlsb	lamp_support_bracket	45	Step3lsb
09:09:2002:20:47:36	09:10:200215:56:34	Lotbc	ballast_cover	125	Step3bc
09:10:2002:01:40:39	09:10:200220:11:34	Lotsb	socket_bracket	85	Step3sb
09:10:2002:07:10:39	09:10:200222:17:34	Lotl	lens	65	Step3l
09:10:2002:09:27:43	09:11:200201:57:34	Lotb	ballast	150	Step3b
09:10:2002:14:10:39	09:10:200223:17:34	Lotlb_2	lamp_box	95	Step3lb
09:10:2002:14:18:10	09:11:200204:57:34	Lotwc	wire_chase	100	Step3wc
09:10:2002:17:30:00	09:11:200211:22:10	Lotbc_1	ballast_cover	125	Step3bc
09:10:2002:17:40:39	09:11:200214:07:10	Lotlfa	lens_frame_assy	95	Step3lfa
09:10:2002:21:46:58	09:11:200218:52:10	Lotsb_1	socket_bracket	85	Step3sb
09:11:2002:00:40:39	09:11:200219:52:10	Lotlb_3	lamp_box	95	Step3lb
09:11:2002:02:22:39	09:11:200223:31:10	Lotsc	side_channel	130	Step3sc
09:11:2002:04:45:46	09:12:200200:31:10	Lotlb_4	lamp_box	95	Step3lb
09:11:2002:19:18:00	09:12:200214:31:10	Lotlsb_1	lamp_support_bracket	45	Step3lsb
09:12:2002:10:38:47	09:13:200201:29:10	Lotb_1	ballast	150	Step3b
09:12:2002:11:33:00	09:12:200219:31:10	Lotec	end_channel	150	Step3ec
09:12:2002:14:18:00	09:12:200222:49:10	Lotts	tube_socket	160	Step3ts
09:12:2002:19:31:48	09:13:200205:44:10	Lotd	socket_bracket	95	Step3sb
09:12:2002:23:48:00	09:13:200207:38:10	LotlbBis	lamp_box	125	Step3lb
09:13:2002:03:18:40	09:13:200213:32:10	Lotbc_2	ballast_cover	125	Step3bc
09:13:2002:04:48:00	09:13:200217:02:10	LotsbBis	socket_bracket	65	Step3sb
09:13:2002:05:00:40	09:13:200222:14:10	LotbcBis	ballast_cover	105	Step3bc

Dispatch List

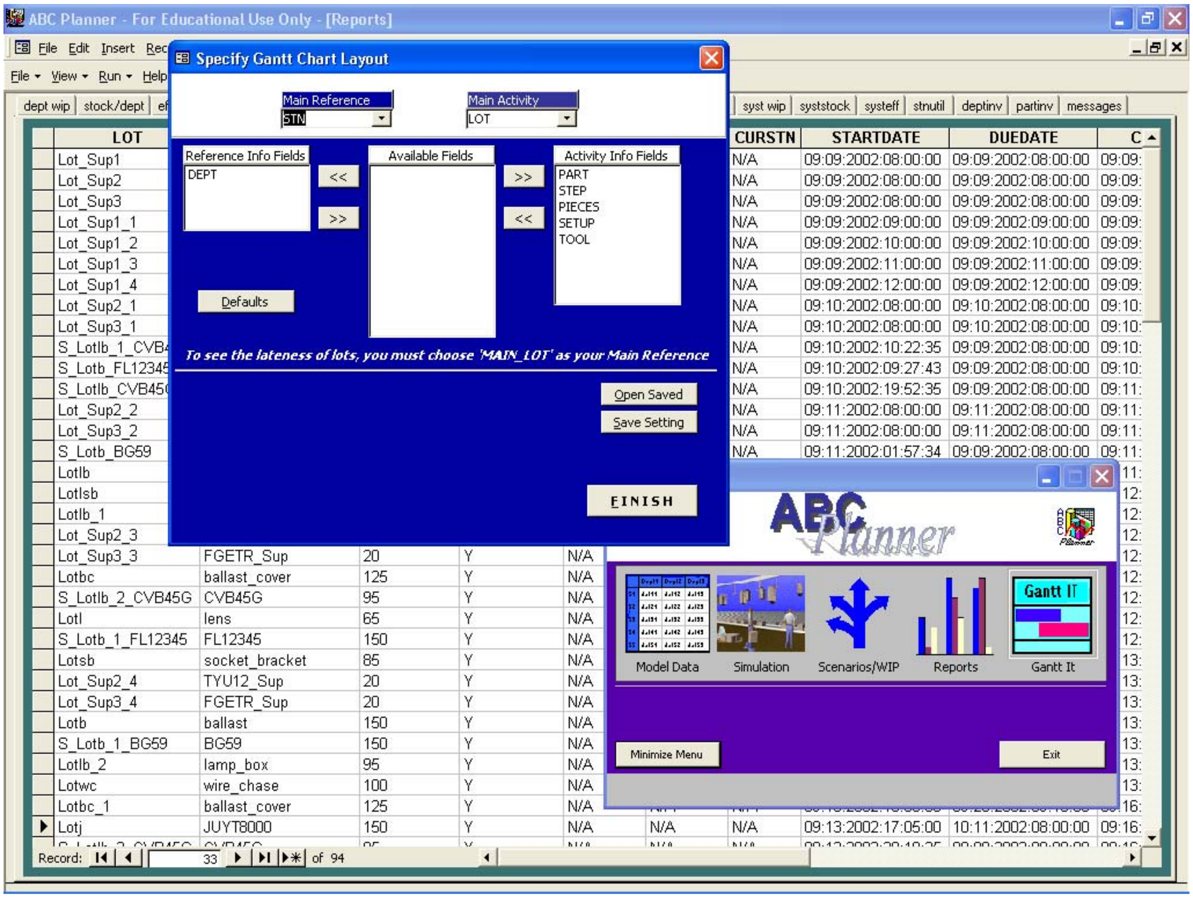
The Dispatch List contains the Start Date (by date and time) and End Date of each produced Part for every Station of the system. It is possible to distribute this report to all operators of a production system, in order for them to follow the sequence of production. By respecting the indicated sequence, operators contribute to the respect of the production schedule.

6.3 Frequency of Reports for Aggregated Statistics

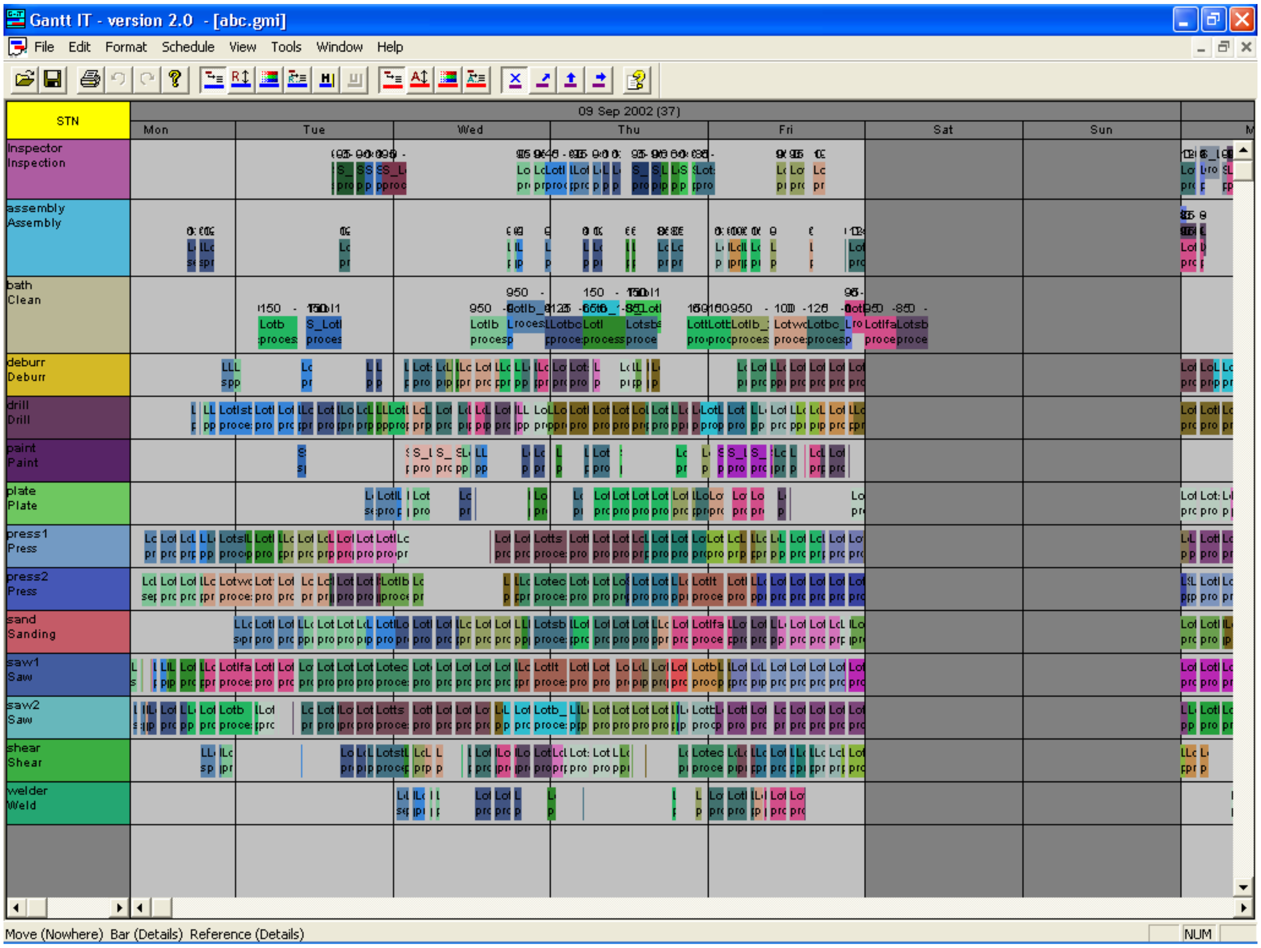
The frequency at which the aggregated statistics are compiled is defined by the user with the help of the dialog box into which the parameters of the simulation are entered. The aggregated statistics enable the user to have a trace (at every time unit that he chooses) of the evolution of the stocks and of the utilization of the stations.

6.4 Gantt Charts

It is possible to visualize all the simulated activities of the system with Gantt Charts by using Gantt It, which is thoroughly integrated to ABC Planner. The user can launch Gantt It directly from ABC Planner by pressing the Gantt It Button of the Floating Menu. By pressing this Button, ABC Planner will display a dialog box into which the user will be asked to enter certain parameters, enabling Gantt It to display the data in the desired format. Please refer to the Gantt It documentation for further information on Gantt It. The following figures display the Gantt It dialog box launched by ABC Planner and an example of Gantt Charts created by Gantt It.



Dialog Box launched by ABC Planner



Gantt Charts created by Gantt It

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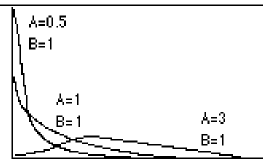
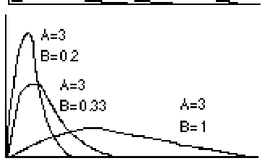
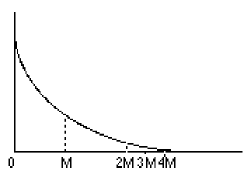
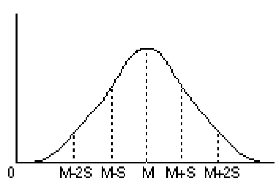
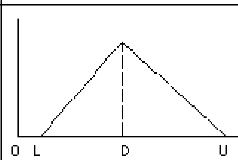
CHAPTER 7: CHOOSING A DISTRIBUTION

There are several fields related to the use of distributions in ABC Planner. The first column contains a keyword establishing the distribution type (BETA, BINO, CONS, GAMM, EXPO, NORM, POIS, TRIA, UNIF, WEIB). The last three fields are used to enter the parameters of the distribution. Depending on the distribution type, 1, 2 or 3 parameters are necessary.

When some parameters are not required for a distribution, the related fields should be left to 0.

The default distribution is the CONS distribution, which necessitates only one parameter.

The following table describes the distributions defined in ABC Planner.

Distribution	Example	Parameters	Description
GAMM – Gamma		A,B	A >0 B is the scale, B >0 Domain: [0, ∝) Mean: AB Peek: A-1
CONS – Constant		C	Constant value, C
EXPO – Exponential		M	Mean: M 63% of values < M, 14% > 2M, 5% > 3M, 2% > 4M Domain: [0, ∝) Peek: 0
NORM – Normal		M,S	Mean: M Standard deviation: S >0 68,7% of values between M-S and M+S 95.5% of values between M-2S and M+2S Peek: M Domain: (-∝, ∝)
TRIA – Triangular		L,D,U	Minimum (L), peek (D), maximum (U) Domain: [L, U] Peek: D

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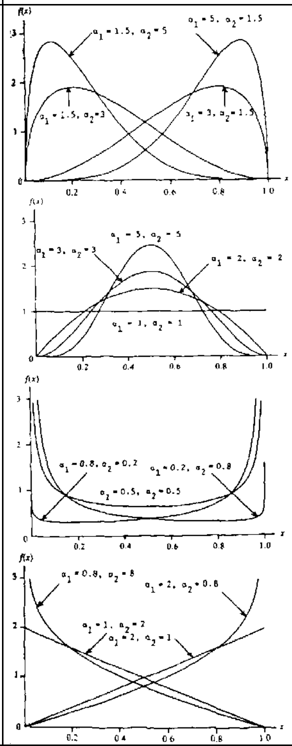
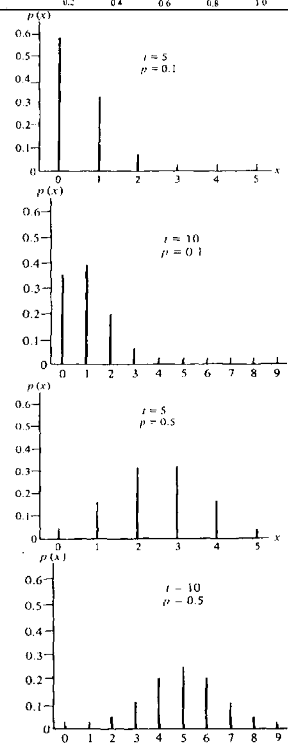
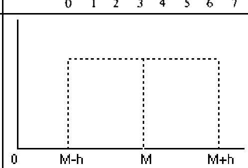
Distribution	Example	Parameters	Description
BETA – Beta		α_1 , α_2, b	α_1, α_2, b positive real values mean: b (α_1 / α_1 + α_2) domain: [0,b] The following approximations are of interest for determining the peeks P: α_1=(M) (2P – b)/(P-M)(b) α_2=α_1 (b-M) / M
BINO – Binomial		t, p	t positive integer p, real, 0 < p < 1 Domain: {0,1,…,t}
UNIF – Uniform		M, h	Mean (M), deviation (h) Domain: [M-h, M+h]

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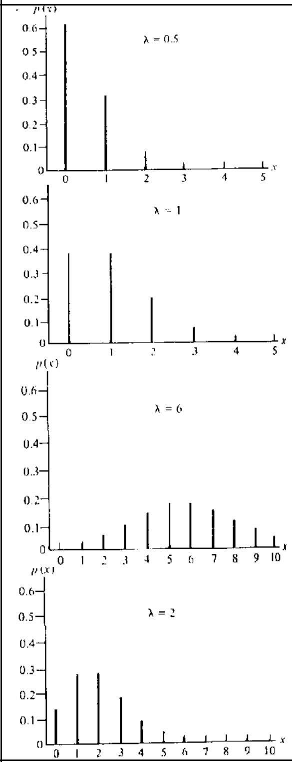
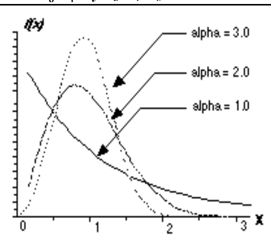
Distribution	Example	Parameters	Description
POIS – Poisson		λ	Mean λ > 0 Peeks λ-1and λ, or the integer part of λ if λ is not an integer Domain: {0,1,…}
WEIB – Weibull		α, β	Alpha (shape) > 0, beta (scale) >0 Mean: β/α Γ(1/α) Peek: β (α-1/α) $^{1/\alpha}$ (if α<1, 0) Domain: [0,∝)

CHAPTER 8: EXAMPLES

8.1 Machining and assembly workshop

Situation

Fiat Lux Inc. manufactures industrial lighting equipment. There are 12 different departments in the facility and 18 work centers as detailed below :

- Saw (2 work centers – saw1 and saw2)
- Press (2 work centers – press1 and press2)
- Drill (1 work center – drill1)
- Shear (1 work center – shear1)
- Deburr (1 work center – deburr1)
- Sanding (1 work center – sand1)
- Inspection (1 work center – inspector1)
- Weld (1 work center – welder1)
- Clean (8 work centers – bath1 to bath8)
- Plate (1 work center – plate1)
- Paint (1 work center – paint1)
- Assembly (1 line – assembly1)

Finished lamp (FL12345)
- Lamp box (1)
- Reflector (1)
- Socket bracket (2)
- Wire chase (1)
- Ballast cover (1)
- Lamp support bracket (3)
- Lens (1)
- Ballast (1)
- Lens frame assembly (1)
  - Side channel (2)
  - End channel (2)
- Tube socket (6)
- Lamp tube (3)

The products manufactured require the same types of components but vary on the quantity of lamps. The figure on the right shows the typical structure of a finished product. The steps for producing the various elements are detailed below.

Lamp box

Step	Department	Standard time / throughput
1	Saw	5 min/piece
2	Shear	9 min/piece
3	Sanding	2 min/piece
4	Drill	7 min/piece
5	Inspection	10 min/lot
6	Weld	5 min/piece
7	Clean	120 pieces/h
8	Paint	50 lot/h
9	Delay	1 h/lot
10	Paint	45 lot/h
11	Delay	2 h/lot
12	Inspection	3 sec/piece

Channel (side/end)

Step	Department	Standard time / throughput
1	Saw	5 min/piece
2	Sanding	2 min/piece
3	Drill	2 min/piece
4	Inspection	10 min/lot

Lens frame assembly

Step	Department	Standard time / throughput
1	Weld	7 min/piece
2	Inspection	10 min/lot
3	Clean	3 min/piece
4	Paint	70 lot/h
5	Delay	1 h/lot
6	Paint	60 lot/h
7	Delay	2 h/lot
8	Inspection	3 sec/piece

Ballast cover

Step	Department	Standard time / throughput
1	Saw	3 min/piece
2	Formage	4 min/piece
3	Sanding	2 min/piece

4	Shear	4 min/piece
5	Inspection	10 min/lot
6	Clean	6 pieces/min
7	Plating	1.2 min/piece
8	Inspection	3 sec/piece

Socket bracket

Step	Department	Standard time / throughput
1	Saw	3 min/piece
2	Formage	2.5 min/piece
3	Sanding	1 min/piece
4	Drill	3 min/piece
5	Inspection	10 min/lot
6	Weld	3 min/piece
7	Clean	6 pieces/min
8	Paint	20 sec/piece
9	Delay	1 h/lot
10	Paint	30 lot/h
11	Delay	2 h/lot
12	Inspection	3 sec/piece

Reflector

Step	Department	Standard time / throughput
1	Saw	5 min/piece
2	Formage	6 min/piece
3	Sanding	2 min/piece
4	Shear	5 min/piece
5	Inspection	10 min/lot
6	Clean	6 pieces/min
7	Plating	1.2 min/piece
8	Inspection	3 sec/piece

Finished lamp FL12345

Step	Department	Standard time / throughput
1	Assembly	5 min/piece
2	Inspection	5 min/lot

The other components are whether subcontracted, whether bought on the market:

- ballast: receipt of a 25 units lot every 8 hours
- lamp support bracket: receipt of a 150 units lot every 8 hours
- tube socket: receipt of a 225 units lot every 24 hours
- lamp tube: receipt of a 75 units lot every 8 hours
- lens: receipt of a 25 units lot every 8 hours
- wire chase: receipt of a 75 units lot every 24 hours

The sewing machines also necessitate a 15 minutes setup between two consecutive operations.

The storage space is not a constraint (999999).

The plant is working on 2 x 8 hours shifts, daily, with breaks of 30 min after 4 and 12 hours respectively (the paint, plate and clean departments do not observe these breaks). Furthermore, the shear1 machine necessitates a preventive maintenance operation every 16 hours for a period of 30 ± 5 min, following a uniform distribution.

The demand of finished goods is repetitive and 25 units are to be delivered every 8 hours. Sub-assemblies are launched when the lamp box starts its first routing step.

Some work centers can treat more than 1 piece or lot at a time:

- Saw – 5 pieces
- Sanding – 10 pieces
- Paint – continuous access, up to 10 lots simultaneously
- Assembly – continuous access, up to 3 lots simultaneously

Model

The user should follow the sequential order of the Tabs in the Data Entry Zone in order to respect precedence and avoid modeling errors. The only field in the Model which depends of fields of a subsequent sheet, is the Calendar field of the Station Sheet. Indeed, the Calendar Sheet needs to be filled before Stations can be attached to the appropriate Calendars.

One builds the Model by entering the appropriate data into the Sheets of the Data Entry Zone, and the Scenarios Zones if he chooses to use the WIP in his Simulation. The user should refer to Chapter IV – Data Files, in order to know what type of data the software requires for each field.

Dept Sheet

The information regarding the Departments of the production system must be entered into this sheet. The user must choose a name for each department and indicated their respective capacity and cost of inventory per unit and per hour.

Stocks Sheet

Similar to the Department Sheet, the user must indicate the name of each Storage area and precise their respective capacity and inventory cost.

Station Sheet

This sheet will contain all the information regarding the Stations of the system. The user must define each existing Station in the system and associate it to a Department. A rule of selection must be attached to each Station. Stations used this rule in order to know which Lot in a queue to process next. A capacity must be assigned to each Station. The Batch Type indicates how will the parts be manufactured: either by individual piece or by Lot. The capacity refers to the unit used (xlots or xpieces or cont). The Max Wait Batch Field indicates the maximum delay to wait before admitting a partial batch when the capacity is greater than one and the batch type is xlots. The distribution fields concern the time requested to (re)configure the station between two consecutive entities having a different setup code. It is possible to assigned a set up cost for each machine. The processing time of a lot or piece is multiplied by the factor indicated in the PROCEFF Field in order to determine how long it really takes on this station to complete an operation. Finally, the user can attach up to 4 different Calendars to a Station. The Calendars must be defined beforehand.

Shifts Sheet

The Calendars will be defined in this sheet. The user must choose a name for each shift and can eventually associate an Off Cost to each shift. The End and start Date must be entered for each shift. The shifts must then be précised. Please refer to the “Important note concerning Calendars” and the “Note regarding ON Fields” of Chapter IV for details on how to define shifts.

Holidays Sheet

Each holiday observed by the production system must be entered here. It is possible to assign a Holiday to ALL Departments or to only certain of them. An Off Cost can be defined. The Start and End Date of the Holiday must be entered.

Exceptions Sheet

The user must precise a name for each exception and associate it to a Station. It is possible to assign an Off Cost to the exception. The Start and End Date of the exception must be indicated.

Down Sheet

The user must assign each defined Down period to a Station. He must define the On Period and the Off Period for each Down. The On Period must be at minimum 0.01. It is possible to assign a Cost to the Down Period. The Start and End Date of the down period must be indicated.

Tools Sheet

The user must defined tools or operators in this sheet. He must also indicate their respective quantity.

Parts Sheet

The user defines the Parts or services produced or provide by the production system in this sheet. It is possible to indicate the cost of raw material and indicate the Sales Value of each Part. It is also possible to precise the number of Parts in stock at the beginning of a Simulation.

Routes Sheet

The Routes Sheet contains the production sequence of each Part. The user must define all the steps associated to the production of each part. A step must be attached to a department. It is possible to use a tool or to assign an operator at each step. The quantity of tolls or operators must also be indicated. The user may also define the set up type for each part in this sheet. The throughput of the step regarding a precise part will also be defined here. The user has the alternative to define the throughput either by Hours per Lot (hpl), Hours per Pieces (hpp) Lot per Hour (lph) or by Pieces per Hour (pph). The user can finally indicate the Processing Cost and the Added Value of the Step.

BOM Sheet

The recipes of each part are defined in the Bill Of Material Sheet. The user must precise the Assembly (parent) part and the Component (child) part in this sheet. The quantity of components will also need to be indicated. Please refer to the launch criteria for the components field of the BOM Section of Chapter IV for details on how to use the Launch criteria.

Orders Sheet

The produced Lots (Orders) are defined in this Sheet. The parts (and their quantities) contained in each order must be entered here. It is possible to assigned priorities for Lots. A lot can be produce either to fulfill an order or for stocks (Lot Type). The Start Date typically indicates the date at which the order was received and the Due Date indicates the date at which the Lot is due to the client. It is possible to precise a Sales Value of each Lot. Finally, the user can enter the information regarding a recurring Lot in this sheet (Please refer to Chapter IV for more information on hoe to use these fields).

Supply Sheet

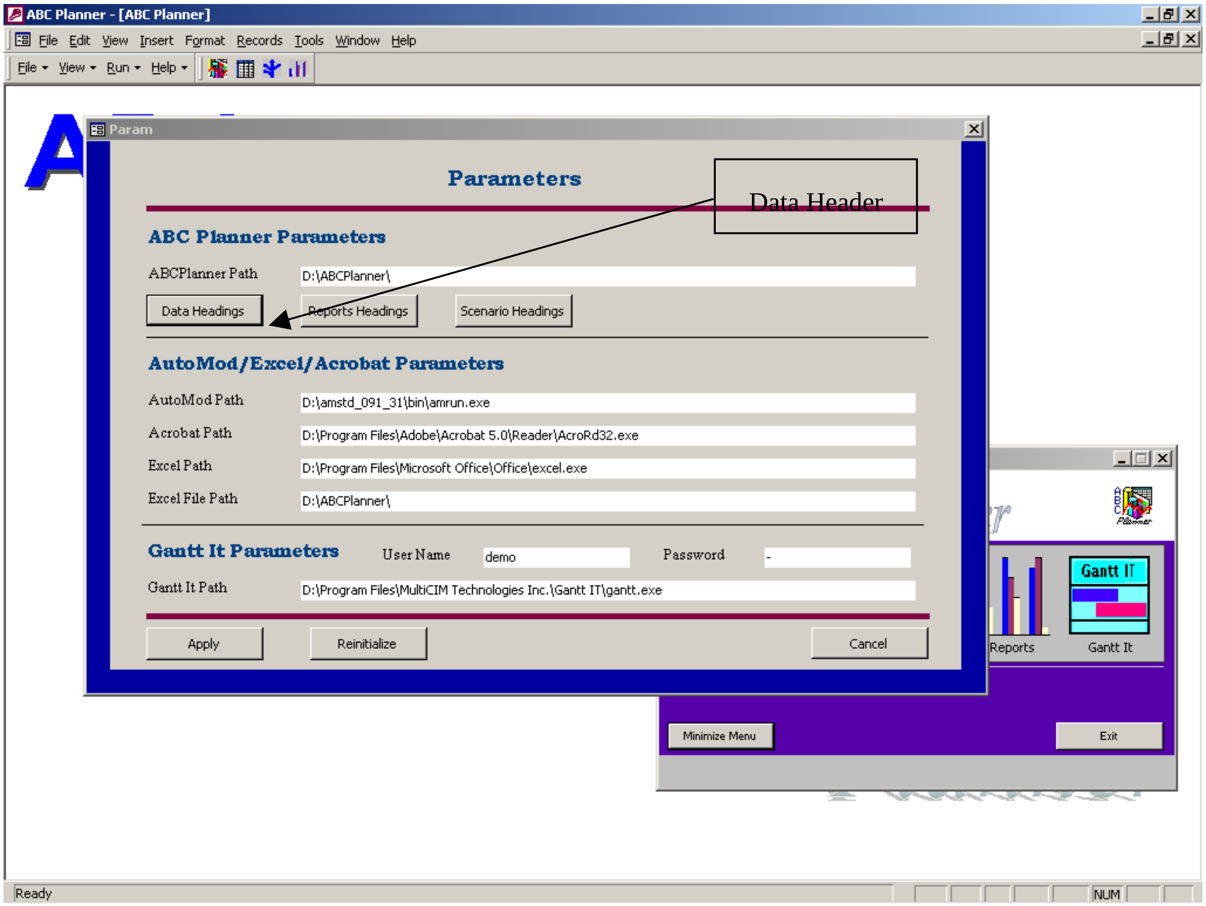
This sheet refers to supply orders. Similar to the Orders Sheet, the Order name, the Part and the quantity ordered must be indicated by the user. The expected reception date must be entered. It is also possible to define a cost and to add information concerning recurring orders in this sheet, in a similar way than in the Orders Sheet.

Syst Sheet

The Syst Sheet contains the name of the Model, which cannot be changed (abcmodel), and some eventual indirect cost of the production system.

Sheet Headers

It is possible to change the header of each Data Field in order to customize the Model. One can access the tables used to enter the personalized Headers by clicking on the Data Headings Button displayed in the Figure hereafter. This will open a table into which the user can enter the corresponding user defined headers, as displayed in the next Figure.


ABC Planner - [ABC Planner]
File Edit View Insert Format Records Tools Window Help
Param
Parameters
Data Header
ABC Planner Parameters
ABCPlanner Path
D:\ABCPlanner\
Data Headings
Reports Headings
Scenario Headings
AutoMod/Excel/Acrobat Parameters
AutoMod Path
D:\amstd_091_31\bin\amrun.exe
Acrobat Path
D:\Program Files\Adobe\Acrobat 5.0\Reader\AcroRd32.exe
Excel Path
D:\Program Files\Microsoft Office\Office\excel.exe
Excel File Path
D:\ABCPlanner\
Gantt It Parameters
User Name
demo
Password
Gantt It Path
D:\Program Files\MultiCIM Technologies Inc.\Gantt IT\gantt.exe
Apply
Reinitialize
Cancel
Reports
Gantt It
Minimize Menu
Exit
Ready
NUM

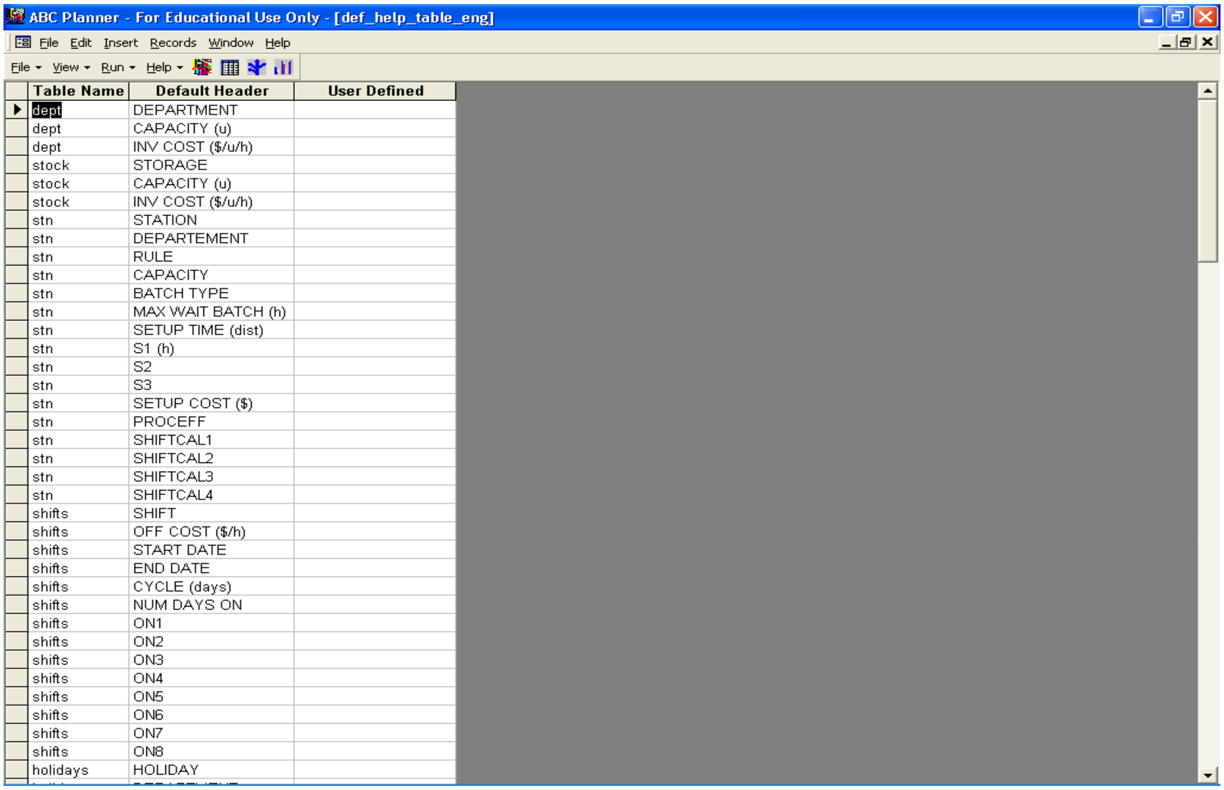


Table Name	Default Header	User Defined
dept	DEPARTMENT	
dept	CAPACITY (u)	
dept	INV COST ($/u/h)	
stock	STORAGE	
stock	CAPACITY (u)	
stock	INV COST ($/u/h)	
stn	STATION	
stn	DEPARTEMENT	
stn	RULE	
stn	CAPACITY	
stn	BATCH TYPE	
stn	MAX WAIT BATCH (h)	
stn	SETUP TIME (dist)	
stn	S1 (h)	
stn	S2	
stn	S3	
stn	SETUP COST ($)	
stn	PROCEFF	
stn	SHIFTCAL1	
stn	SHIFTCAL2	
stn	SHIFTCAL3	
stn	SHIFTCAL4	
shifts	SHIFT	
shifts	OFF COST ($/h)	
shifts	START DATE	
shifts	END DATE	
shifts	CYCLE (days)	
shifts	NUM DAYS ON	
shifts	ON1	
shifts	ON2	
shifts	ON3	
shifts	ON4	
shifts	ON5	
shifts	ON6	
shifts	ON7	
shifts	ON8	
holidays	HOLIDAY	

User Defined Header Table

8.2 Hospital

Situation

St. Hippocratus Hospital provides treatments to the county community. The goal of the study is to analyze the capacity and the cost related to the operation of its emergency unit and some other key services, as shown in the table below:

Department	Capacity (patients)	Waiting cost ($/h)	Service unit (max. # of patients simultaneously served by 1 unit)	Sequencing rule (# units)	Setup (duration / hourly cost)
admission	100	2 $/h	2 (1)	FIFO	36 sec / 1 $/h
X-ray	10	10 $/h	1 (1)	HP	6 min / 100 $/h
laboratory	10	5 $/h	4 (1)	HP (2) EDD (1) SPT (1)	3 min / 10 $/h
infirmary	30	12 $/h	2 (10)	SPT (1) HP (1)	36 sec / 1 $/h
emergency	5	80 $/h	3 (1)	HP (2) SPT (1)	3 min / 100 $/h
surgery	2	100 $/h	2 (1)	CR (1) HP (2)	2 h / 500 $/h
bedrooms	25	5 $/h	25 (1 to 5 – 1, 6 to 20 – 2, 21 to 25 – 4)	EDD (3) SPT (4) HP (5) FIFO (13)	30 min / 25 $/h

The three waiting areas have the following capacity respectively : infinite (for the purpose of this study), 100 and 100 people. The waiting cost associated with a person waiting in any of these areas is 5$/hr.

Support employees include trainee nurses (20) and assistants (10).

Previous studies have shown that 97.5% of the patients can be classified in the following categories:

1. trauma (priority 1, average cost $1,500, interarrival rate triangular 0.25, 2, 12 hours)

STEP #	TYPE	DEPT	ASSISTANTS	QTY REQ.	THROUGHPUT (dist)	T1	T2	T3	UNIT	COST ($/h)
10	xray_exam	admission			CONS	15			lph	10
20	xray_exam	waitingArea1			CONS				lph	
30	xray_exam	emergency			UNIF	12	5		lph	200
40	xray_exam	waitingArea2			CONS				lph	
50	xray_exam	Xray			CONS	2			lph	75
60	xray_exam	emergency			UNIF	12	3		lph	230

2. X-ray exam (priority 4, average cost $100, interarrival rate exponential 1 hours)

STEP #	TYPE	DEPT	ASSISTANTS	QTY REQ.	THROUGHPUT (dist)	T1	T2	T3	UNIT	COST ($/h)
1	lab	admission			CONS	15			lph	10
2	lab	waitingArea1			CONS				lph	
3	lab	emergency			NORM	0.5	0.1		hpl	200
4	lab	waitingArea2			CONS				lph	
5	lab	lab	nurse	1	CONS	7			lph	17
6	lab	emergency			NORM	12	2		lph	200

3. Lab exam (priority 5, average cost $35, interarrival rate triangular 3, 15, 60 minutes)

STEP #	TYPE	DEPT	ASSISTANTS	QTY REQ.	THROUGHPUT (dist)	T1	T2	T3	UNIT	COST ($/h)
1	surgery	emergency			TRIA	0.25	1	3	hpl	450
2	surgery	waitingArea2			CONS				lph	
3	surgery	lab	nurse	1	CONS	10			lph	25
4	surgery	waitingArea3	assistant	1	CONS				lph	
5	surgery	surgery_dept			UNIF	5	2		hpl	750
6	surgery	waitingArea3	assistant	1	CONS				lph	
7	surgery	infirmry	nurse	1	UNIF	1	0.7		hpl	
8	surgery	bedrooms			NORM	240	96		hpl	

4. Surgery (priority 2, average cost $15,000, interarrival rate uniform 10 ± 3 hours)

STEP #	TYPE	DEPT	ASSISTANTS	QTY REQ.	THROUGHPUT (dist)	T1	T2	T3	UNIT	COST ($/h)
100	aches	admission			CONS	10			lph	10
200	aches	waitingArea1			CONS				lph	
300	aches	lab	nurse	1	CONS	12			lph	15
400	aches	infirmry	nurse	1	UNIF	4	2		hpl	5
500	aches	waitingArea3	assistant	1	CONS				lph	
600	aches	bedrooms			TRIA	24	72	144	hpl	

5. Chronic and minor aches (priority 3, average cost $60, interarrival rate triangular 15, 30, 75 minutes)

STEP #	TYPE	DEPT	ASSISTANTS	QTY REQ.	THROUGHPUT (dist)	T1	T2	T3	UNIT	COST ($/h)
1	trauma	emergency			UNIF	0.5	0.1		hpl	300
2	trauma	Xray			CONS	3			lph	100
3	trauma	lab	nurse	1	CONS	5			lph	50
4	trauma	emergency			UNIF	1	0.25		hpl	150
5	trauma	waitingArea3	assistant		CONS				hpl	
6	trauma	surgery_dept			TRIA	2	4	6	hpl	800
7	trauma	bedrooms			TRIA	24	96	240	hpl	18

Supplies are not a constraint except for blood and plasma supplies. The inventory contains 100 units initially. A shipment of 100 units is to be received every week (15 $/u). Upon reception, the units are checked and marked about 30 minutes (per unit received, and at a cost of 12 $/h) in the laboratory before being sent to a special storage area that can hold up to 1000 units. Trauma patients necessitates on an average 4 units while surgery patients will require 15.

The modeling process for this model is very similar to the one used in the previous example:

1. fill department and waiting / storage areas forms
2. create individual units of services taking into account their individual sequencing rule
3. add support resources (nurses and assistants)
4. define the patient types
5. enter their treatment patterns in the routing file
6. consider the blood requirements in the BOM file
7. add patients arrival and blood supplies patterns