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1. GENERAL INFORMATION

The EMEPS program serves to formulate and analyse development projects for industrial production systems, support investment decision-making procedures and economic policy decisions.

EMEPS is owned and maintained by UNIDO. It is an enhanced version of the former MEPS program package (MEPS is an acronym for *Methodology for the Evaluation, Programming and Management of Production and Consumption Systems*).

Main features of EMEPS

EMEPS is dynamic, permitting a 10 year planning horizon it supports medium and long term decision making on governmental level.

EMEPS is essentially an accounting model, which can be used for industrial simulations. Nevertheless, its demand module also contains a simple economic model[1].

EMEPS is not an optimizing model, it does not provide the "best" solution for a development problem. An investment decision may be optimal from one point of view, and less advantageous from another. EMEPS provides essential information for the decisions, but they are made outside the program. The main task of EMEPS is to simulate the effect of different economic policy and investment decisions on the demand and supply relations of the investigated productive system. Also the effect of different development scenarios on the foreign currency and government account of the country can be assessed.

EMEPS helps to systematize the available data on productive systems and to analyze their demand and supply structures. If satisfactory data are not available different data sets can be tested with the help of EMEPS.

EMEPS is not an econometric model, it does not estimate data. Future data (prices, foreign demand, etc.) should be estimated by econometric models or by using educated guesses outside the program. Such estimation procedures always involve different assumptions. Applying EMEPS you can test the effect of these assumptions.

EMEPS makes possible the monitoring and measurement of the impact of changing technologies, prices, taxes, subsidies and other variables on demand and supply structures.

EMEPS allows the analysis of different investment options, comparing them with each other and with a projection of the present situation. Different development scenarios for the whole industrial system can be tested.

EMEPS supports the governmental level decision making, it allows however to consider the possible reactions of the firm-level decision

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[1] Cf. R. Stone (1954) *Linear Expenditure Systems and Demand Analysis: An Application to Patterns of British Demand*, Economic Journal 64, 511-527.

makers.

The logical structure of EMEPS is clear and consistent, and is at the same time adaptable. You can flexibly interpret the different structural elements within EMEPS.

Technically, EMEPS is a user-friendly program software based on Symphony spreadsheets and written in Symphony Command Language. If you are familiar with Symphony (or other spreadsheet softwares) then our menu driven program is almost totally self-explanatory. Nevertheless, EMEPS is prepared in such a way, that even inexperienced computer users can work with EMEPS by following the instructions of this User's Guide.

Logical structure of EMEPS

Depending on the aim of the analysis, a representation of productive systems (shortly *systems*) can be built up by the user starting with a bundle of final and intermediate goods or services. (An example for productive systems is the eating fat and oil industry of a country, including also the most important intermediate goods). You can analyze simultaneously more systems, but they are independent of each other.

The first step in defining a system (beside giving a name to it) is to specify the first and last year of the planning horizon, called *base year* and *target year*. Data should be introduced and results are obtained for every year between the base and target year. The base year is not necessarily the decision-making year. You can begin the analysis with earlier years to see how the processes being investigated behaved in the past.

Defining every system involves introducing data into both a *demand* and a *supply module*. The modules are related to each other through the information on consumer demand for final products at a given price.

The **demand module** allows investigation of expenditure and demand relations concerning the final goods of a system. According to the different assumptions on the future changes in price, expenditure and demand parameters it is possible to establish different *demand scenarios*.

Every demand scenario consists of four tables. The first table contains the computations of a macroeconomic consumption function, which is independent of the investigated system. The second table - based on the previous one - contains the population and expenditure calculations. EMEPS allows a division of the population into groups (e. g. poor, medium and rich). The third table is to specify different demand system parameters, while the fourth provides the final results of the demand calculations.

The **supply module** is made up of a number of *components*. A component is any major extraction, processing or distributional activity affecting the supply and use of a given good. (In the previously mentioned *fat and oil system* butter, margarine or olive-oil production, milk-transportation network, olive plantation may be examples for a component).

The supply module is of an accounting type. You can build up the inputs, outputs and costs of production processes item by item. In the first data table of the supply module you can specify data which are common to every component in the system (e.g. exchange rate).

The supply calculations cover each component separately. Within the components different technologies can be defined: a maximum of three existing and six planned technologies. (We call a technology existing if it already exists in the decision-making year). The second data table of the supply module contains data common to every technology (including also data on importing the main product of the component).

The starting logical stage of the supply analysis is to estimate what will happen in the future, when only the presently existing capacities are operating (this is called *projection of the present situation*, shortly *present* in the table titles). During this technologies are investigated first individually: one table describes the production process, the other contains the output calculations and results. Results concerning the different technologies and the import are summarized in a so called *OUTPUT TOTAL* table.

Already this stage of the analysis allows for testing the impact of policy variables on the profitability of the technologies and the import, and consequently on the supply.

Then you can define and build up different investment variants (the *planned technology* and *investment variant* terms are used as synonyms). Within the investment variants there are *new plant* type and *rehabilitation* type variants. In the case of a rehabilitation type investment the planned technology replace the related existing technology. Here again the investment variants are first analyzed individually. Beside the tables mentioned with the existing technologies there is a table which describes the investment process.

From the existing and planned technologies you can set up different supply scenarios and summarize them in the *OUTPUT TOTAL* table.

Finally, if you have already chosen a supply scenario in every component, you can collect the most important variables into a *SYSTEM TOTAL* table.

The demand and the supply module of a system are connected to each other through the selling prices of and the consumer demands for the investigated final goods. The selling prices are exogenous in both module. By setting the prices you obtain the demand for the final products of the system. In the supply module you can analyze the options for satisfying this demand. There you get some results on the profit level of the production, on the efficiency of the different investment projects, etc. at given prices. According to the results of these computations you can go back again to the demand module and change the prices and/or other parameters, calculate new demand values, substitute this into the supply module again and so on.

Thus, you can simulate the functioning of a partial equilibrium model. Compared with such a model EMEPS is simpler in both its economic structure and data requirements. (Whether this is an advantage or disadvantage depends on the circumstances). However, the

most important difference is that EMEPS is primarily intended for analyzing the development projects of an industrial system. The investment activities and consequently the production do not change continuously, the decision- maker select from discrete alternatives. For this problem partial equilibrium models are not applicable.

The construction of EMEPS

One part of the tables in EMEPS contains both data typed in by the user (input data) and results calculated by the program. Changing a figure you can immediately follow the effect of this on variables depending on the modified data.

The tables depend on each other. Input data or partial results obtained in a table are used in other tables. *Figure 1* provides a map of connections between the tables.

The four tables of a demand scenario are simultaneously in the operative memory of the computer, even if you can see only one of them at the same time. So, if you change a data for instance in the *MACROECONOMIC CONSUMPTION FUNCTION* table, then loading the *RESULT* table you can see immediately the effect of it, without loading before the intermediary *EXPENDITURES* table.

The situation is different with the supply module, always only one table is in the operative memory. Data from previous tables are combined into a table when you load it. Consequently, if you change a data in a table then you have to load all of the intermediary tables to get the results. For instance, if you modify the exchange rate in the *DATA COMMON TO EVERY COMPONENT* table then you have to recalculate the whole supply module: the *DATA COMMON TO EVERY TECHNOLOGY* and *QUANTITIES* tables for every component, all of the *PRODUCTION PROCESS*, *INVESTMENT PROCESS* and *OUTPUT* tables and finally the *OUTPUT TOTAL* tables to get the new results in *SYSTEM TOTAL*. The recalculation itself is performed automatically, what you have to do is merely loading and saving again the tables.

Figure 1 helps you to know which tables can be passed over during this recalculation. If you change for instance the export price in the *DATA COMMON TO EVERY TECHNOLOGY* table, then it is enough to load the *OUTPUT* tables of the existing technologies and investment variants and the *OUTPUT TOTAL* table of the component, because the *PRODUCTION PROCESS* and *INVESTMENT PROCESS* tables do not use data from *DATA COMMON TO EVERY TECHNOLOGY*.

There is a connection which is not marked in *Figure 1*. The *OUTPUT* table of a rehabilitation type investment variant uses data from the *OUTPUT* table of the "parent" existing technology. We treat this connection in details in the manual.

As we have already mentioned, EMEPS is a menu driven program. One part of the menus appear automatically, others should be invoked by the user. These second type menus are called **«Alt» «M» menu** because they can be invoked by pressing the «Alt» key and holding it down pressing «M». You can call this «Alt» «M» menu while you are working with the tables.

Figure 2, *Figure 3* and *Figure 4* provide a map of the basic menu

structure of EMEPS (there are some submenus which are not incorporated into this maps).

Figure 1

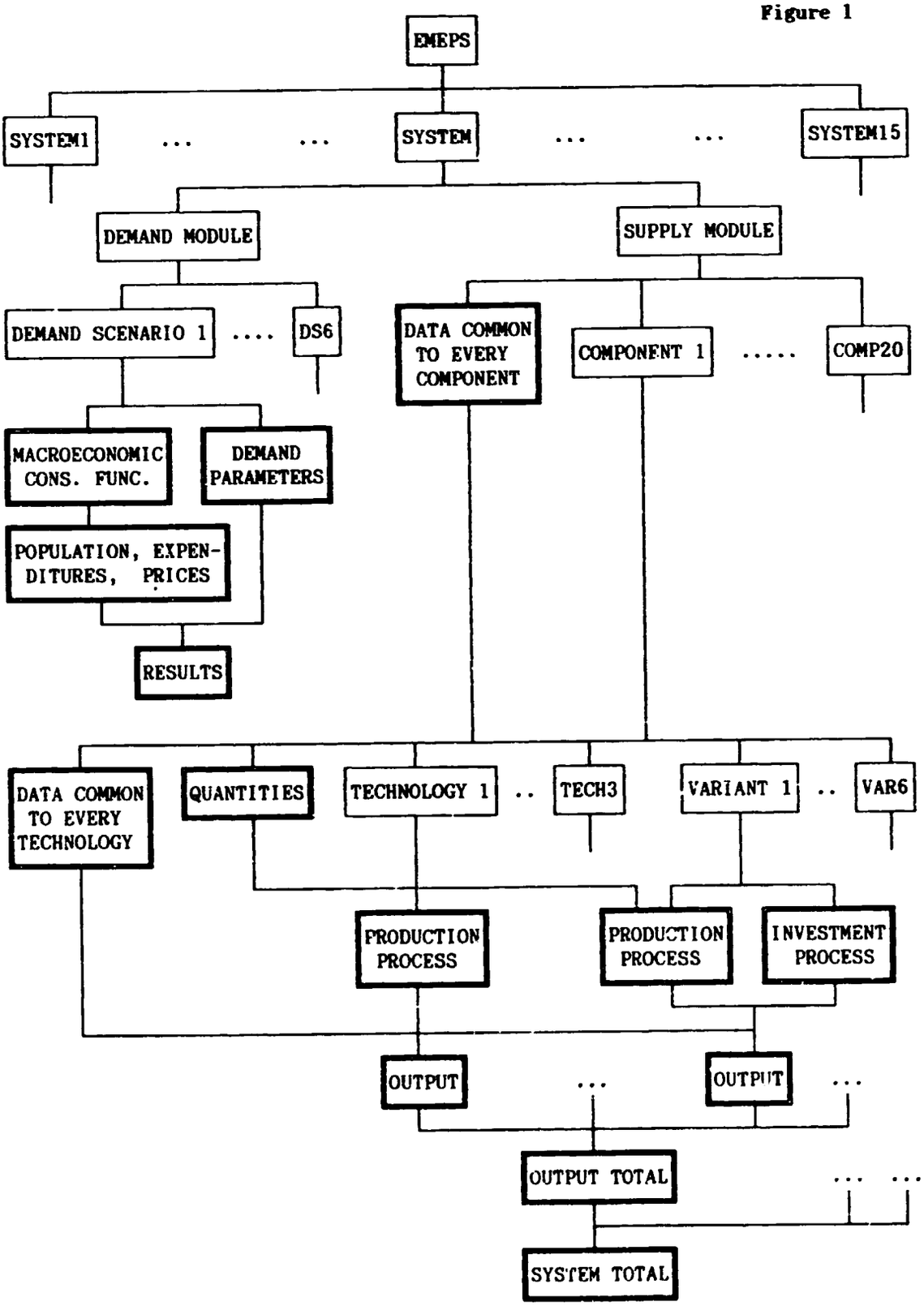
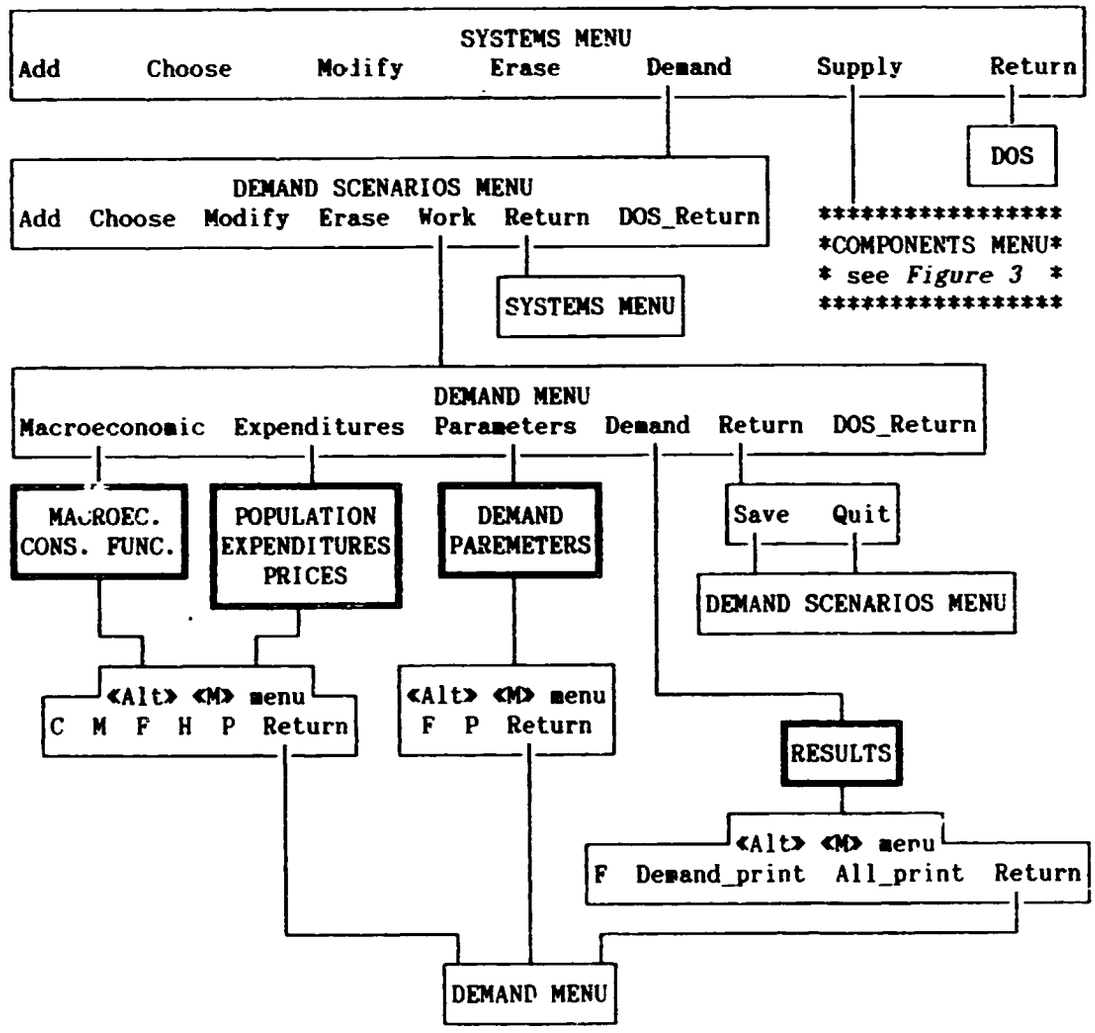


Table names are surrounded with double line.

Figure 2



Notes to *Figure 2, 3 and 4*:

1. Abbreviations in «Alt» «M» menu commands:
   C = Copy; M = Multiply; F = Format; H = Heading; P = Print.
2. The effect of the *DOS_Return* command is obvious, so we omitted the embranchments to DOS.
3. Dashed box borders in *Figure 3* and *Figure 4* represent conditional menus, depending on the number of existing technologies.

Figure 3

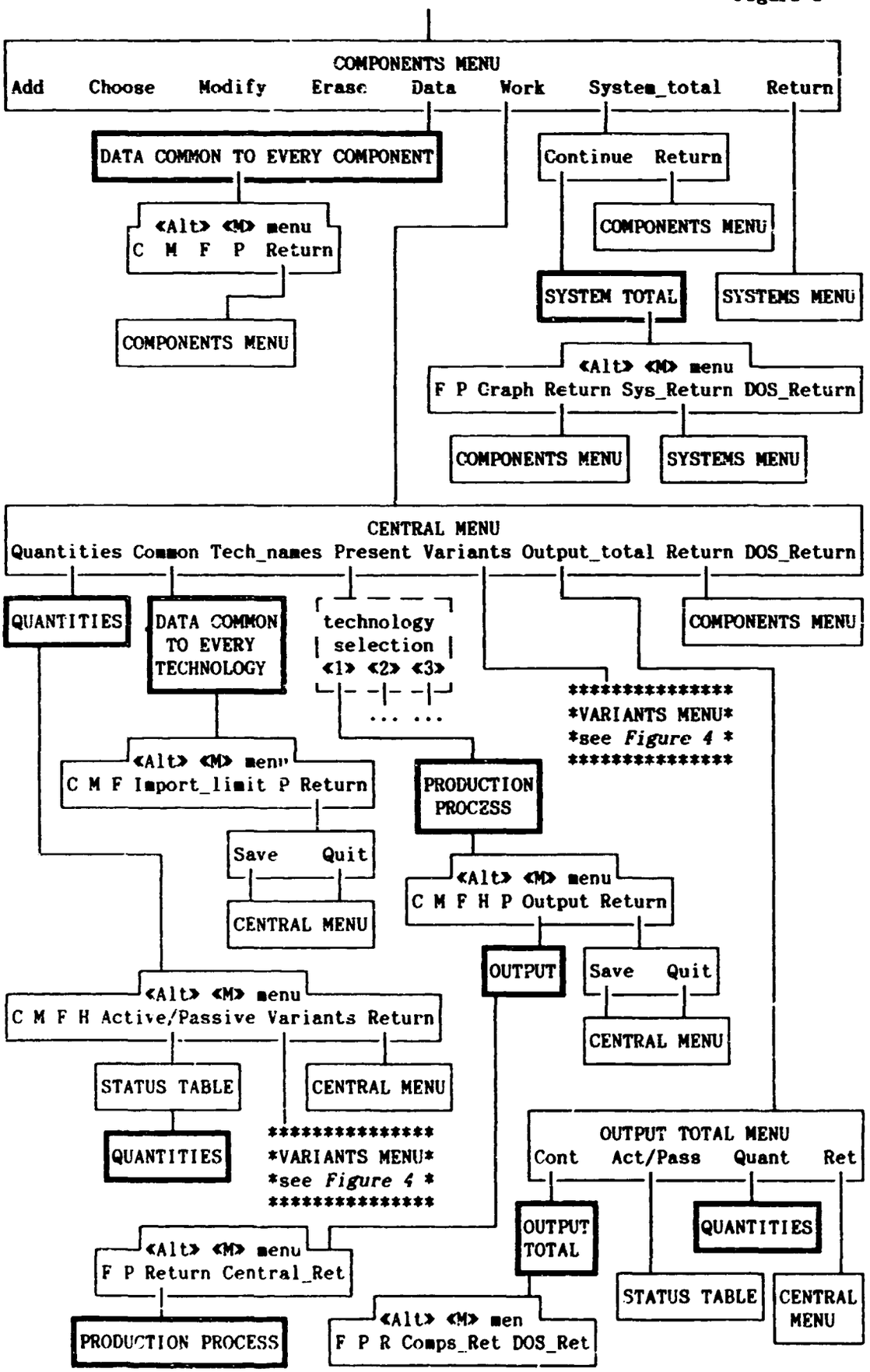
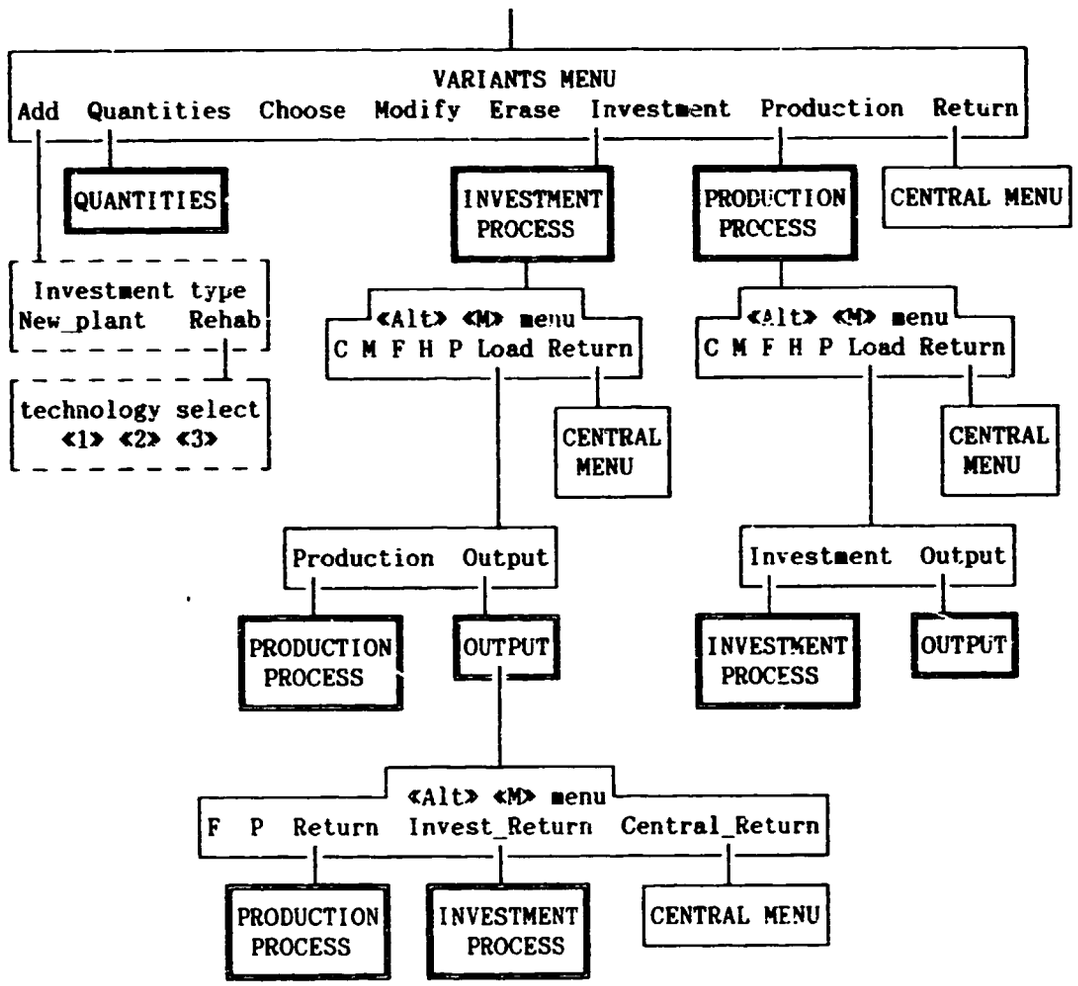

COMPONENTS MENU
Add Choose Modify Erase Data Work System_total Return
DATA COMMON TO EVERY COMPONENT
«Alt» «M» menu
C M F P Return
COMPONENTS MENU
Continue Return
COMPONENTS MENU
SYSTEM TOTAL
SYSTEMS MENU
«Alt» «M» menu
F P Graph Return Sys_Return DOS_Return
COMPONENTS MENU
SYSTEMS MENU
CENTRAL MENU
Quantities Common Tech_names Present Variants Output_total Return DOS_Return
QUANTITIES
DATA COMMON TO EVERY TECHNOLOGY
technology selection
«1» «2» «3»
... ...
COMPONENTS MENU
****
VARIANTS MENU
*see Figure 4 *
****
«Alt» «M» menu
C M F Import_limit P Return
PRODUCTION PROCESS
Save Quit
CENTRAL MENU
«Alt» «M» menu
C M F H P Output Return
OUTPUT
Save Quit
CENTRAL MENU
«Alt» «M» menu
C M F H Active/Passive Variants Return
STATUS TABLE
CENTRAL MENU
QUANTITIES
****
VARIANTS MENU
*see Figure 4 *
****
OUTPUT TOTAL MENU
Cont Act/Pass Quant Ret
OUTPUT TOTAL
QUANTITIES
«Alt» «M» menu
F P Return Central_Ret
STATUS TABLE
CENTRAL MENU
PRODUCTION PROCESS
«Alt» «M» men
F P R Comps_Ret DOS_Ret

Figure 4


VARIANTS MENU
Add Quantities Choose Modify Erase Investment Production Return
QUANTITIES
INVESTMENT PROCESS
PRODUCTION PROCESS
CENTRAL MENU
Investment type
New_plant Rehab
technology select
«1» «2» «3»
«Alt» «M» menu
C M F H P Load Return
CENTRAL MENU
«Alt» «M» menu
C M F H P Load Return
CENTRAL MENU
Production Output
Investment Output
PRODUCTION PROCESS
OUTPUT
INVESTMENT PROCESS
OUTPUT
«Alt» «M» menu
F P Return Invest_Return Central_Return
PRODUCTION PROCESS
INVESTMENT PROCESS
CENTRAL MENU

About this guide

This guide is divided into five chapters, and within the chapters into sections and subsections. Two Appendices complete the manual.

Basic theoretical considerations and economic relations on which the EMEPS program is based are presented in *Part I*. The instructions on using EMEPS are described in *Part II*. If you wish, you can begin with *Part II* and turn back to *Part I* when you need to know the exact interpretation of variables in EMEPS.

The technical requirements of using EMEPS are described in *Section 2.1*. In *Section 2.2* and partly in *Chapter 3* the program description is very detailed, although we try to lead the unexperienced user step by step. We provide some information about basic operations (e. g. menu commands, moving in the tables, etc.) while reviewing EMEPS. Users, familiar with spreadsheets may wish to skip over these technical paragraphs.

Chapter 3 contains the demand module. In *Chapter 4* we summarize what you should know about working with EMEPS tables. This general information is illustrated with examples taken from the EMEPS demand module. *Section 4.2* is also written for advanced users and contains the description of the «Alt» «M» utility menu.

Chapter 5 contains the supply module. Because the structure of menus and tables is very similar, we do not repeat all information at every menu and table.

In the body of the manual we tried to avoid the technical details. The exact description of the equations used in the tables can be found in *Appendix A*. The variable names used in this appendix are written into the table, in order to help you to connect the table descriptions and the equations with each other.

Appendix B contains the list of EMEPS files and their memory requirements.

In this guide the key names of the keyboard are enclosed in angle quotation marks, for instance «Esc», «Enter». EMEPS menu commands are enclosed in normal quotation marks, for instance "Add", "Print", etc.

The references to menu or table names, to table labels and to program messages are printed in *italics*. On the computer screen there are highlighted cells or cells marked with a different color (depending on the computer and the monitor). In the tables and screen pictures the content of these cells is printed in bold letters.

Warning for Inexperienced Users. If at any time something unexpected happens (such as the appearance of an *ERROR* message or an unknown menu) press «Esc» once or twice. This usually helps. You can also try to find the cause of the problem in this guide.

2. TO START EMEPS

2.1. INSTALLING EMEPS

To use EMEPS the following hardware is required:

IBM PC/XT/AT/PS2 or a compatible system with 640 Kb RAM memory and a hard disk of at least 20 Mb. However with an XT the program is a little bit slow.

The required software is as follows:

DOS 3.1 operating system, or a later version of DOS. The Symphony program package on a hard disk, installed according to your computer's hardware. You should have Symphony in a subdirectory entitled *symphony*, directly below the root directory.

The EMEPS diskette(s):

The EMEPS program package requires about 850 Kb of memory, that is one or two diskette(s) according to the diskette capacity. The diskette contains in its root directory two files (*emeps.bat* and *emeps.cnf*) and an *emeps* subdirectory with 28 files.

The installation procedure

To install EMEPS on the hard disk C (or any other hard disk) follow the instructions below.

Create an EMEPS subdirectory on disk C, directly below the root directory. The *emeps.cnf* file has to be copied into the *symphony* subdirectory and the files of the *emeps* subdirectory into the *emeps* subdirectory of C. The *emeps.bat* file can be copied anywhere. You can start the EMEPS program from the directory, where *emeps.bat* is located, or you can put this directory into your PATH.

We repeat this procedure for the beginners in detail (the *emeps.bat* file will be placed into the root directory of C):

Insert the (first) EMEPS diskette into drive A and type:

```
c:«Enter»
md emeps«Enter»
copy a:emeps.bat«Enter»
copy a:emeps.cnf \symphony«Enter»
copy a:\emeps\*.* emeps«Enter»
```

If your EMEPS package is contained on two diskettes, then insert the second diskette into drive A and repeat the command in the last row
(on some computer keyboards the «Enter» key is called «Return»).

Memory requirements

The program occupies about 850 Kbytes on the hard disk. The memory requirements of a system depend on the system parameters.

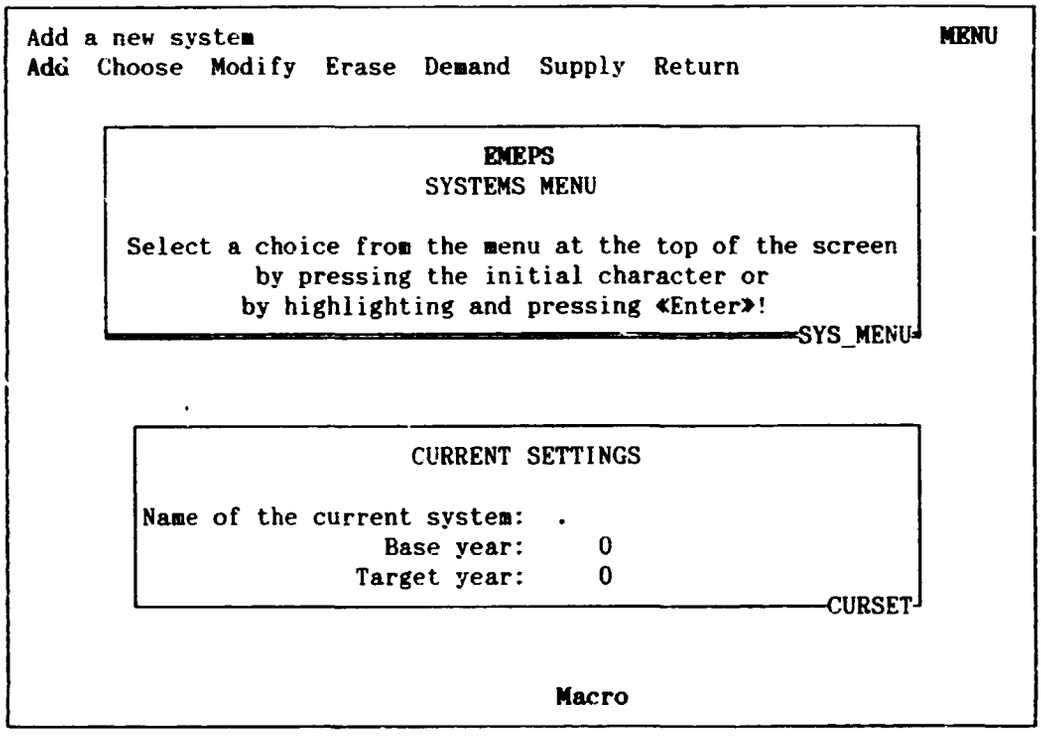
Roughly speaking we can say that defining a system with one demand scerario and without investment variants (the no investment variant) neeas about 500 Kbytes. Every further demand scenario needs 120 Kbytes, every further component (without investment variants) requires 350 Kbytes. One investment variant requires about 150 Kbytes. The detailed description of this topic can be found in *Appendix B*.

2.2. EMEPS *SYSTEMS MENU*

2.2.1. THE FIRST SCREEN IN EMEPS

To start EMEPS, type *emeps* (or *EMEPS*) and press «Enter»! Loading EMEPS takes a few seconds. The first screen to appear looks like this:

Screen 1



The bordered text (windows), entitled *SYSTEMS MENU* and *CURRENT SETTINGS* serves only as a reminder. If you invoke EMEPS on the first occasion, no system has been defined, and thus the *CURRENT SETTINGS* form is empty. Later, when you have already defined one or more systems, the name and the planning period of the current system appear in this window. The *Macro* indicator at the bottom of the screen is not interesting for you. (In some of the following screens appears a *Calc* indicator at the bottom, or a *SHEET* indicator in the top right corner of the screen. They are also not interesting for you.)

In the second line of the screen there is a menu choice. If you are familiar with any menu driven program package (word processing, spreadsheet, etc.) you need not read the following part of this paragraph. If the program is in menu mode (the word *MENU* in the upper right corner of the screen signals this) you can only select one of the menu possibilities offered. There are two ways to select an item from the menu:

a) Point to menu items. The menu pointer is a highlight in the second line. Press → or ← (right and left arrow keys) to move the menu pointer to an item. You can press «Home» to move the pointer to the first menu item, and «End» to move to the last menu item. Notice that as you move the pointer, a short description of the

menu option appears on the line above the menu. (On *Screen 1* the short description of the "Add" menu command can be seen). Press «Enter» to select the item that is highlighted.

b) Type the first character of a command word in the menu (each command in a given menu begins with a different character.) You can type either a lowercase or an uppercase letter. The menu pointer can be anywhere in the menu when you type the letter.

2.2.2. EMEPS SYSTEMS MENU COMMANDS

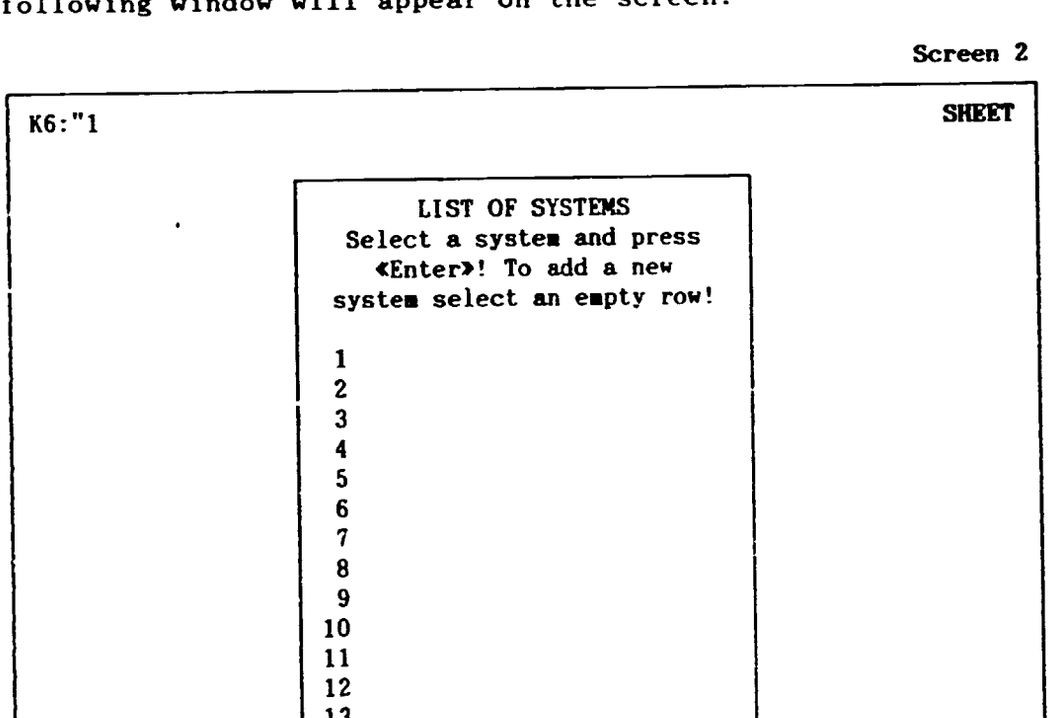
With the help of EMEPS *SYSTEMS MENU* commands you can add and erase systems, modify system settings and/or go to the demand or supply module of the current system.

In the description of the "Add" command there are some instructions of a general type for users not familiar with Symphony (or other spreadsheet programs).

"Add"

By selecting "Add" you can start to define and build up a new productive system. On the first occasion that you select "Add" the following window will appear on the screen:

Screen 2



Later, if systems have already been defined, their names can be seen after the respective numbers.

Selecting a row

Using up and down arrow keys and «Home» you can move the highlight (also called the cell pointer) through the numbers from 1 to 15. «End» works in a different way than in the case of menu choice. Press «End» and than ↓ to move to the last row (the *End* indicator appears in the lower right corner of the screen when you press «End», and disappears when you press an arrow key or press «End» again).

In the first line of the screen you can always see the address of

the current (highlighted) cell, e.g. K6. This is followed by the content of the current cell. You should not type anything, only press «Enter» when the highlight is in an empty row (where there is no system name). The next time this screen is called, the name of the newly defined system will appear in the appropriate row.

Possible mistakes in selecting a row

a) You type something (what you type will appear in the second line of the screen):

   - If you realize this mistake before pressing «Enter» press «Esc» and the typed characters disappear.

   - If you type something and press «Enter», then the computer beeps and a blinking *ERROR* indicator appears in the upper right corner. Pressing «Esc» will return you to *SYSTEMS MENU*.

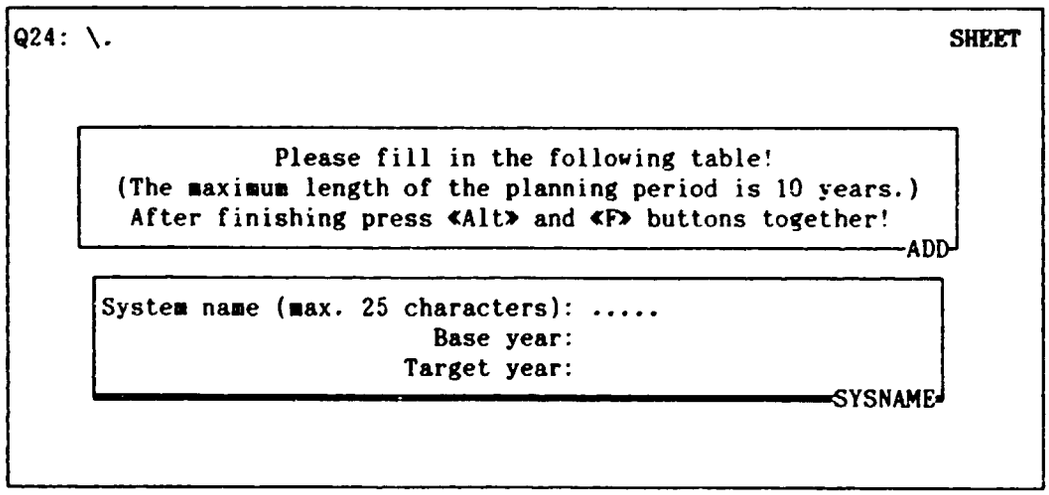
b) You select accidentally a row that is already filled-in. This causes no complications as you simply arrive back to *SYSTEMS MENU* and can begin the "Add" step again.

A maximum of 15 systems can be simultaneously defined in EMEPS. However, the storage capacity of the computer may prevent you from adding a new system earlier. (See *Appendix B* on the memory requirements of a system). The systems are independent of each other in the program.

System parameters

After selecting an empty row in the *LIST OF SYSTEMS* window, the next screen serves to give the name and the planning period of the system:

Screen 3



The cell pointer appears on the dotted line, where you have to type in the name of the system.

How to fill in a table

Here we will only begin this topic, it is treated in detail in *Section 4.1.*

When you begin to type a word or a number, the typed characters appear in the second line of the screen, in the so called control panel. To enter the typed characters into the current (highlighted) cell, press «Enter». Then move the cell pointer with the help of the arrow key (or other pointer-movement keys) to another cell and continue filling in the table. You can speed up data entry. Instead of pressing «Enter» after you complete an entry, simply press a pointer-movement key. This single keystroke has two effects; it records the entry in the current cell, and it moves the cell pointer to the next cell (the real advantage of this method becomes apparent when using large tables). From this it follows that before finishing a cell entry you should not use the pointer-movement keys.

Changing, revising entries

You can change an entry as you type it, or you can return to an existing entry and edit it. Revising entries can be undertaken in the following ways:

a) While typing (before pressing «Enter») press «Backspace» (grey left arrow) to erase the last character that you typed. You can now erase another character with «Backspace», type a new character, or press «Enter» to complete the entry.

b) Move the pointer to a cell containing an entry you want to change. The cell contents are displayed in the first line of the screen. Now type a new entry. When you begin to type, the original cell contents remain on Line 1, and the new characters appear on Line 2. When you press «Enter» the new entry appears in the cell and on Line 1. The cell's original entry is lost.

c) In the case of long entries it is easier to use Symphony's Edit Mode. Details of Symphony's Edit Mode can be found in the *Symphony How-To Manual.*

How to fill in the *SYSNAME* table?

In the cell where the dotted line is, you have to type the name of the system. The maximum length of a system name is 25 characters. Numbers or spaces are allowed in the names, but the first character should be a letter of the English alphabet. Both lower- and uppercase letters are acceptable.

The planning period is a maximum 10 years, including the base and the target years. Instead of real years you can use dummy years, such as 0 for the base year and 9 for the target year (here using the longest possible planning horizon).

If you have finished your work press «Alt» and, holding it down press «F». A menu appears again on the control panel at the top of the screen with the following commands:

File Quit

Selecting "File" confirms that you really want to create a system

with the given name and planning horizon. If the name and the years have been correctly entered, EMEPS creates files needed for the subsequent tables. This will take some seconds. When finished, you return to the *SYSTEMS MENU*. The newly added system becomes the current system and its parameters appear in the *CURRENT SETTINGS* window.

Selecting "Quit" will lead you back directly to *SYSTEMS MENU* without creating a new system. You are advised to do this if you have selected "Add" by mistake or if you have pressed «Alt» «F» accidentally.

Possible mistakes

a) Pressing "Add" in the first step by mistake (this can be an error only when there are systems already defined in *LIST OF SYSTEMS*). To correct select a row which contains a system name. You will return to *SYSTEMS MENU*. You can also leave the *SYSNAME* table blank, press «Alt» «F» and select "Quit".

b) The first character of the system name is not a letter, the planning period is longer than 10 years, or the base year is larger than the target year (these errors can occur for example if you press «Alt» «F» before filling in all of the three cells).

   - If you realize this - or any other - mistake before selecting "File" press "Esc"! You get back *Screen 3* again. Here you can modify the system settings in *SYSNAME* window and press «Alt» «F» repeatedly.

   - After selecting the "File" command you'll get an error message: *Error! Not a correct name or wrong year settings!*. Now you can correct the wrong parameter(s) in *SYSNAME* and press «Alt» «F» again.

c) You had typed a wrong name or year in other respect and only later realized this mistake. In this case you can use the "Modify" menu option from *SYSTEMS MENU* (see later) to change incorrect entries.

"Choose"

If you have already defined more than one system, you can select the system to be worked with using the "Choose" option. If you want to erase a system or work with a system which is not the current system you must first use "Choose". Thus, before using "Erase", "Demand" or "Supply" you have to employ "Choose".

Selecting "Choose" brings you again to *LIST OF SYSTEMS*. Here select the number of the desired system and press «Enter» (if you accidentally select an empty row you will return to *SYSTEMS MENU*). After some seconds you will return to *SYSTEMS MENU* and the parameters of the selected system will appear in the *CURRENT SETTINGS* window.

"Modify"

By selecting "Modify" the *SYSNAME* window is displayed again, with the actual system settings. You can retype those settings you wish to change. After finishing press «Alt» «F». You will return to *SYSTEMS MENU* and in *CURRENT SETTINGS* the modified settings will be seen. If you have selected "Modify" accidentally, then press «Alt» «F» without changing the system settings.

By selecting "Modify" you can rename the current system and/or change the planning period. For example you can substitute dummy years with real years or you can shift, lengthen or shorten the planning period. If you have already worked with data tables in EMEPS, columns of which are filled in according to years, you should be very careful if lengthening or shortening the planning period. Take the following example. Suppose the base year is 1991, the target year 1994 and take a data table, the top heading of which reads according to years as follows:

	1991	1992	1993	1994
Selling price	10	11	13	15
Demand	2000	2300	2500	2800

If you modify the planning period, only the heading changes. The table remains unchanged. If you modify the base year to 1990, then loading this table again will give the following:

	1990	1991	1992	1993
Selling price	10	11	13	16
Demand	2000	2300	2500	28000

If you modify the base year to 1992, then loading this table again will give:

	1992	1993	1994
Selling price	10	11	13
Demand	2000	2300	2500

If you have already defined investment variants and you modify the base and target years, then you also have to correct the year settings of the investment variants according to this modification (cf. *Subsection 5.4.1*).

"Erase"

By selecting "Erase" you can erase the whole current system from EMEPS (all of the demand scenarios, supply components and investment variants). Considerable caution should be exercised prior to erasing any material. If you have erased a system you can't recover it within EMEPS. ("Erase" calls a DOS batch file using DOS delete command. There are program products which can recover deleted files. For the file names used by EMEPS see *Appendix B.*)

Selecting "Erase" first produces the following warning:

```
Do you really want to erase the current system,
ALL of the COMPONENTS and DEMAND SCENARIOS in it?
Press the «y» button to erase, any other to abort!
                                                ERASE
```

If you press any button except «y» (or «Y») nothing will be erased and you will return to *SYSTEMS MENU*. If you press «y» then the system is erased and you return to *SYSTEMS MENU*. In the *CURRENT SETTINGS* window the system name will be cleared. If you want to continue your work with another system you have to first employ "Choose", or "Add". You can erase only the current system.

"Demand"

By selecting "Demand" the *DEMAND SCENARIOS MENU* (treated in *Section 3.1*) is loaded and you can begin to build up or work with demand scenarios within the current system. If there is no current system when you call "Demand" you will return to *SYSTEMS MENU*.

"Supply"

By selecting "Supply" the *COMPONENTS MENU* (see *Section 5.1*) is loaded and you can begin to build up or work with supply components within the current system. If there is no current system when you call "Supply" you will return to *SYSTEMS MENU*.

"Return"

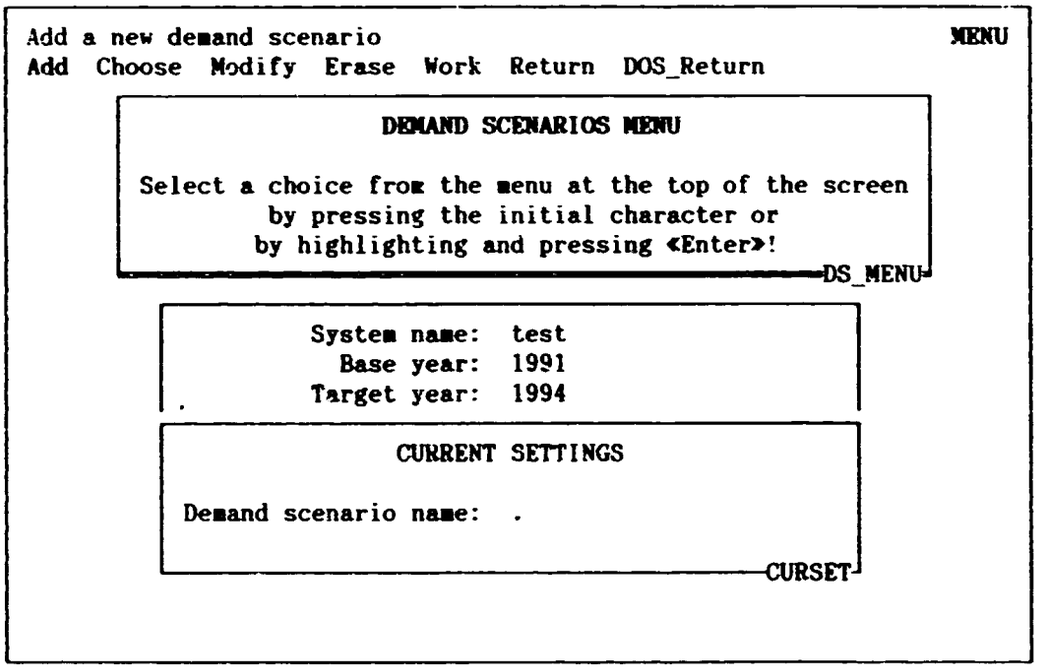
By selecting "Return" you can leave EMEPS and return to DOS.

3. DEMAND MODULE

3.1. DEMAND SCENARIOS MENU

By using the "Demand" command in *SYSTEMS MENU* you will call the next screen:

Screen 4



The structure of this screen is similar to *Screen 1* in *Subsection 2.2.1 (SYSTEMS MENU)*. The treatment of this screen's menu option is thus suitably abridged.

In the centre window the settings of the current system can be seen (the system name *test* and the base and target years are given only as examples.) The *CURRENT SETTINGS* window refers to the current demand scenario. When calling this screen on the first occasion, or after erasing a demand scenario the cell of the current demand scenario name contains a dot.

The menu commands are the following:

"Add"

By selecting "Add" you can start to build up a new demand scenario. As with the loading of a system (see *Screen 2* in *Subsection 2.2.2*), "Add" loads the *LIST OF DEMAND SCENARIOS*. Here move the cell pointer to a number belonging to an empty row and press «Enter».

Possible mistakes

a) You type something.

- If you realize this error before pressing «Enter», press «Esc» and the typed characters disappear.

- If you type something and press «Enter», then the computer beeps and a blinking *ERROR* indicator appears in the upper right corner. Pressing «Esc» will bring you back again to the *DEMAND SCENARIOS MENU*.

b) You select accidentally an already completed row. This causes no complications, you return to *DEMAND SCENARIOS MENU*.

You can define up to 6 demand scenarios in a system, although the storage capacity of the computer may prevent you from adding new demand scenarios earlier (see *Appendix B*). The demand scenarios are independent of each other. They exist in parallel. You can compare there results on printouts.

After selecting an empty row in *LIST OF DEMAND SCENARIOS* window, the next screen serves to give the name of the demand scenario. Type the name into the *DEM_NAME* window and press «Enter». The maximum length of a demand scenario name is 25 characters. Numbers and spaces are allowed in the names, but the first character should be a letter of the English alphabet. Both lower- and uppercase letters are accepted. If you have finished press «Alt», hold it down and press «F». The following menu commands appear on the control panel:

File Quit

Selecting "File" confirms that you really want to create a demand scenario with the name you have given. If the name has been correctly given after selecting "File" you return to the *DEMAND SCENARIOS MENU*. The newly added demand scenario becomes the current demand scenario and its name appears in the *CURRENT SETTINGS* window. Selecting "Quit" will lead you back directly to the *DEMAND SCENARIOS MENU*, without creating a new demand scenario. You are advised to do this if you have selected "Add" by mistake or if you have pressed «Alt» «F» accidentally.

Possible mistakes

a) Pressing "Add" by mistake. Now you can select a row which contains a system name. You will return to the *DEMAND SCENARIOS MENU*. If you fail to do this you can leave blank the *DEM_NAME* table (where you have to type in the demand scenario name), press «Alt» «F» and select "Quit".

b) The first character of the demand scenario name is not a letter. This can occur for example if you press «Alt» «F» before typing in the demand scenario name.

- If you realize this (or any other mistyping) mistake before selecting "File" press "Esc"! You get back *DEM_NAME* window again. Here you can modify the scenario name and press «Alt» «F» repeatedly.

- After selecting the "File" command you'll get an error message: *Error! Not a correct name!* Now you can correct the wrong name and press «Alt» «F» again.

c) You had mistyped the name and only later realized this

mistake. In this case you can use "Modify" (see below) to change it.

"Choose"

If you have already defined more demand scenarios, you can choose another demand scenario as the current demand scenario. Before using "Erase" or "Work" you have to use "Choose" if you want to erase a demand scenario or work with a demand scenario which is not the current demand scenario.

By selecting "Choose" brings you again to *LIST OF DEMAND SCENARIOS*. Here select the number of the desired demand scenario and press «Enter». If you accidentally select an empty row you will return to *DEMAND SCENARIOS MENU*. After some seconds you arrive back to *DEMAND SCENARIOS MENU* and the name of the selected demand scenario appears in *CURRENT SETTINGS* window.

"Modify"

By selecting modify you can rename the current demand scenario. Window *DEM_NAME* is displayed again with the actual name. Here you can retype the demand scenario name. After finishing press «Alt» «F». You return to *DEMAND SCENARIOS MENU* and in *CURRENT SETTINGS* window the modified name can be seen.

"Erase"

By selecting "Erase" you can erase the current demand scenario from EMEPS. However, you should be very careful when using "Erase". If you have erased a demand scenario you can not recover it within the framework of EMEPS.

In the same way as when erasing systems, after selecting "Erase" you have to confirm this command. If you press any button except «y» (or «Y») then nothing happens, and you will return to the *DEMAND SCENARIOS MENU*. If you press «y» then the current demand scenario is erased, you return to the *DEMAND SCENARIOS MENU* and in the *CURRENT SETTINGS* window the demand scenario name is cleared. If you want to continue your work with another demand scenario you have first to select "Choose", or "Add" if you wish add a new demand scenario. You can erase only the current demand scenario.

"Work"

Selecting "Work" allows you to load the *DEMAND MENU* and continue your work with the current demand scenario. Details of the demand tables and computations are described in the next section.

"Return"

Selecting "Return" allows you to return to *SYSTEMS MENU*.

"DOS Return"

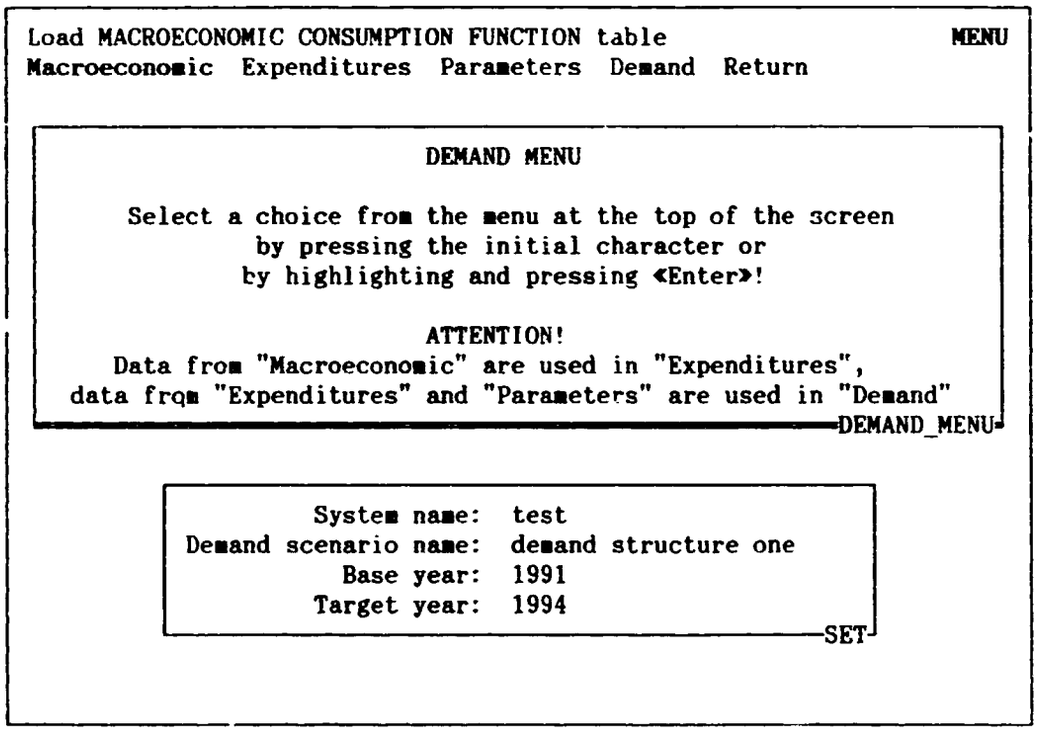
Selecting "DOS_Return" allows you to return to DOS.

3.2. DEMAND MENU

3.2.1. GENERAL INFORMATION ON THE DEMAND MENU

Using the "Work" command in the *DEMAND SCENARIOS MENU* (see the previous section) calls the following screen:

Screen 5



The system settings and the demand scenario name used here are examples only.

The *DEMAND MENU* commands (with the exception of "Return") serve to load different data and result tables on the demand calculations. According to the message in the *DEMAND MENU* window, the expenditure calculations use data from *MACROECONOMIC CONSUMPTION FUNCTION*. After filling in all of the data tables, final results can be examined by selecting the "Demand" command. These relations determine the practical calling order of the demand menu commands (you can call them in any order without typing in data, just to get acquainted with the tables).

By selecting **"Return"** you get the following menu choice:

Save Quit

Both "Save" and "Quit" return the control to *DEMAND SCENARIOS MENU*, but as a result of "Save" all of the tables of the current demand scenario are saved before returning. If you select "Quit" then the changes made since invoking the demand scenario are lost. (If you had applied the «Alt» «S» saving utility during the session - see the next paragraph - then only the changes made after it are lost). Select this option only in the case if you want preserve the previous

data set (e.g. if you were only experimenting with alternative data sets, but have found the original version better, or if you have made errors).

For safety reasons you may want to save your tables while working with them. To do this press «Alt» and holding it down press «S». Pressing «Alt» «S» all of the tables of the current demand scenario are saved, not only the table you are just working with. Further details about the **«Alt» «S» saving utility** can be found in *Section 4.1*.

In *Subsection 2.2.2* we commented on how to fill in a table. Now you have to fill in larger tables, which requires further explanation. This is given in the next chapter (*Section 4.1*). Although *Chapter 4* contains the detailed description of a utility menu (*Section 4.2*), there is some information we have to mention in advance about this utility menu.

When you are working with one of the tables loaded by using commands of the *DEMAND MENU* you can activate the utility menu. To do this, press «Alt» and holding it down press «M». Later we call this utility menu - which is applied in the supply module as well - **«Alt» «M» menu**. Among the menu commands is the "Return" command. Selecting "Return" in the «Alt» «M» menu brings you back again to *DEMAND MENU*. Observe the difference between the two "Return" commands. This one is in the «Alt» «M» menu and serves to go back from one of the tables of the current demand scenario to *DEMAND MENU*; the previous one is in *DEMAND MENU* and serves to finish the work with the current demand scenario and return to *DEMAND SCENARIOS MENU*.

Another «Alt» «M» menu command is "Print". *Section 4.2* provides details on how to print tables.

Now we can review the further *DEMAND MENU* commands.

3.2.2. THE MACROECONOMIC CONSUMPTION FUNCTION

The demand computations start from a simple macroeconomic consumption function. Selecting "**Macroeconomic**" will call the following table:

Table 1

CRT(t) = a0 + a1*100*YDT(t)/PCT(t) + a2*Z(t), where

a0, a1, a2 = parameters
CRT = total consumer expenditures at constant prices
YDT = total nominal disposable income at current prices
PCT = consumer price index or deflator (%)
Z = exogenous variable, specified by the user

MACROECONOMIC CONSUMPTION FUNCTION

System: test	a0	a1	a2	
*Scenario: demand structure one	0	1	0	
years:	1991	1992	1993	1994
*Total income at current prices (YDT)	0	0	0	0
*Price index (PCT, %)	100.0	100.0	100.0	100.0
***Exogenous variable**	0.0	0.0	0.0	0.0
Total exp. at constant prices (CRT)	0	0	0	0
Total exp. at current prices (CNT)	0	0	0	0

MACRO

The upper part of the screen containing the equation serves only as a reminder. (This equation is the base of the computations in *Table 1.* The complete list of equations and variables used in EMEPS can be found in *Appendix A.*) The cell pointer appears in the table *MACROECONOMIC CONSUMPTION FUNCTION.* The system name, the years of the planning period and the demand scenario name in the horizontal (top) heading of the table are written in automatically, according to the settings you have made defining the current system and demand scenario.

You can give values to the parameters a0, a1, a2, and to YDT, PCT and the exogenous variable (if required) in every year. (You can also give a name to the exogenous variable. To perform this you have to first go into the left heading of the table. See the description of the "Heading" command in *Section 4.2* about this action.) These figures - that is the input data of the table - and the text *Exogenous variable* on the screen are displayed in a way which contrasts with the rest of the screen, for instance in a brighter light or another color (depending on the computer, the display screen and the driver set). On the printouts the stars ('*') at the beginning of the rows in question help to distinguish the data rows from the result rows. You should not type anything into the result rows (the rows of CNT and CRT) and into the cells of preset labels (e.g. the years). If you type something into these cells and you press «Enter» the computer beeps and a blinking *ERROR* indicator

appears in the upper right corner. Press «Esc» to get rid of this error.

Typing in the data, the results in the rows of CRT and CNT appear automatically. If you have finished filling in the table, press «Alt» «M» and select "Return" to get back *DEMAND MENU*.

The interpretation of the equation

It is supposed that you have data on total nominal disposable income of the population at current prices (YDT) and on consumer price index or deflator (PCT) in every year *t* in the planning period. From these input data total consumer expenditures at constant prices (CRT) are calculated, according to the equation. Multiplying these values with the price indexes the program gives the values of total consumer expenditures at current (nominal) prices, what is needed for the further demand calculations.

The YDT and PCT data are usually available for the past from national accounts. From these data it is possible to estimate (outside EMEPS) values for the planning period. In the best case the estimation can be based on econometric modelling; appropriate values for parameters a0, a1, a2 and the possible exogenous variable Z - which may reflect demographic or social characteristics and could also contain lagged variables (e.g. incomes) or policy variables - can be derived from an econometric model.

If you have no suitable econometric model for this purpose, you can simplify the equation ignoring the exogenous variable. Practically this means that you keep the zero values for parameter a2 and for exogenous variable Z. Notice that in the equation *YDT/(PCT/100)* is the total nominal disposable income at constant prices. Parameter a0 is that part of the consumer expenditure which is independent of income. If a0=0 then a1 is the ratio of income spent for consumer goods. Based on these considerations you can make educated guesses of parameter values.

If you have no appropriate YDT and PCT data at all, but you have some direct estimation for CNT then you can set a0 and a1 to zero, a2 to 1 and write your data into the row of the exogenous variable.

You can use any unit of measure in YDT, but your choice determines the unit of the results as well (not only here, but also in the later tables).

Instead of current prices you may want to use constant prices throughout in the computations of the current system. In this case you can leave PCT=100 in every year and interpret YDT, CNT accordingly. If constant prices are used then, for the purpose of consistency, constant (that is real instead of nominal) values should also be used for consumer and input prices, wages, interest rates, profits, etc. in the rest of the demand module and in the supply module.

3.2.3. POPULATION, PER CAPITA SYSTEM-EXPENDITURES AND PRICES

From total consumer expenditures per capita system-expenditures are calculated. System-expenditures are the consumer expenditures spent on the final products of the productive system under investigation. To compute per capita expenditures population data are also requested. EMEPS permits a differentiation of the population into population groups (e.g. poor, medium and rich), consequently allowing the calculation of group-specific expenditures.

By selecting "Expenditures" from *DEMAND MENU* you load the following table (without the abbreviating dotted lines):

Table 2

POPULATION, PER CAPITA SYSTEM-EXPENDITURES AND PRICES

System: test Scenario: demand structure one	BASE year 1991	1992	1993	TARGET year 1994
POPULATION IN BASE YEAR and GROWTH RATE (%) IN NEXT YEARS				
***population group 1**	**0**	**0.00**	**0.00**	**0.00**
***population group 2**	**0**	**0.00**	**0.00**	**0.00**
***population group 3**	**0**	**0.00**	**0.00**	**0.00**
***population group 4**	**0**	**0.00**	**0.00**	**0.00**
***population group 5**	**0**	**0.00**	**0.00**	**0.00**
POPULATION				
population group 1	0	0	0	0
. . . . .	.	.	.	.
population group 5	0	0	0	0
TOTAL POPULATION	0	0	0	0
POPULATION GROUP DISTRIBUTION (in %)				
population group 1	0.0	0.0	0.0	0.0
. . . . .	.	.	.	.
population group 5	0.0	0.0	0.0	0.0
GROUP EXPENDITURE SHARES {r(g,t)}				
***population group 1**	**0**	**0**	**0**	**0**
. . . . .	.	.	.	.
***population group 5**	**0**	**0**	**0**	**0**
SUM (should be equal to 1)	0	0	0	0
GROUP CONSUMPTION SHARES {v(g,t)}				
***population group 1**	**0**	**0**	**0**	**0**
. . . . .	.	.	.	.
***population group 5**	**0**	**0**	**0**	**0**
PER CAPITA EXPENDITURE {y(g,t)}				
population group 1	0.000	0.000	0.000	0.000
. . . . .	.	.	.	.
population group 5	0.000	0.000	0.000	0.000
SELLING PRICE				
***final product 1**	**0**	**0**	**0**	**0**
. . . .	.	.	.	.
***final product 15**	**0**	**0**	**0**	**0**

EXPEND

Reminder! If you have finished filling in the table, press «Alt» «M» and select "Return" to get back to the *DEMAND MENU*.

Population

As the first block of the vertical (left) heading of the table shows, you can distinguish a maximum of 5 different population groups. It is not always necessary to divide the population into groups, you can take the total population as one group and leave blank the rows of the other four groups.

You can give names to the groups (see *Section 4.2* for the description of the «Alt» «M» menu's "Heading" command). If you type the population group names into the vertical heading of the first data rows, then the appropriate names automatically replace the corresponding *population group* texts, both in the following tables.

You should be specially careful when filling in the first block of data rows (*POPULATION IN BASE YEAR and GROWTH RATE (%) IN NEXT YEARS*). In the first column you should write the number of the population group in the base year (for example 800 if the number of the population group is 800,000 persons and you have chosen thousand persons as the unit of measure for the population). In the following columns you include the growth rate of the population group in the corresponding years, in percentages (if the growth rate is 5 %, then type in *5*).

The different formats of the zeros emphasize the difference between the first and the other columns of this data block. The population figures are rounded to integers and the growth rate percentages to two decimal places. This does not mean that you have to type in integers for the number of the population. You can use decimals, EMEPS always works with the numbers you typed in, but they are shown in rounded form. (If the cell pointer is on a number, you can see its original form on the control panel). Nevertheless it is practical to choose the unit of measure for the population so as to use integers (e.g. thousand persons). If you do not like the given numeric display formats you can easily change them with «Alt» «M» menu's "Format" command (see *Section 4.2*).

On the basis of these data the number of population groups, total population and the distribution of the population groups are calculated for every year in the planning period. The distribution of the population groups (i.e. the ratio of the groups within the total population) is not used later in EMEPS, it is only to inform the user. These results immediately appear as you type in the data needed to calculate them.

Equations (D3)-(D5) in *Appendix A* describe the exact relations between the population variables.

Per capita system-expenditures

The next data you have to give are the group expenditure shares and the group consumption shares. (They are denoted by r(g,t) and v(g,t) in *Appendix A*. See *equations (D6)-(D9)!*) Group expenditure share is the share of the population group in the total nominal

consumer expenditures. Consequently, the sum of the group expenditure shares should be equal to 1. You can observe the fulfillment of this equation in the *SUM* row of the table. Multiplying total nominal consumer expenditures by group expenditure share we get the consumer expenditures of the group (this partial result is not shown in EMEPS).

For historic data r(g,t) can be obtained from consumer surveys. In the absence of such surveys present known population distributions may be used for estimation purposes. If you do not divide the population into groups then write 1 in the first data row and leave the other rows blank.

Group consumption share is the share of consumer expenditures spent on the final products of the investigated system within the consumer expenditures of the group in question. (For example, if you are investigating in the current system the consumption of different type of cereals, and you find that a quarter of the poors' consumer expenditure is spent for cereals, then the group consumption share of the poors is 0.25 in that year.)

Multiplying total nominal consumer expenditures by group expenditure and consumption shares and dividing by the corresponding population figures EMEPS calculates the per capita group expenditures on the final products investigated in the current system, that is the per capita system-expenditures of the group.

Prices

Actually the selling prices do not belong to the expenditure part of the demand module, but it is expedient here to define them. Within one system you can take into consideration a maximum of 15 final products. You can give their names at the selling prices in the same way as in the case of population group names.

It is important to stress that these prices are selling prices, the price that the consumer pays for a given product (including taxes, etc.). Here the problem of current prices arises. Estimation of current selling prices for the years of the planning period should be connected to the estimation of the consumer price index PCT(t). With other words the same inflation rate should be taken into consideration in estimating both the consumer price index and the individual selling prices. Another possibility is to use constant prices within the whole system. See the discussion of this question at the end of *Subsection 3.2.2.*

Experimenting with different price sets in EMEPS you can change the prices within the current demand scenario and immediately track the effects of these changes in the result table. If you want to have different demand tables (with different price sets or other parameters) in a system at the same time, you can add further demand scenarios to the system.

3.2.4. THE DEMAND CALCULATIONS

Having the per capita system-expenditures and the selling prices, EMEPS calculates the per capita and the total demand for the system's final products. To perform these calculations two more parameter sets are needed: the so called minimum quantities and residual budget shares. Before reviewing the corresponding tables, it is needed to expound the demand relations. Their exact forms can be found in *equations (D10)-(D14)* of *Appendix A*.

The demand relations

It is supposed that there is a minimum quantity of some goods, which is consumed at all events. In the case of foods or other basic needs goods the interpretation of the minimum quantities should be related to what one may call a subsistence level demand for the good. These figures can be derived from statistics reporting minimum needs and respective quantities of goods required for survival. For other types of good the minimum quantity can be zero. Of course the notion of basic goods and the level of minimum quantities depend on the population group and the level of development of the whole economy. For the sake of simplicity it is assumed however that the minimum quantities are independent of the time.

Multiplying the minimum quantities with the selling prices and summarizing over the final goods of the system, EMEPS calculates the per capita minimum expenditures for every population group. With other words minimum expenditures are the smallest expenditures always spent on the goods covered in the analysis.

It is a natural requirement that the difference of the per capita sytem-expenditures and minimum expenditures should be non-negative. This difference will be referred in what follows as residual budget. (If all of the minimum quantities are zero then this *residual* equals to the system-expenditures.) The next question is how to distribute the residual budget among the final goods of the system.

We assume that the residual budget is allocated in fixed proportions among the final goods covered in the system. These proportions are called residual budget shares. (In the literature this parameter is called marginal budget share, but we have found the term *residual* easier to interpret in this non-technical description. The explanation of the *marginal* term and other considerations of technical nature can be found in *Appendix A.*) The residual budget shares depend on the population group but we assume that they are independent of time. From their definition it follows that the sum of the residual budget shares over the final goods of the system should be equal to 1.

The residual budget shares are equal to the actual shares if the minimum quantities are zero. In the absence of proper estimates of the residual budget shares from time series or cross section observations or from consumer surveys one may try to use values which are close but not equal to average budget shares.

Multiplying the residual budget with the residual budget share we get the amount of money spent on the final good in question. Dividing this amount with the selling price and adding the minimum quantity to

this result we get the per capita (group specific) demand for the investigated good. Multiplying with the number of population and summarizing over the population groups the total demand is computed.

To facilitate the understanding of per capita demand calculations we give a simple numeric example. Suppose that our analysis covers three final products: good A, B and C; their selling prices are $ 2, 4 and 5, respectively. The system-expenditures of the population group considered in this example are $ 1500. Let the minimum quantities of the goods be 150, 50 and 0 units, respectively. The minimum expenditures are 150*2 + 50*4 = 700 dollars, the residual expenditures 1500 - 700 = 800 dollars. Suppose that the residual budget shares are 0.5, 0.4 and 0.1, respectively. This means that from the residual budget 0.5*800 = 400 dollars are spent on good A. Dividing this amount with the price of good A we get that above the minimum quantity further 200 units of good A can be consumed. That is the total per capita demand for good A of an average member of the investigated population group is 350 units. Similarly, from the residual budget 0.4*800 = 320 and 0.1*800 = 80 dollars are spent for good B and C, resulting in a 320/4 + 50 = 130 units demand for good B, and 80/5 = 16 units demand for good C.

Now, we can turn to the description of the tables connected to the above-discussed relations.

Demand system parameters

Selecting the "Parameters" command in *DEMAND MENU* allows you to load the following table:

Table 3

DEMAND SYSTEM PARAMETERS (per capita)

System: test Scenario: demand structure one	Group 1	....	Group 5
MINIMUM QUANTITIES {a(i,g)}			
*final product 1	0	....	0
. . . .	.	....	.
*final product 15	0	....	0
RESIDUAL BUDGET SHARES {b(i,g)}			
*final product 1	0	....	0
. . . .	.	....	.
*final product 15	0	....	0
SUM (should be equal to 1)	0	....	0

PARAM

Reminder! If you have finished filling in the table, press «Alt» «M» and select "Return" to get back to the *DEMAND MENU.*

In this table you must introduce the minimum quantities and the residual budget shares for the final products. As it was mentioned already, these parameters are constant over time, but they vary according to the population groups. The names of each population groups are substituted by the headings *Group 1*, *Group 2*, etc. according to the same population group order defined in the previous

table. If you have the final product names specified in the selling price part of *Table 2*, then these names appear here in the vertical heading.

The sum of the marginal budget shares should be equal to 1. You can observe the fulfillment of this equation in the *SUM* row.

The results

By selecting the "Demand" command in *DEMAND MENU* you get the results of the demand calculations:

Table 4

RESULT: MINIMUM EXPENDITURES, TOTAL DEMAND and PER CAPITA DEMAND

System: test Scenario: demand structure one	BASE year 1991	1992	1993	TARGET year 1994
MINIMUM EXPENDITURES {ymin(g,t)}				
population group 1	0.000	0.000	0.000	0.000
. . . . .	.	.	.	.
population group 5	0.000	0.000	0.000	0.000
RESIDUAL EXPENDITURES {y-ymin} (SHOULD BE NONNEGATIVE!)				
population group 1	0.000	0.000	0.000	0.000
. . . . .	.	.	.	.
population group 5	0.000	0.000	0.000	0.000
T O T A L D E M A N D {CT(i,t)}				
final product 1	0	0	0	0
. . . . .	.	.	.	.
final product 15	0	0	0	0
PER CAPITA DEMAND for GROUP 1 POPULATION GROUP 1				
final product 1	0.000	0.000	0.000	0.000
. . . . .	.	.	.	.
final product 15	0.000	0.000	0.000	0.000
PER CAPITA DEMAND for GROUP 2				
. . . . .	.	.	.	.
. . . . .	.	.	.	.
PER CAPITA DEMAND for GROUP 5 POPULATION GROUP 5				
final product 1	0.000	0.000	0.000	0.000
. . . . .	.	.	.	.
final product 15	0.000	0.000	0.000	0.000

DEMAND

Reminder! If you have finished studying the table, press «Alt» «M» and select "Return" to get back to the *DEMAND MENU*. See *Section 4.2*, «Alt» «M» menu's "Print" command for information on how to print tables!

First, both per capita minimum expenditures and residual expenditures are calculated. The residual expenditures should be

nonnegative. If this condition does not hold for one or more population groups then either the prices are too high compared with the expenditure possibilities of the group in question or the parameter values are wrong, for instance minimum quantities are too high. In this case of course the total and per capita demand values do not make sense. To gain satisfactory demand values you have to correct some of the data in the previous tables. To do this call the «Alt» «M» menu, choose "Return" to go to the *DEMAND MENU* and there select the appropriate command. Then come back to this table to verify the results.

The main result obtained through the demand module is the total consumer demand for the final products of the system. In addition to unit price information, data on total consumer demand is the second main area where an output from the demand module serves as an input in the supply module. However, it should be remembered that unit price information is given outside the model. It is the task of the supply module to analyze, how to satisfy the demand resulting from the given prices from the side of production (or imports).

Notice that both selling prices used and demand levels obtained in the demand module are not loaded automatically into the supply module. These have to be entered manually. This small inconvenience makes it possible to use the demand and supply modules separately and to test the supply module with different demand scenarios.

At the end of the table the per capita demand values are listed for the different population groups (in place of the *POPULATION GROUP* texts of course the formerly defined names appear). These disaggregated data are very important mainly in the case of basic goods. They help investigate the economic and social situation of the different population groups.

4. WORKING WITH THE TABLES

4.1. HOW TO FILL IN A TABLE

After *Screen 2* and *Screen 3* in *Subsection 2.2.2* we began to discuss how to move within a table and how to fill in a table. Now we continue this topic further. The text is illustrated with tables taken from the demand module, but applies equally to the tables of the supply module.

Moving in the tables

Using the four arrow keys (up, down, left and right) you can move the cell pointer to the next cell in the appropriate direction. From the edge of the table (the first or last column or row) you cannot move outside. If you try to do so then the computer beeps (signals with a sound). There are closed areas in the tables in which you cannot move the pointer. We call an open area that part of the tables in which you can move the pointer. The horizontal upper headings (titles) of the tables are always closed areas. There are tables where you should write in the vertical title. With these tables you can open and close the area of this title with the commands of the «Alt» «M» menu (see next section).

The tables in EMEPS are usually larger than the screen. So if you are on the edge of the screen, this dos not necessarily mean that you are on the edge of the table. Moving further in the desired direction the subsequent parts of the table appear. Most of the tables are longer than the screen.

Their width usually depends on the length of the planning period. If the planning period is longer than four years then you cannot see all of the columns on the screen. The *Base year* and *Target year* superscriptions, above the years in the horizontal title, help to indicate whether the first or the last columns are on the screen. The *DEMAND SYSTEM PARAMETERS* table has 5 columns for the population groups but only 4 columns can be seen on the screen.

In the case of large tables you can move the whole open area of the table without moving the cell pointer. Press «Scroll Lock». The *Scrcll* indicator appears at the bottom of the screen (if you press «Scroll Lock» again, the indicator disappears). Then press an arrow key. The table's open area moves one row or column in the appropriate direction, while the cell pointer (and the closed areas) remains in the same cell. There are two instances in which the cell pointer moves while the *Scroll* indicator is on: firstly, when it must move in order to remain visible on the screen and secondly when the table can move no further in the indicated direction but the pointer can.

To move one screen up or down press «PgUp» or «PgDn». To move one screen right or left press «Ctrl» and holding it down press the right or left arrow key. If the table is not long enough to move one screen in the required direction, the cell pointer stops on the appropriate edge of the open area of the table.

By pressing «Home» you can go at once to the top left corner cell of the table's open area.

By pressing «End» an *End* indicator appears in the lower right corner of the screen (if you press «End» again, the indicator disappears). If the *End* indicator is on, and you press «Home», the pointer moves to the lower right corner of the table. You can move the pointer in any direction to the next boundary between empty space (blank cells) and filled space (cells with entries). Press «End», then press an arrow key. If the cell pointer is on a filled cell, the pointer moves in the arrow's direction to the last filled cell before a blank cell or to the edge of the table's open area. If the cell pointer is on a blank cell, the pointer moves in the arrow's direction to the first filled cell. In the case of right and left arrows you can move this way to the last or first column of the table's open area. In the case of up and down arrows you can move to the end of that data block where the pointer is.

There are cases, when the length of the investigated time period is less than four years, that the table under consideration has less than four columns (this is characteristic of the investment tables). In these cases you can see four columns on the screen (filled in with zeros), but you cannot go into the redundant columns, which are closed.

Typing and changing entries

The content of the cell indicated by the cell pointer can be seen in the first line of the screen, together with the cell's address and other symbols, indicating the type and format of the entry. When you begin to type a word or a number, the typed characters appear in the second line of the screen. To enter the typed characters into the current cell, press «Enter». In this way you can fill in blank cells or revise existing entries (the cell's original content is lost). Usually this is the case, because the large tables are filled in originally with zeros (or sometimes with other numbers) helping you to see where to type.

You can speed up data entry. Instead of pressing «Enter» after you complete an entry, simply press a pointer-movement key. This single keystroke has two effects; it records the entry in the current cell, and it moves the cell pointer to the next cell. From this follows that before finishing to type a cell entry you should not use the pointer-movement keys.

You can change an entry as you type it. While typing (before pressing «Enter») press «backspace» (grey left arrow key) to erase the last character that you typed. You can now erase another character with «backspace», type a new character, or press «Enter» to complete the entry.

If you begin to type an entry and change your mind, press «Esc» and the typed characters disappear.

If you made a mistake or changed your mind then you can retype the entry. In the case of long entries it is easier to use Symphony's Edit Mode (details are found in the *Symphony How-To Manual*).

Protected cells

Even in the open areas of the tables there are cells where you

should not type anything. These cells - containing subtitles, labels, results, etc.- are protected. The non-protected cells, where you can type (the cells of data input), are displayed in some contrasting way, for instance more brightly or in another color (depending on the computer, the display screen and the driver set). On the printouts the stars ('*') at the beginning of the rows containing non-protected cells help distinguish these rows from the result rows. If the cell pointer is on a cell, where data input is allowed a letter *A* can be seen before the cell content on the control panel.

You should not type anything into the protected cells. If you type something and you press «Enter», then the computer beeps and an *ERROR* indicator blinks in the upper right corner. Press «Esc» to get rid of this error.

Numeric display formats

The content of protected cells is usually a formula. It appears on the control panel if the cellpointer is on the cell, while in the table the numeric result of the formula can be seen. Both these results and the content of the non-protected cells may have different formats.

The general format means that (within the cell's width) numbers are not rounded, trailing zeros after the decimal point are suppressed, very large and very small numbers are displayed in exponential format. In "normal" cases you do not meet with exponential format, so instead of complicated explanation we give two examples to make clear the interpretation of it:

$3.2E+09 = 3.2*10^{9} = 3\ 200\ 000\ 000$

$5.8E-11 = 5.8*10^{-11} = 0.000000000058$

On the left hand side of the equations the displayed format can be seen.

In the case of fixed formats fixed number of decimal places is displayed. Zero decimal places result in integer format. Numbers which have more decimals then the applied format are rounded. They are only shown in this way, EMEPS always works with unrounded numbers. If the cell pointer is on a number (not on a formula) you can see its unrounded form on the control panel.

In some cells stars may appear across the full width of the cell (********). This means that the number is too large and the cell is not wide enough to show it (the cells in EMEPS can contain 8 digits, including the decimal point). Usually this means that you may have made a mistake, you have chosen an unsuitable unit of measure for a variable or the display format is not appropriate. You can change the display format with the help of «Alt» «M» menu's "Format" command. It is described in the next section. (In one case in the supply module the stars appear intentionally in the cells, see *Table 6*).

The original zeros in the tables help you to know the formats of the numbers. Only one exception exists, the case of lone zeros: *0*. These zeros may indicate either general or integer format. You can find out the cell format also from the control panel. If the format is fixed decimal then an *(Fd)* sign can be seen on the control panel

before the number, where *d* denotes the number of decimal places. That is integer format is denoted by *(F0)*, numbers with one decimal by *(F1)*, etc. The general format is not signed on the control panel.

Saving your work -- the «Alt» «S» saving utility

For safety reasons you may want to save your tables while working with them. To do this press «Alt» and holding it down press «S». You get the following menu choice:

Yes No

Select "Yes" to save the table; select "No" if you have pressed «Alt» «S» accidentally and you do not want to save the table. In the case of the demand module you save all of the tables of the current demand scenario. In the case of the supply module you save by this command only the table you are working with. The «Alt» «S» command is naturally defined only for tables where data input is needed.

We stress again that this command serves only safety purposes. Leaving the table you are working with it is always automatically saved or in other cases you are asked whether to save or quit the table without saving.

Miscellaneous

Do not type the % sign when you have to type data in percentages!

Sometimes you may push a button on the keypad accidentally and an *ERROR* occurs (and an error message appears in the bottom line of the screen), or an unknown menu or text appears on the control panel (for instance an *EDIT* indicator). In this case press «Esc» once, or more if it is needed, to get rid of the problem.

4.2. «Alt» «M» UTILITY MENU

When you are working with data tables, you can activate a utility menu. To do this, press «Alt» and, holding this down, press «M».

In the demand module the «Alt» «M» menu can be activated while working with *Table 1*, *Table 2*, *Table 3* and *Table 4*.

The list of «Alt» «M» menu commands depends on the table, from where you call the menu. First we describe the general form of the «Alt» «M» menu, then we turn to its special uses within the demand module. The «Alt» «M» menu is applied in the supply module as well. Reviewing the data tables of the supply module, we indicate the applicability of the «Alt» «M» menu and its special uses.

4.2.1. GENERAL FORM OF THE «Alt» «M» MENU

The general form of the «Alt» «M» menu is as follows:

```
Copy current cell's content up to the end of current row          MENU
Copy  Multiply  Format  Heading  Print  Return
```

The first row is the capsule description of the "Copy" command. As you move through the commands, you can see the capsule description of the each.

If you call the «Alt» «M» menu by mistake, press «Esc» and the menu disappears.

The menu commands operate as follows:

"Copy"

This command is useful if you would like to reproduce the same values in a row, from a cell of the row to the end of that row. (For example you are using constant prices, or some parameters do not change according to population groups, etc).

If the cell pointer is in a cell, you call the «Alt» «M» menu and select "Copy", then the content of the cell is copied into every cell right of the current cell in that row of the table. The cells left of the current cell are unchanged.

"Multiply"

This command makes it easier to enter data into a row, which is changing (increasing or decreasing) at a constant rate. By selecting "Multiply" the following text appears at the top of the screen: *Type the rate of change (in %) and press «Enter»!* Now you have to type a number and press «Enter». Do not type the % sign!

To make clear what is happening, we formulate the result of this command. Denote the current cell's content with c and the rate of

change with r. The content of each cell, beginning with the current cell will be, in succession:

$$c,\quad c*(1+r),\quad c*(1+r)^2,\quad c*(1+r)^3,\ \ldots\ldots$$

and so on, up to the end of the row. Cells left of the current cell remain unchanged. The r rate can be negative, in this case the values are decreasing.

"Format"

With the "Format" command you can change the entry format of the whole current row, that is the row where the cellpointer is. You can format also rows of protected cells. By selecting "Format" the following subcommands appear:

General Fixed

By selecting "General" the entry format of the current row becomes general. (General format means that numbers are not rounded, trailing zeros are not displayed, very large and very small numbers are displayed in exponential format).

By selecting "Fixed" a message appears at the top of the screen: *Type the number of decimal places (0..6) and press «Enter»!* Follow this instruction to get the desired format.

One important case of employing the "Fixed" command is the following. Usually the cells of data input have general format. This is practical because the data appear in the same form as you type them. But in most cases when you generate a row with the help of the "Multiply" command you get too much decimals.

"Heading"

As previously mentioned, there are closed areas in the tables, where you cannot move. Sometimes it is needed however to step into the vertical (left) heading of the tables to define some of the labels. (For instance the *population group* and *final product* labels in *Table 2*).

If the left heading is closed then the "Heading" command opens it.
With open left heading if the table is wider than the screen, and you are moving the cell pointer to the far right of the table, then the left heading disappears from the screen. To freeze it again, call the "Heading" command: if the left heading is open then "Heading" closes it. The cell pointer's position does not affect the functioning of "Heading". You can call it even if the cell pointer is in the vertical heading.

The «Alt» «M» menu contains the "Heading" program only in the cases when label input is allowed in the left heading of the table.

"Print"

By selecting "Print" you can print the table you are working

with. You can apply this command only if your *Symphony* program package is properly installed to your printer. Before printing check whether your printer is turned on, you have paper in it, etc.

The page length of the paper should be 11 inches (66 lines are printed on a page). You cannot change this option in EMEPS. (If you are a practiced *Symphony* user, you can work with *Symphony's* printing facility to change this setting. In this case you should print directly from *Symphony* and not from EMEPS. However, if it is possible, avoid this switch to *Symphony*).

The current date and page numbers (in the case of tables longer than one page) are printed on the top of the pages.

If an error occurs press «Esc». The error message can be seen at the bottom of the screen.

"Return"

We already considered "Return" in *Subsection 3.2.1.* Selecting "Return" you can go from the table you are working with to *DEMAND MENU*. This "Return" does not save the table. It is not necessary to save the table because it remains in the active memory of the computer, although you cannot see it. This «Alt» «M» menu command has analogous effect in the case of the supply module tables.

4.2.2. «Alt» «M» MENU SPECIAL USES IN THE DEMAND MODULE

In the case of *Table 1* and *Table 2* there are no special uses, the general form of «Alt» «M» menu is applied.

DEMAND SYSTEM PARAMETERS (Table 3)

The commands of the «Alt» «M» menu are reduced to:

Format Print Return

A short explanation follows on why the three other menu options are omitted. In this table you need not write anything into the vertical title, so "Heading" is not needed. The columns of this table vary according to the population groups, instead of the years of the planning period, as in the case of other tables. The maximum number of population groups is 5, although you can work with fewer groups as well. In this case some of the columns should remain empty (or to be more precise, the original zeros should remain). The "Copy" and "Multiply" commands fill the cells of a row up to the end of that row. To avoid the possible problem of filling in cells which should remain empty these commands are omitted.

The *RESULT* table (Table 4)

The commands of «Alt» «M» menu are:

Format Demand_print All_print Return

In the case of this table there is no data input, so the omitted commands are useless.

"Format" and "Return" function as usual.

"Demand_print" has the same effect as "Print" in the case of other tables and prints this demand table.

"All_print" prints all of the four tables of the current demand scenario. You need not print these tables one by one.

5. SUPPLY MODULE

In the supply module you can extend the scope of the analysis over the most important intermediate goods needed, directly or indirectly, in the production of the system's final goods. A *component* is any major extraction, processing or distributional activity affecting the supply and use of a given good. The component's activity is expressed in the terms of a *main product*, where the notion of a main product is understood in wide sense, it can be also a transport or traiding activity. It is supposed that the main product is homogenous in quality and consequently also in price. If it is not so, then you can regard them as different products, belonging to different components. The supply calculations cover each component separately. The commands of the *COMPONENTS MENU* serve to define and handle the components.

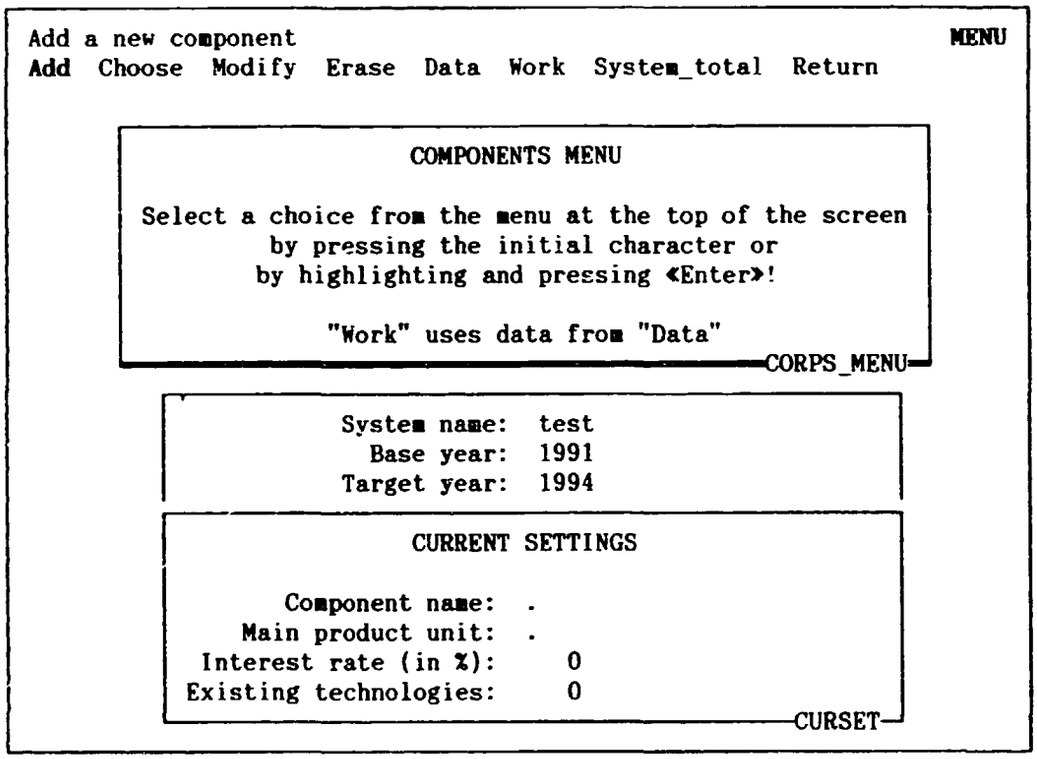
There are economic variables, which should have the same value in every component, that is they are uniform within the current system. Such variables are the exchange rate, profit tax rate, etc. They are reviewed in *Subsection 5.1.2.*

5.1. COMPONENTS MENU

5.1.1. COMPONENTS MENU COMMANDS

You can start the supply calculations with the "Supply" command of *SYSTEMS MENU* (see *Subsection 2.2.1*), which invokes the following screen:

Screen 6



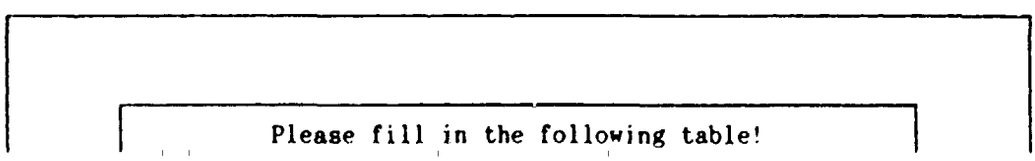
The structure of this screen is almost the same as in that of *DEMAND SCENARIOS MENU* (see *Section 3.1, Screen 4*). A short description of the commands in the *COMPONENTS MENU* is given below.

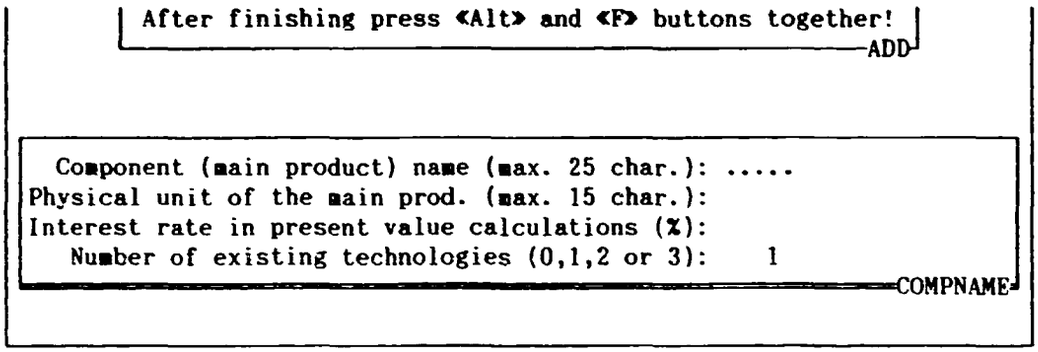
"Add"

By selecting "Add" you can start to build up a new component. As in the case of systems (see *Screen 2* in *Subsection 2.2.2*), "Add" calls *LIST OF COMPONENTS*. Here move the cell pointer to a serial number belonging to an empty row and press «Enter». You can define altogether 20 components in a system (*Subsection 2.2.2* details possible mistakes that may arise in the process).

After selecting an empty row in the *LIST OF COMPONENTS* window, you get the following screen:

Screen 7





The maximum length of a *component name* is 25 characters. Numbers and spaces are allowed in the names, but the first character should be a letter of the English alphabet. Apart from these restrictions, you can use any name as a component name, but it is practical to use the name of the main product which you want to analyze.

The *physical unit* of the main product serves later only as a reminder. It will be written into the titles of the appropriate tables and appears on the printouts as well. Such reminders can be useful when you have to give the amount of inputs per unit of main product output.

The first character of the physical unit should be a letter or a quotation mark. For instance the text *1000 tons* is not acceptable for EMEPS. If you try to enter this text the computer beeps and an *EDIT* indicator appears on the control panel. Press «Esc» twice to get rid of this problem. Instead of *1000 tons* you can type *thousand tons* or you can begin typing the entry with a quotation mark: *"1000 tons*. In this case the quotation mark is not visible in the cell.

The *interest rate* (or discount rate) is used in present value calculations (see *Subsection 5.4.4*). During the present value calculations EMEPS discounts sales and cost values occurring in different years to values in the base year, using this interest rate. The results of the present value calculations are comparable only when using the same interest rate. This is why you have to give the interest rate at this early stage in the program. You can leave this cell blank if you do not want to work with investment variants (blank cells are treated as zeros in EMEPS calculations). Later, if you change your mind, you can come back to fill in this cell with the help of the "Modify" command.

If you are working with constant prices (cf. *Subsection 3.2.2*) apply real, if you are working with current prices apply nominal interest rate.

By modifying the interest rate you can undertake sensitivity tests. After filling in the investment variant tables, return to this menu and modify the interest rate. By going back to the appropriate tables, you can find the results of the present value calculations prepared with this new interest rate.

EMEPS allows to distinguish up to three **different existing technologies** producing the main product of the component. These are the technologies which already exist in the base year. The planned technologies should not be counted here. If there are no existing technologies at all - the good in question is imported - then you

should type here 0. EMEPS offers the figure 1 as the number of technologies (this is a frequent occurrence), but you can overtype it.

Different technologies have different input and output structures. According to the number of technologies, you have to fill in different tables later on. Thus you cannot modify the number of technologies if you have already worked with the tables.

If you have finished filling in the *COMPNAME* table, press «Alt» and holding it down press, «F». The following menu commands appear on the control panel:

File Quit

The "File" command confirms the creation of a component with the given name and settings. If the component name is correct and the number of technologies equals to 0, 1, 2 or 3 then EMEPS completes the file-creation and the control is returned to *COMPONENTS MENU.* (Otherwise you will get an error message and can correct the wrong settings.) The newly added component becomes the current component and its name and settings appear in the *CURRENT SETTINGS* window.

"Quit" will lead you back directly to *COMPONENTS MENU* without creating a new component. You are advised to do this if you have selected "Add" by mistake, you mistyped the number of technologies or if you have pressed «Alt» «F» accidentally.

Pressing «Esc» in this menu you get back *COMPNAME* window again. If it is needed, you can modify here the component settings and press «Alt» «F» repeatedly.

"Choose"

If you have already defined components, you can choose another component to work with as the current component. If you want to erase a component ("Erase" command) or work with a component ("Work" command) which is not the current component you have to use "Choose".

Selecting "Choose" brings you again to *LIST OF COMPONENTS.* Here select the serial number of the desired component and press «Enter». (If you accidentally select an empty row you will return to *COMPONENTS MENU*). After some seconds you arrive back to *COMPONENTS MENU* and the parameters of the selected component appear in *CURRENT SETTINGS* window.

"Modify"

By selecting "Modify" you can rename the current component and/or change the main product unit or the interest rate. You cannot change the number of existing technologies with this command. Selecting "Modify" the *COMPNAME* window is displayed again with the actual settings. Here you can revise them. After finishing press «Alt» «F». You will return to *COMPONENTS MENU.* In *CURRENT SETTINGS* window the modified settings can be seen.

"Erase"

By selecting "Erase" you can erase the whole current component (all of the investment variants it contains) from EMEPS. If you have erased a component you cannot recover it within the framework of EMEPS.

After selecting "Erase" you have to confirm this command. If you press any button except «y» (or equivalently «Y») then nothing happens and you return to *COMPONENTS MENU*. If you press «y», then the current component is erased, you return to *COMPONENTS MENU* and in the *CURRENT SETTINGS* window the component name, main product unit and interest rate are cleared. If you want to continue your work with another component you have first to select "Choose" or you have to add a new component with "Add". You can erase only the current component.

"Data"

By selecting "Data" the *DATA COMMON TO EVERY COMPONENT* table is loaded. You can invoke this command before and after adding the components alike, but you should call it before selecting "Work". The table is treated in the next subsection.

"Work"

By selecting "Work" the *CENTRAL MENU* is loaded and you can continue your work with the current component. Before selecting "Work" fill in the *DATA COMMON TO EVERY COMPONENT* table, because its data are used in the subsequent computations. If you forget it or want to modify some of the data you can later return from *CENTRAL MENU*. The *CENTRAL MENU* is described in the next section.

"System total"

By selecting "System_total" you are given a final summation and comparison of the current system's components. In this summation some variables of the *OUTPUT TOTAL* tables are used. These tables are the summaries of the component calculations, they are described in *Subsection 5.5.2*. Consequently, you can call the "System_total" command only if you have already calculated the *OUTPUT TOTAL* tables of at least two components of the current system. If you select "System_total" before having at least two components, the following error message appears: *You have not created a component, or you have created only one component! Press any key to return to COMPONENTS MENU!* Moreover, to get a complete summation of the current system you should have calculated the *OUTPUT TOTAL* tables of all of the components. Selecting "System_total" the following menu appears:

Continue Return

According to the warning, which appears on the screen at the same time, you should select "Return" from this menu if you have not calculated yet all of the *OUTPUT TOTAL* tables. Selecting "Continue" the *SYSTEM TOTAL* table is loaded. Further details on this table are given later, in *Section 5.6*.

"Return"

By selecting "Return" the components' settings and the *DATA COMMON TO EVERY COMPONENT* table are saved, the control is returned to *SYSTEMS MENU*.

5.1.2. DATA COMMON TO EVERY COMPONENT

As a result of the "Data" command in *COMPONENTS MENU* you get the following table:

Table 5

DATA COMMON TO EVERY COMPONENT

System: test	BASE year 1991	1992	1993	TARGET year 1994
*Exchange rate (national currency/$)	1	exch		
*Profit tax rate (in %)	0	profittax%		
*Wage tax rate (in %)	0	wagetax%		
*Social security, paid by employer(%)	0	socsec%1		
*Social security, paid by employee(%)	0	socsec%2		
Personal income tax				
* Lowest value of first tax bracket	0	inclevel1		
* Lowest value of second tax bracket	0	inclevel2		
* Lowest value of third tax bracket	0	inclevel3		
* Tax rate in the first bracket (%)	0	inctax%1		
* in the second bracket (%)	0	inctax%2		
* over the second bracket (%)	0	inctax%3		

TABLE

In the supply module there are quite a lot variables and relations.
To make identification of the variables easier, we have written the variable names used in *Appendix A* into the appropriate row of the table. We follow this practice throughout in the supply module.

The data of this table are only defined at this point of the program, they are used later, in the component computations. Working for example with an *OUTPUT* table (*Subsection 5.3.2*) of a component, data specified in this table are loaded automatically. In this way you can easily perform policy analyses. Having the results of the EMEPS calculations based on a data set, you can come back to this point and change for example the exchange rate. Loading again the adequate component tables you get immediately the results with the new exchange rate.

In most developing countries the national currency is not convertible. Because of this fact, EMEPS accounts separately for incomes and costs in convertible currency. Items in foreign (convertible) currency are calculated in dollar. If you want to carry out the whole computation in dollar you can keep the preset 1 values for the *exchange rate*.

In some countries there exist product-specific exchange rate differences. EMEPS works with uniform exchange rate, occasionally possible exchange rate differences can be taken into account by the export and import taxes/subsidies in the components.

Profit tax rate is the percentage rate of the gross profit.

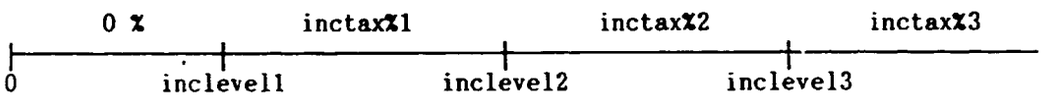
Wage tax rate is the percentage rate of wage taxes, paid by the

employers. *Social security payments* are distinguished from the wage taxes because in most countries they flow into a separate found and not the central budget. This distinction is used in EMEPS when calculating the effect of the investigated system on the government account.

EMEPS also differentiates between the social security payments paid by the employers or the employees, because the former is the part of the production costs.

EMEPS approximately quantifies the direct effects of the investment projects on the personal income of the employees working in the productive system under investigation and - through this - on the government account. Thus *personal income tax* is calculated after the wages earned within the framework of the system (involving the assumption that this is the only income of the workers of the system). Personal income taxation is applied only on the employees, employers are taxed by the profit tax.

We use a stepwise increasing income taxation with three brackets:



The portion of the income below the *lowest value of first tax bracket* (referred shortly as *inclevel1*) is not taxed. That part of the income, which falls between *inclevel1* and the *lowest value of second tax bracket* (*inclevel2*) is taxed by the *tax rate in the first bracket* (*inctax%1*). Analogously, that part of the income, which falls between *inclevel2* and the *lowest value of third tax bracket* (*inclevel3*) is taxed by the *tax rate in the second bracket* (*inctax%2*). The third bracket is open from above, that part of the income which falls over *inclevel3* is taxed - according to the meaning - by the *tax rate over the second bracket* (*inctax%3*). The exact formula is given in *Appendix A, equation (??)*.

We illustrate this rule with a simple example. If the income is 1000 units, the *inclevel* values are 300, 500, 800 units and the tax rates are 20, 30 and 50 % by turns, than the income tax is:

(500-300)*20/100 + (800-500)*30/100 + (1000-800)*50/100 = 230.

If the income taxation is proportional, that is there are no income brackets, then give the value of the uniform tax rate to *inctax%3* and keep the 0 values for the other income taxation parameters. If you have one tax bracket (that is the income taxation is proportional over an income level and below this level the tax rate is 0) then give the appropriate values to *inclevel3* and *inctax%3*. Similarly, in the case of two tax brackets give value to *inclevel2, inclevel3, inctax%2* and *inctax%3*; the other two parameters remain 0.

Warning! You should use the same unit of time here, in the income taxation and later, in the labor input and wage parts of the *PRODUCTION PROCESS* tables. That is if you measure the labor input in manyears, then apply yearly wages and income; if you measure the

labor input in months, then apply monthly wages and income.

«Alt» «M» menu

In the case of *Table 5* the «Alt» «M» menu commands are:

Copy Multiply Format Print Return

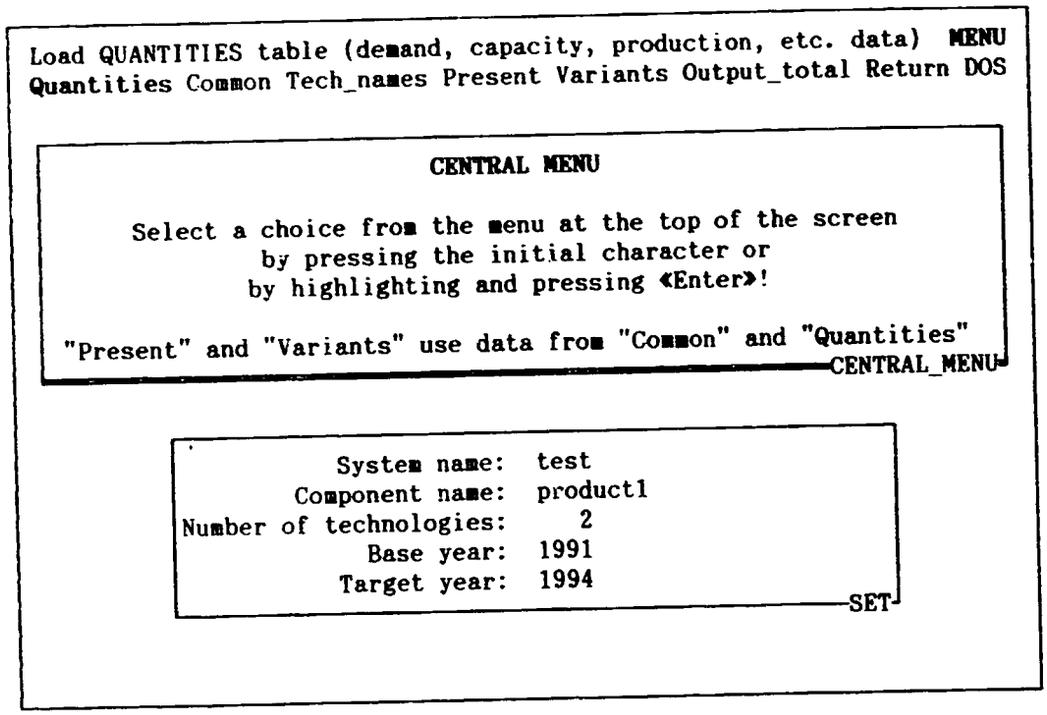
Their usage is the usual (see *Subsection 4.2.1*). With the help of "Return" you can go back to *COMPONENTS MENU*.

5.2. THE CENTRAL MENU OF THE COMPONENTS

5.2.1. CENTRAL MENU COMMANDS

The "Work" command in *COMPONENTS MENU* loads the next screen:

Screen 8



The message in the *CENTRAL MENU* window reminds you that the tables which are loaded by selecting "Present" or "Variants" use data from the tables loaded by "Common" and "Quantities". So, if you meet this menu on the first occasion within a component, then first choose "Common" and "Quantities".

The appearance of *Screen 8* is a little bit different from the form presented here if the number of existing technologies is 1 or 0. In the case of 1 existing technology "Tech_names" (an abbreviation for technology names) is omitted from the *CENTRAL MENU* commands. If there are no existing technologies at all, then both "Tech_names" and "Present" are missing.

The effect of most *CENTRAL MENU* commands is rather complex, they lead to further tables and command menus. So, in this subsection we describe these commands only shortly, they are treated in details in the following subsections and sections.

"Quantities"

By selecting "Quantities" the *QUANTITIES* table is loaded. In this table you can specify those data of the current component which are measured in physical quantities: demand for the main product of the component; capacity and production level of the existing capacities

and of the already defined investment variants. Also the partition of the different technologies' production into domestic and export sales should be given in this table. To do this, some information from the table loaded by the "Common" command are useful, so it is advised to invoke at the first time the "Common" command.

The *QUANTITIES* table is described in details in *Subsection 5.2.3.* You can return from the table to *CENTRAL MENU* by «Alt» «M» menu's "Return" command.

"Common"

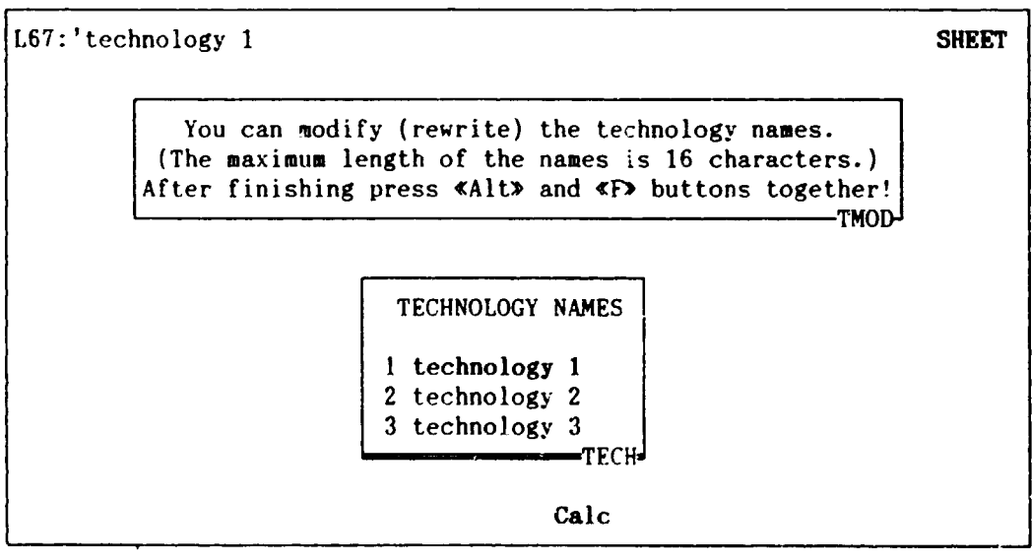
By selecting "Common" you call the table: *DATA COMMON TO EVERY TECHNOLOGY*. In this table you can specify the output prices, the different kinds of taxes and the import costs related to the main product of the component. These data are uniform within the current component, they are applied both in the existing and planned technologies. Working with the current component at the first occasion it is practical to call first the "Common" command.

The *DATA COMMON TO EVERY TECHNOLOGY* table is described in the next subsection. You can return from the table to *CENTRAL MENU* by invoking the «Alt» «M» menu and selecting "Return".

"Tech names"

If there are 2 or 3 existing technologies you can give them names with the help of this command. Selecting "Tech_names" you get the following screen:

Screen 9



The *technology 1, technology 2, technology 3* names (of course in the case of two existing technologies only the first two) are preset in EMEPS. Do not call "Tech_names" if these preset names are suitable for you. If you want to give more expressive names you can rewrite the old ones. The technology names help to identify the different data sets and tables, they appear in the *QUANTITIES* table and in the titles of the *PRODUCTION PROCESS* and *OUTPUT* tables belonging to the corresponding technology. You can issue this command at any time

(before or after other commands), and can modify the names several times if you change your mind.

Pressing «Alt» «F» you go back to *CENTRAL MENU*.

"Present"

In the case of one existing technology by selecting "Present" the *PRESENT -- PRODUCTION PROCESS* table is loaded. In the case of two or three existing technologies a menu choice appears first (here the two technology case is shown):

1: technology 1 2: technology 2

Pressing «1», «2» (or «3») the corresponding *PRESENT -- PRODUCTION PROCESS* table is loaded, containing also the technology name in the table title. The *PRESENT* word refers to the fact that these tables contain data on the technologies which are already present in the base year.

The *PRODUCTION PROCESS* tables include data on the possible by-products, material and labor inputs and calculate the input costs. It uses data from the *DATA COMMON TO EVERY COMPONENT* table (see *Subsection 5.1.2*) and the corresponding production levels from the *QUANTITIES* table. The table is described in *Subsection 5.3.1.*

"Variants"

By selecting "Variants" you call *VARIANTS MENU*, where you can define different investment variants. See *Section 5.4* for further information about variant programming.

"Output total"

By selecting "Output_total" you get a final summation of the current component. The *OUTPUT TOTAL* table is build up from the *OUTPUT* tables of selected existing and planned technologies. It is described in *Subsection 5.5.2.*

"Return"

As a result of "Return" the *QUANTITIES* table, the technology names and the variant settings are saved and the control is returned to *COMPONENTS MENU*.

"DOS Return"

On *Screen 8* only *DOS* can be seen insteda of *DOS_Return* owing to lack of space. As a result of "DOS_Return" the *QUANTITIES* table, the technology names and the variant settings are saved and the control is returned to DOS.

5.2.2. DATA COMMON TO EVERY TECHNOLOGY

The "Common" command in *CENTRAL MENU* loads the following table:

Table 5

DATA COMMON TO EVERY TECHNOLOGY

System: test Component: product1 Main product unit: metric ton	BASE year 1991	1992	1993	TARGET year 1994
*DOMESTIC SELLING PRICE of the main product (used in demand module)	0	p		
RATES OF TAXES minus SUBSIDIES (%)				
* Salestax	0	**salestax%**		
* Export tax	0	**xtax%**		
* Import taxes and tariffs	0	**itax%**		
Production taxes				
* Turnover tax	0	**turntax%**		
* Value added tax	0	**vat%**		
SELLING PRICE COMPONENTS of the main product:				
Salestax	0.00	salestax		
* Trade margin, transp cost, etc/unit	0	**margin**		
Producer's (or importer's) price	0.00	pp		
Production tax (per unit)	0.00			
EXPORT PRICE COMPONENTS				
Exchange rate	0	exch		
* Export price in $	0	**xp$**		
Export price in national currency	0.00	xp		
Export tax (per unit)	0.00	xtax		
DIFFERENCE BETWEEN THE UNIT PROFIT OF DOMESTIC AND EXPORT SALES	0.00	profitdiff		
I M P O R T of the main product				
COST COMPONENTS PER UNIT				
* Import price in $	0	**ip$**		
Import price in national currency	0.00			
Taxes&tariffs on imports	0.00			
Other import costs (freights, insurance, etc.)				
* Domestic	0	**icostother**		
* Foreign in $	0	**icostother$**		
in national currency	0.00			
Total costs per import unit	0.00	icost		
Total $ costs per import unit	0	icost$		
GROSS PROFIT on import unit	0.00	iprofit		
UPPER LIMIT ON IMPORT				
* in $	0	**Imax$**		
in physical terms	*********	QImax		

TABLE

If the main product of the component is a final good, then the *domestic selling price* usually should be the same as in the demand module. (We wrote about the connection established by the prices

between the demand and the supply module at the end of *Subsection 3.2.3*). Nevertheless, if you want to try the effect of other price or consumer demand data on the supply module, or the investigated final good was not modelled in the demand module (because of lack of appropriate data), you can write in other values here.

The selling price of intermediate goods can be the same as the producer's price.

In the second data block of the table different kinds of indirect taxes or subsidies can be specified. In the case of subsidies the value of the tax in question should be negative.

Under the term *salestax* we mean the tax levied or subsidy received at the point of retail sale. The salestax does not belong to the costs of the producer. In some countries there exist a general salestax system, the goods are taxed in the retail sale. In other countries the salestax exist in the form excise tax on cigarettes, alcohol, etc. On the other side, basic foods or some other goods can be subsidized. If so, the rate of subsidy should be written into the table as salestax rate, with negative sign.

According to the usual definition, *salestax%* is a percentage of the net price (net price is the price before imposing the salestax). In the case of intermediate goods the salestax rate is set to zero. The exact formula can be found in *equation (S1)*, *Appendix A*.

It is supposed that both *export taxes* and *import taxes and tariffs* are proportional to the dollar value of export and import, respectively. Their rate in percentages is specified in the next two rows. In developing countries the export is frequently subsidized. In this case the rate of export tax is negative.

In most countries, either the *turnover tax* system, or the *value added tax* system is used in the taxation of production. The tax which is not used has to be set to zero. However it is possible that both taxes are used. There are countries for example, where there exists a general value added tax system, but with proportional subsidies given to some products. If the previously mentioned general salestax system is applied then both the turnover and the value added taxes can be neglected.

The turnover tax is proportional to the production value measured on producer's price. In some cases there exist also subsidies proportional to the production value.

Theoretically the value added tax (shortly VAT) is proportional to the value added of the investigated production process. In the practice however, tax rates are proportional to the output value and there is a tax drawback after the input materials. It is assumed throughout in EMEPS that the prices of the input products are net of VAT. Under this assumption VAT can be calculated in the same way as salestax. The rate of VAT is the percentage of the net price.

The third block of the table contains the selling price component calculations. The main aim of this short calculation is to determine the difference between the unit profit of domestic and export sales. This difference is very important in the decision where to sell the production of the component. (Cf. *equations (S1)-(S6)* in *Appendix A*).

The *producer's price* is the price that the producer, or in the case of imports the importer, receives when selling one unit of good. The row of *Trade margin, transportation cost, etc. per unit of output* serves to give the unit value of those factors of the selling price which are not due to the component under investigation. Subtracting this and the salestax falling on one product unit from the selling price we get the producer's price.

According to the specified turnover tax and VAT rates the value of *production tax* per product unit is calculated.

The value of the exchange rate is loaded automatically from the *DATA COMMON TO EVERY COMPONENT* table.

In the supply module we are interested in the producer's profitability. Consequently the dollar *export price* should not contain freights, insurance, etc. Naturally, you can leave zero the export data if the investigated good is rot exportable.

The unit *export tax* is calculated from the export tax rate. It is supposed that the production taxes are not applied to the export. There are countries however where the whole production - irrespective of the destination - is proportionally taxed and beside it the export is also taxed or more frequently subsidized. In this case you have to use the balance of these taxes, written into the export tax rate row.

Because the production costs are the same for both the domestic and export sales, the difference between the unit profit of domestic and export sales (shortly *profitdiff*) depend only on the prices and the output taxes. *Profitdiff* is got as the difference of *producer's price minus unit production tax* and *export price minus unit export tax*. The effect of different policy variables can be tested here. By changing the export and production tax rates you can influence the relation o. domestic and export profit.

Instead of or in addition to producing the main product of the component, you can import it. The import block of this table is an important element of the whole decision making procedure. Based on the domestic selling price, on the import price and on other import costs the *gross profit on import unit* is calculated (see *equations (S7)-(S9)* in *Appendix A*). Other import costs include transportation, insurance, etc. so as to make the unit import cost and the producer's price of the investigated good conceptually comparable. In the cause of foreign currency account calculations (at the end of the component computations) import costs arising in dollar are distinguished from costs in national currency.

In cases of foreign currency shortage institutional import limitations may be imposed. In EMEPS this limitation is given in value, restricting the dollar costs of the import. Dividing this value by the dollar cost of import unit we get an upper limit on import in physical terms (see *equation (S10)*).

If there are no import limitations then the upper limit on the import costs should be set to infinite. You can do this by invoking the "Import_limit" command in the «Alt» «M» menu of this table. As the result of this special «Alt» «M» menu command stars (********) appear in the import limit rows. The stars mean that there is no import limitation. (Practically of course not the infinity but a very large number, 10^{200} is written into the cells). If later you change

your mind you can rewrite the stars just like the "normal" numbers.

When loading *Table 6* at the first time, stars (*******) can be seen in the *Upper limit on import in physical terms* row. This is so, because at the beginning the import cost is zero, consequently there is no effective import limit. If you fill in the import cost data and also import limitation is imposed then these stars disappear.

If the import is totally prohibited then the upper limit should be set to zero.

«Alt» «M» menu

The «Alt» «M» menu commands used in *DATA COMMON TO EVERY TECHNOLOGY* table are the following:

Copy Multiply Format Import_limit Print Return

"Copy", "Multiply", "Format" and "Print" function as described in *Subsection 4.2.1.*

As the result of the "Import_limit" command the *Upper limit on import in $* and *in physical terms* rows are filled in with stars, denoting that there is no import limitation.

By selecting "Return" you get the following menu choice:

Save Quit

Both "Save" and "Quit" return the control to *CENTRAL MENU*, but as a result of "Save" the *DATA COMMON TO EVERY TECHNOLOGY* table is saved before returning. If you select "Quit" then the changes made since loading the table or since the last application of the «Alt» «S» saving utility are lost. Select this option only in the case if you want preserve the previous data set.

5.2.3. QUANTITIES TABLE

The "Quantities" command in *CENTRAL MENU* loads the next table:

Table 7

QUANTITIES

System: test Component: product1 Main product unit: metric ton	BASE year 1991	1992	1993	TARGET year 1994
DEMAND for the main product				
* Consumer demand; from demand module	0	CT(n)		
Induced demand for the main product by:				
* component name 1	0	Q(n,1)		
* component name 2	0	.		
* component name 3	0	.		
* component name 4	0	.		
* component name 5	0	Q(n,5)		
* Other domestic demand	0	Dother(n)		
TOTAL DOMESTIC DEMAND	0	Ddom(n)		
* ESTIMATED EXPORT DEMAND	0	Dexp(n)		
TOTAL (domestic & export) DEMAND	0	DTOT(n)		
PRESENT: technology 1				
STATUS: Active				
* Capacity	0	CAP(tech1)		
* Production	0	PROD(tech1)		
Capacity utilization rate (%)	0	util%(tech1)		
* Quantity of export sales	0	QXsal(tech1)		
Quantity of domestic sales	0	QDsal(tech1)		
PRESENT: technology 2				
STATUS: Active				
* Capacity	0	CAP(tech2)		
* Production	0	PROD(tech2)		
Capacity utilization rate (%)	0	util%(tech2)		
* Quantity of export sales	0	QXsal(tech2)		
Quantity of domestic sales	0	QDsal(tech2)		
TOTALS				
Production	0	PRODTOT		
Quantity of export sales	0	QXTOT		
Quantity of domestic sales	0	QDTOT		
Excess total demand (negative value means excess supply!)	0			
Excess export demand	0			
Excess domestic demand	0			

TABLE

If the main product of the component is a final good, then the consumer demand usually should be the same as in the demand module. (We wrote about the connection established by the consumer demand between the demand and the supply module when treating *Table 4* in *Subsection 3.2.4*). Nevertheless, if you want to try the effect of other consumer demand data on the supply module, or the investigated final good was not modelled in the demand module (because of lack of

appropriate data), you can write in other values here. If the main product is an intermediate good then the consumer demand is zero.

As it was already mentioned, to gain a complex picture about the system it is useful to devote components also to the most important intermediate goods, that is to goods which are used in relatively large volume as an input in the production or investment process of other goods of the system. So, if the main product of the component is such an intermediate good, the demand induced by other components of the system can be written into the next 5 rows. Every row is a linkage between two components of the system. The name of the component which induces demand for the investigated good, can be written into the left title, overwriting the text *component name* with the help of the «Alt» «M» menu's "Heading" command (see *Subsection 4.2.1*). In *Subsection 5.5.1* we'll write about the *supply scenarios*. At this point we just mention that if you have more supply scenarios for a product then it is practical to refer in the name not only to the component but also to the scenario.

Usually the consumer demand for an intermediate good is zero and similarly, the induced demand for a final good is also zero. Of course it is possible that a product is both a final and an intermediate product (for instance there may be a consumer demand for raw fish, which also serves as an intermediate input in the canned fish production).

Into the *other consumer demand* row you can write estimations on demand coming from outside the system.

The estimation of the *export demand* can be based on the extrapolation of the past market data outside the scope of EMEPS. In the absence of such data you have to use educated guesses. The estimation of export demand should be in close correlation with the export price estimation in *Table 6*. Higher prices result in lower demand and the other way round.

It is a typical situation in the EMEPS-applications that there is a huge domestic shortage from the investigated goods, and the main aim of the analysis to evaluate the investment possibilities of diminishing this shortage. Under such circumstances the exact estimation of the export demand is not so important. If the investigated good is not exportable then keep the zeros in the export demand row.

Adding up the different demand elements *TOTAL DEMAND* is provided in the last row of the first block of the table (cf. *equations (S11),(S12)* in *Appendix A*).

The subsequent blocks of the *QUANTITIES* table serve to specify the most important output data of the different technologies. A data block is attached to every existing and planned technology. *Table 7* is an example for the two existing technologies case. Modification of the table caused by adding investment variants to the component is treated in *Subsection 5.4.1*.

The *PRESENT: technology 1* text in the first row is the identification of the technology - it is an existing technology with this name. If you change the technology name with the "Tech_names" command of *CENTRAL MENU* (see *Screen 9* in *Subsection 5.2.1*) then the new name appears here. If there is only one existing technology then

the *EXISTING TECHNOLOGY* text can be read in this row. If there are no existing technologies then the block is suppressed, only the *THERE ARE NO EXISTING TECHNOLOGIES* text can is between the two jagged line.

The meaning of the *STATUS: Active* row is explained a little bit later in this subsection.

Into the *capacity* row type the capacity of the technology, measured in the production of the main product of the component. The capacity can decrease over time because of deterioration. The level of *production* should not be higher then the capacity. At the beginning it is expedient to set the production on the capacity level. Later, if you find that the new capacities are more efficient than the old ones and the sum of their production would be higher than the total demand, you can decrease the production on the existing capacities, to reach excess capacity intentionally. The ratio of production and capacity is calculated in the *Capacity utilization rate* row.

Quantity of export sales rows contain input data of the model, *quantity of domestic sales* data are calculated as the difference of production end export sales. If the export sales are zero then domestic sales equal to production.

So, the decision about the distribution of the production to export and domestic sales is made outside the program, but it can be based on information provided by EMEPS. The most important information is the difference between the unit profit of domestic and export sales, which is calculated in *Table 6 (DATA COMMON TO EVERY TECHNOLOGY)*. If, for example, the export profit is higher then the domestic one then it is natural to suppose that - up to the level of the export demand - the producers export the whole production. At the first step it is recommendable to determine the quantity of export and domestic sales according to this thinking. Later, having the detailed results of all of the existing and planned technologies you can come back here, modify the data and perform again the calculations with the new data.

The last block of the table contains the totals of the production, the export and domestic sales over the *active* technologies of the component. That is only those technologies are taken into account in the summation, *status* of which is active. You can change the status of technologies to *passive* and back by applying the special "Active/Passive" «Alt» «M» menu command. The command is treated in details under the *«Alt» «M» menu* title in this subsection. The real significance of the status of technologies presents itself only after adding investment variants to the component and assembling supply scenarios from the existing and planned capacities. In *Subsection 5.5.1* we return to this question again.

Excess total demand is the difference of total demand and total production (later, in other tables, supplementary import will be taken into account, but at this point of EMEPS we disregard import). The *excess of export and domestic demand* is defined analogously. Negative value for excess demand means excess supply. Excess supply is not likely when investment variants are not yet attached to the component.

«Alt» «M» menu

The «Alt» «M» menu commands used in *QUANTITIES* table are the following:

Copy Multiply Format Heading Active/Passive Print Variants Return

"Copy", "Multiply", "Format", "Heading" and "Print" function as described in *Subsection 4.2.1.*

By selecting **"Return"** you can go back to *CENTRAL MENU.* (The command does not save the table, because it remains in the active memory of the computer. *QUANTITY* is saved on the effect of "Return" in *CENTRAL MENU*, see *Subsection 5.2.1.*)

"Variants" is the same as the "Variants" command in *CENTRAL MENU.* By selecting it you call *VARIANTS MENU*, where you can define investment variants. See *Section 5.4* for further information about variant programming.

By selecting **"Active/Passive"** you can change the status of the existing and planned technologies. Only the active technologies are taken into account in the summation of the *QUANTITIES* table and in the *OUTPUT TOTAL* table of the component. In the case of three existing technologies and before adding any investment variants to the component, the command loads the following screen:

Screen 10

STATUS TABLE (Supply scenario)

Select an item and press «Enter» to change its status!
If you change a technology or rehabilitation variant to "Active" the status of the related rehabilitation variant or technology is changed to "Passive" automatically.

Select 0 to leave this table!

	Name	Status	Type
0			
1	technology 1	Active	PRESENT
2	technology 2	Passive	PRESENT
3	technology 3	Active	PRESENT

STATUS

Later, treating the investment variants, we return to this screen and explain the comment about the rehabilitation variant in the heading of the table. The cursor can move in the first column, through the numbers. Selecting an item and pressing «Enter», the status of the selected technology changes from *Active* to *Passive*, or reversely. Selecting 0 you go back to the *QUANTITIES* table, where the *TOTALS* block of the table has already been automatically changed according to the changes in the *STATUS TABLE.*

5.3. PROJECTION OF THE PRESENT SITUATION

5.3.1. THE PRODUCTION PROCESS TABLE

In *Subsection 5.2.1* we have shortly reviewed the "Present" command in *CENTRAL MENU*, describing how can you select the existing technology (if there are more existing technologies) you want to work with. After selecting the technology the command loads the next table:

Table 8

PRESENT, TECHNOLOGY: technology 2 -- PRODUCTION PROCESS

System: test Component: product1 Main product unit: metric ton	BASE year 1991	1992	1993	TARGET year 1994
PRODUCTION of the MAIN PRODUCT	0	PROD(tech2)		
Marketable BY-PRODUCTS				
Output per main product unit				
* by-product (and unit) 1	0	0		
* by-product (and unit) 2	0	0		
* by-product (and unit) 3	0	0		
Quantity of output				
by-product (and unit) 1	0	0		
by-product (and unit) 2	0	0		
by-product (and unit) 3	0	0		
Price (producer's price)				
* by-product (and unit) 1	0	0		
* by-product (and unit) 2	0	0		
* by-product (and unit) 3	0	0		
Output value				
by-product (and unit) 1	0	0		
by-product (and unit) 2	0	0		
by-product (and unit) 3	0	0		
Total value of the by-products	0	0		
MAIN INPUTS -- QUANTITIES				
Needed amount per unit of output				
* input product (and unit) 1	0	0		
. . . . .	.	.	.	
* input product (and unit) 10	0	0		
Needed fixed amount				
* input product (and unit) 1	0	0		
. . . . .	.	.	.	
* input product (and unit) 10	0	0		
Total quantity of inputs				
input product (and unit) 1	0	0		
. . . . .	.	.	.	
input product (and unit) 10	0	0		
MAIN INPUTS -- PRICES				
Unit $ cost of import				
* input product (and unit) 1	0	0		
. . . . .	.	.	.	
* input product (and unit) 10	0	0		
Rate of imp. taxes, tariffs etc.(%)				
* input product (and unit) 1	0	0		

. . . . .	.	. .
* input product (and unit) 10	0	0
Other costs per imported input unit		
* input product (and unit) 1	0	0
. . . . .	.	. .
* input product (and unit) 10	0	0
Price of imp. inputs in nat. curr.		
input product (and unit) 1	0.00	0.00
. . . . .	.	. .
input product (and unit) 10	0.00	0.00
Price of domestic inputs		
* input product (and unit) 1	0	0
. . . . .	.	. .
* input product (and unit) 10	0	0
DISTRIBUTION OF INPUTS ACCORDING TO ORIGIN		
Quantity of imported inputs		
* input product (and unit) 1	0	0
. . . . .	.	. .
* input product (and unit) 10	0	0
Quantity of domestic inputs		
input product (and unit) 1	0	0
. . . . .	.	. .
input product (and unit) 10	0	0
COST OF INPUTS		
Domestic		
input product (and unit) 1	0	0
. . . . .	.	. .
input product (and unit) 10	0	0
Imported (national currency)		
input product (and unit) 1	0	0
. . . . .	.	. .
input product (and unit) 10	0	0
out of which taxes & tariffs		
input product (and unit) 1	0	0
. . . . .	.	. .
input product (and unit) 10	0	0
$ costs		
input product (and unit) 1	0	0
. . . . .	.	. .
input product (and unit) 10	0	0
MAIN TYPES OF LABOR INPUT		
Needed amount per unit of output		
* **category of labor 1**	0	0
. . . . .	.	. .
* **category of labor 5**	0	0
Needed fixed amount		
* category of labor 1	0	0
. . . . .	.	. .
* category of labor 5	0	0
Total quantity of labor		
category of labor 1	0	0
. . . . .	.	. .
category of labor 5	0	0
Wage (per used labor unit)		
* category of labor 1	0	0
. . . . .	.	. .
* category of labor 5	0	0
Wage cost		
category of labor 1	0	0

. . . . .	.	. .
category of labor 5	0	0
Personal income tax		
category of labor 1	0	0
. . . . .	.	. .
category of labor 5	0	0
CALCULATION OF PRODUCTION COSTS		
COST OF MATERIAL INPUTS		
Domestic inputs		
Cost of main domestic inputs	0	0
Other domestic inputs		
* Cost per unit of output	0	0
* Fixed cost	0	0
Total cost of domestic inputs	0	0
Imported inputs		
Cost of main imported inputs	0	0
Other imported inputs		
* $ cost per unit of output	0	0
* Fixed $ cost	0	0
Total $ cost of other imp. inputs	0	0
* Rate of imp. taxes, etc. (%)	0	0
* Rate of other costs on imp.(%)	0	0
Total cost of imported inputs	0	0
out of which taxes & tariffs	0	0
TOTAL cost of material inputs	0	0
LABOR COST		
Wages in main labor categories	0	0
Other wages		
* Per unit of output	0	0
* Fixed amount	0	0
Wages total	0	0
Wage taxes	0	0
Social security, paid by employer	0	0
TOTAL cost of labor	0	0
FIXED COSTS		
* Depreciation on buildings	0	0
* Depreciation on machinery	0	0
Depreciation total	0	0
* Interest payment, domestic	0	0
* Interest payment, foreign in $	0	0
in nat. currency	0	0
Total of interest payments	0	0
Other fixed costs		
* Fixed taxes minus subsidies	0	0
* Other domestic fixed costs	0	0
* Foreign fixed costs in $	0	0
in national currency	0	0
Total of other fixed costs	0	0
TOTAL of fixed costs	0	0
TOTAL COST OF INPUTS	0	0
- out of which FOREIGN COSTS in $	0	0
in nat. currency	0	0
- out of which GOVERNMENT TRANSFER	0	0
Social security payments	0	0

TABLE

The technology name (in our example *technology 2*) is written automatically into the title. In the case of one existing technology the title is *PRESENT -- PRODUCTION PROCESS*.

The aim of this table to account for the possible by-products and for the different inputs of the production process of the investigated technology and based on these data to calculate the production cost. During this, data from *DATA COMMON TO EVERY COMPONENT* table and the corresponding production data from *QUANTITIES* table are used. The production level of the technology is loaded automatically into the first row.

In the production process, in addition to the main product, by-products can also be produced. EMEPS permits 3 marketable by-products, their names (and units) can be written into the vertical title with the help of the «Alt» «M» menu's "Heading" command (described in *Subsection 4.2.1*).

It is assumed that the quantity of the by-products is proportional to the quantity of the main product. Write the coefficients (in physical terms) into the *output per main product unit* rows. Multiplying these coefficients with the production level we get the *quantity of output* of the by-products.

Compared with the importance of the problem, it would cause too much discomfort to differentiate between export and domestic sales of by-products. So, into the next rows you should write the *price* what the producer gets for the by-product, measured in national currency. If the by-product is both exported and sold on domestic market apply an average price. Multiplying the output quantities with the prices and adding up the three items we get the *total value of the by-products*.

The most important inputs of the production process can be investigated separately in EMEPS. This is done in the *MAIN INPUTS* data block. Here the notion of an input is interpreted in a broad sense, including transportation, trade or any other service. You can work with at most 10 main inputs, there name can be written into the left title. Other inputs are taken into account in aggregated form later in this table.

We assume that the requirement for an input is a linear function of output: there is (or can be) a fixed amount, which is used beside any production level, while the larger part of the input is proportional to the production. These proportions (i.e. input coefficients) can be written into the *needed amount per unit of output* rows. Using the coefficients and the fixed amounts, total quantity of the main inputs is calculated (see *equation (S??)* in *Appendix A*). If this quantity is large for a main input, and thus it seems to be particularly important, you can define a new component in the current system to investigate the production process of it in details. (Considering the importance of an input, not only one *PRODUCTION PROCESS* table should be taken into account, but the corresponding tables of all existing and planned technologies.)

In the case of inputs, EMEPS permits selling price differences

between domestic production and imports. This differentiation makes sense only if the producer can import an intermediate good cheaper than the domestic price.

The *price of imported inputs* is composed of three parts: dollar costs, import taxes and tariffs and other costs (see *equation (S??)*). In this way we can reckon with the effect of imported inputs on foreign currency and government accounts. *Unit $ cost of input* contains the import price in dollar and other dollar costs (e.g. freights and insurance) on one unit of import. According to the general assumption on VAT (see *Subsection 5.2.2*) percentage *rate of import taxes and tariffs* should not contain VAT, even in the case if VAT is imposed on import.

If the importer of the input product is not the producer and market for the input product is homogeneous (i.e. there are no selling price differences between domestic and import products), then *other costs per imported input unit* can be used to equate the price of the input with the market price. So, it contains also the profit of the importer.

If you know only the market price of the imported input then you can write it into the *other costs* row, leaving the *unit $ cost* and *import taxes* rows zero.

Price of domestic inputs is the price what the user pays for it. In the case of a VAT system it does not contain VAT.

It is up to the user to determine the distribution of the input products according to their origin. Usually an input product is either imported or domestic production is used. You should give only the *quantity of imported inputs*, the *quantity of domestic inputs* is got subtracting it from *total quantity of inputs*.

The decision on this division can be based on the price differences, on supply possibilities (domestic production) and on the availability of foreign currencies. If the input product is the main product of a component, then the decision can be based on the results of that component.

Multiplying total quantity of inputs with the corresponding prices we get the *cost of main domestic* and *imported inputs*. Within the latter *taxes and tariffs* and *$ costs* are also calculated.

You can define different kinds of labor inputs (for example skilled workers, unskilled workers, engineers, etc., or according to wage levels). EMEPS permits 5 *categories of labor*, their name can be written into the left title. Other labor inputs are taken into account in aggregated form later in this table.

As in the case of material inputs we suppose that labor input is a linear function of the production: there is a fixed amount of labor, independently of the production level (e.g. maintenance, one part of the administration), while the larger part of the labor input is proportional to the production. From these labor coefficients (*needed amount per unit of output* row) and from *needed fix amount* EMEPS calculates *total quantity of labor*.

Having the *wages* of the different labor categories wage costs,

and using the income tax rates and brackets defined in *DATA COMMON TO EVERY COMPONENT* table (*Subsection 5.1.2*) *personal income tax* are calculated. In the personal income tax calculations only the wages are taken as the base of the taxation.

As we have mentioned already in *Subsection 5.1.2* you should use the same unit of time here, and in the income tax definitions. That is if you measure the labor input in manyears, then apply yearly wages and income tax levels; if you measure the labor input in months, then apply monthly wages and income tax levels.

Having described in detail the main inputs of the production process, we can turn to the cost calculations.

Within the *cost of domestic inputs* first the cost of the main inputs is summarized. Then you can specify a cost item independent of production level (*fixed cost*) and a cost item proportional to the production (*cost per unit of output*). Cost of other materials and cost of inventories can be incorporated into these two variables. If you do not want or do not know (because of inadequate data) how to handle main inputs separately, you can put all of the input costs into these variables.

The calculation of total *cost of imported inputs* and *wage cost* is got in a similar way. Adding *wage taxes* and *social security payments* (paid buy the employer) to it, we get the *total cost of labor*.

The different fixed cost items speak for themselves. *Fixed taxes* (or subsidies with negative sign) can be special money flows to (or from) the government which are not taken into account in other forms of the taxation. Taxes related to the output (cf. the different taxes in *Subsection 5.1.2*) are calculated in the *OUTPUT* table, to be described in the next subsection.

At the end of the *PRODUCTION PROCESS* table, summarizing all of the cost items we get the *TOTAL COST OF INPUTS*. Within it *foreign costs* and *government transfer* are demonstrated separately. The last row contains the *social security payments*, including social security paid by both the employer and the employee. (In some countries this is part of the government transfer, in other places social security is independent from it.)

The simple relations used in this tables are formalized in *equations (S??)-(S)* of *Appendix A*.

«Alt» «M» menu

In the case of *Table 8* the «Alt» «M» menu commands are:

Copy Multipl, Format Heading Print Output Return

The first five command function in the usual way. By selecting **"Output"** the *PRODUCTION PROCESS* table is saved and the corresponding (i.e. which belongs to the same technology) *OUTPUT* table is loaded. The output calculations are always based on the saved tables. The next subsection provides more information on *OUTPUT*.

Selecting **"Return"** the usual submenu appears on the control

panel (cf. *Subsection 3.2.1*):

Save Quit

By selecting "Save" the *PRODUCTION PROCESS* table is saved, and the control is returned to *CENTRAL MENU*. By selecting "Quit" you can return without saving. In this case your work done since last invoking "Present" command is lost (or since the last application of «Alt» «S» saving utility).

5.3.2. THE OUTPUT TABLE

As a result of the "Output" command (an «Alt» «M» menu command of the *PRODUCTION PROCESS* table, described in the previous subsection) the following table is loaded:

Table 9

PRESENT, TECHNOLOGY: technology 2 -- OUTPUT

System: test Component: product1 Main product unit: metric ton	BASE year 1991	1992	1993	TARGET year 1994
QUANTITIES				
PRODUCTION LEVEL	0	PROD(tech2)		
Excess capacity	0			
Quantity of domestic sales	0			
Quantity of export sales	0			
Employment from main types of labor	0			
PRICES				
Domestic selling price	0.00			
Producer's price	0.00			
Export price in national currency	0.00			
RESULTS PER UNIT OF OUTPUT; in value				
Unit cost of inputs	0.00			
Unit cost of materials	0.00			
Unit value of the by-products	0.00			
DOMESTIC SALES (incl. by-products)				
Unit output	0.00			
Value added	0.00			
Production taxes (minus subsidies)	0.00			
Gross profit of domestic sales	0.00			
EXPORT SALES (incl. by-products)				
Unit output	0.00			
Value added	0.00			
Production taxes the by-products	0.00			
Export taxes (minus subsidies)	0.00			
Gross profit of export sales	0.00			
TOTAL VALUES				
Domestic sales at selling price	0			
SALES (including by-products)	0			
Domestic sales at producer's price	0			
Sales of by-products	0			
Export sales	0			
Value added	0			
Salestax (minus subsidies)	0			
Production taxes (minus subsidies)	0			
Export taxes (minus subsidies)	0			
COSTS of production	0			
GROSS PROFIT	0			
Profit tax	0			
NET PROFIT	0			
TOTAL ACCOUNTS				
Government transfers	0			
Social security payments	0			

Foreign currency account	0
Export sales in $	0
Imports and other $ costs	0

TABLE

In the case of one existing technology the title of the table is *PRESENT -- OUTPUT*.

There is no data input in this table. Results related the existing technology selected in *CENTRAL MENU* are calculated and summarized here, based on data specified in *Table 5*, *6*, *7* and *8*. Some of the results from previous tables are also repeated here so as to bring the most important data relating to the investigated technology together in one table.

In the first block of the table some data from the *QUANTITIES* table are repeated. *Excess capacity* is the difference of capacity and production specified there. *Employment from main types of labor* (this part of employment can be measured in physical terms) is the sum of respective data defined in the *PRODUCTION PROCESS* table of this technology. This quantity will be used later, when summarizing the employment of the component.

In the second block price data are repeated from *DATA COMMON TO EVERY TECHNOLOGY* table. (This block also good to call your attention if you have forgotten to fill in the *COMMON* table).

The central question of the whole decision making problem involves a choice between the different technologies. There are a lot of important factors (employment, effects on the foreign currency balance, etc.) nevertheless the decision should be grounded mainly on the profitability of the existing and planned technologies. In the third block - beside other important variables - EMEPS calculates the gross profit on one product unit for both domestic sales and exports. (We remind you that in *Table 6* the difference of these profits was calculated).

Unit cost of inputs and *unit cost of materials* is obtained by dividing with the production level the *total cost of inputs* and the *total cost of material inputs*, respectively (both were calculated in *Table 8*, the *PRODUCTION PROCESS* table). *Unit value of the by-products* is the ratio of *total value of the by-products* (from *Table 8*) and the production level.

Unit output of domestic sales is the total value of output (from the producer's point of view) on one unit of the main product sold on domestic market, that is the sum of the *producer's price* and the *unit value of the by-products*. *Value added* is the difference of *unit output of domestic sales* and *unit cost of materials*.

In *Table 6* (*DATA COMMON TO EVERY TECHNOLOGY*) we have calculated the production tax on one unit of the main product. The *production taxes* row in this block of *Table 9* differs from the previous one in the fact that now production taxes on the by-products value are also included.

Gross profit of domestic sales (on one unit of output) is obtained by subtracting *unit cost of input* and *production taxes* from

unit output.

In the next part of this block the same variables are evaluated for export sales. *Unit output of export sales* is the sum of the *export price* in national currency and the *unit value of the by-products*. *Value added* is the difference of *unit output of export sales* and *unit cost of materials*.

In the previous subsection it was already mentioned, that by-products are assumed to be sold on the domestic market, thus they are taxed according to this. Despite this, by-products resulting from the production of exported main products should be reckoned in the profit calculations of the export, because their costs are not separable. So, EMEPS calculates *production taxes on the by-products* and *export taxes* on the main product (this latter was already computed in *Table 6*).

Gross profit of export sales (on one unit of output) is obtained by subtracting *unit cost of input*, *production taxes on the by-products* and *export taxes* from *unit output of export sales*.

Now, with these results, in the next block EMEPS quantifies the total value of the most important variables. The terms in this block explain themselves, only some of them needs short comments. In the *SALES* row the three items below it are summarized, that is total value of sales is understood at producer's price. *COSTS of production* contains *total cost of inputs* (from *Table 8*), production and export taxes. (Salestax does not belong to the producer's cost). *Net profit* is the difference of *gross profit* and *profit tax*, which is levied only on positive profits.

Finally, EMEPS presents total accounts relating to the investigated technology. *Government transfers* are the sum of the respective item from *Table 8* and of salestax, production tax, export tax and profit tax. *Social security payments* and *imports and other $ costs* are taken from *Table 8*. *Foreign currency account* is the difference of export and import.

«Alt» «M» menu

In the case of *Table 9* the «Alt» «M» menu commands are the following:

Format Print Return Central_Return

"Format" and "Print" commands function as usual. Both **"Return"** and **"Central_Return"** saves the table (what is needed for the totalization of the component). The former loads the corresponding *PRODUCTION PROCESS* table (from where this table was called), while the latter returns the control to *CENTRAL MENU*.

5.4. INVESTMENT VARIANTS

5.4.1. VARIANTS MENU COMMANDS

By selecting "Variants" in *CENTRAL MENU (Subsection 5.2.1)* or in the «Alt» «M» menu of *QUANTITIES (Subsection 5.2.3)* you call the next screen:

Screen 11

```
Add a new variant                                                    MENU
Add  Quantities  Choose  Modify  Erase  Investment  Production  Return

      VARIANTS MENU

      Select a choice from the menu at the top of the screen
              by pressing the initial character or
             by highlighting and pressing «Enter»!
                                                          VARS_MENU

                        System name:  test
                     Component name:  product1
              Number of technologies:     2
                          Base year:  1991
                        Target year:  1994

          Name of the current variant:  .
          Type of the current variant:  .
First year of the investment process:     0
 Last year of the investment process:     0
 First year of the running-in period:     0
                                                          CURSET
```

In the usual way, there are no settings in the *CURSET* (abbreviation for *CURRENT SETTINGS*) window on the first occasion or after erasing the current variant. Later the settings of the current investment variant can be seen here.

Before reviewing the menu commands we define what does it mean the *type of a variant* (you can see this term in the second row of the *CURSET* window). In EMEPS two kinds of investments can be defined, namely: *new plant type* and *rehabilitation type* investments. In the former new productive capacities are created, which can be treated separately from the existing capacities. The existing capacities and the new capacities can be added. In the case of rehabilitation type investments, new capacities replace existing ones. If there are more existing technologies then information on the type of the investment variant always contain the reference to the original technology (in *LIST OF VARIANTS* or in *STATUS TABLE*, see later in this subsection).

If the number of existing technologies is zero then only new plant type investments are possible. In this special case the *Type of the current variant* row is missing from the *CURSET* window. This comment also concerns every following case where the type of a

variant occurs.

The menu commands are the following:

"Add"

By selecting "Add" you can begin to define a new investment variant. Just as when adding new systems, demand scenarios or components the "Add" command loads the screen *LIST OF VARIANTS*. Here move the cell pointer to a number belonging to an empty row and press «Enter». You can define up to 6 investment variants within a component (*Subsection 2.2.2* outlines mistakes that might arise at this stage).

Except for the case when there are no existing capacities, after selecting an empty row in *LIST OF VARIANTS* you have the following menu choice:

New plant type investment Rehabilitation type investment

Here you can select the type of the investment variant you are defining. If you pressed "Add" by mistake, then you should not make a selection from the menu. Instead press «Esc» to return to *VARIANTS MENU*.

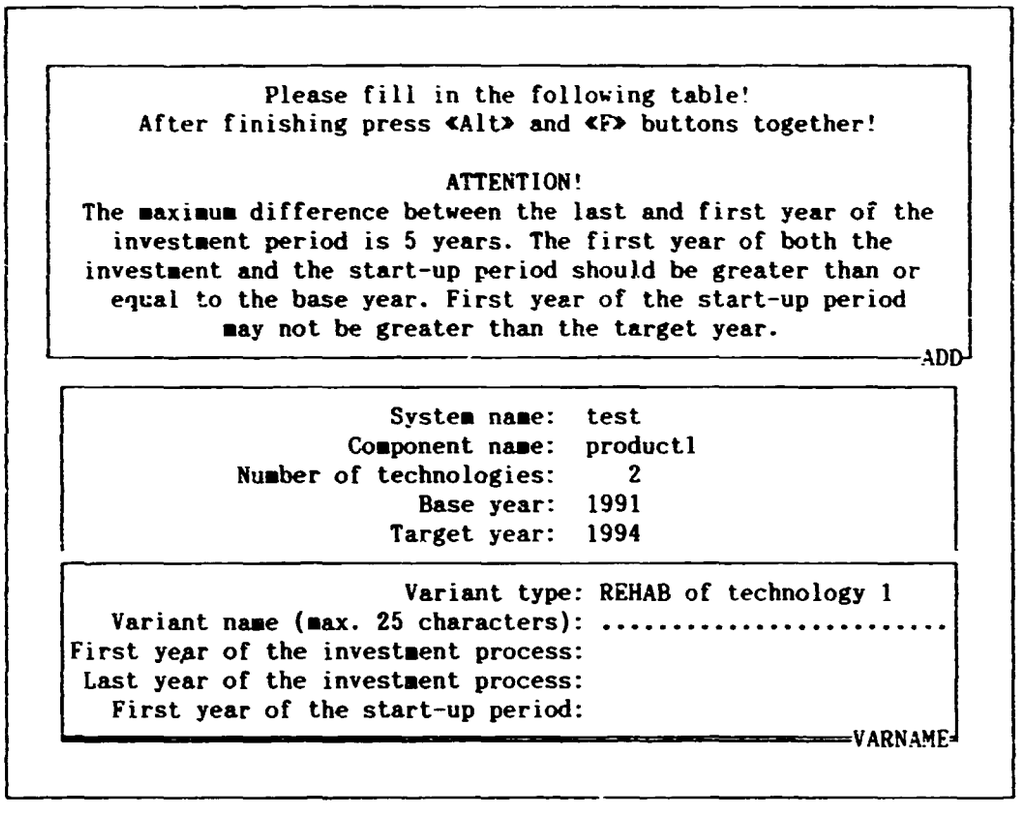
If you want to define a rehabilitation type investment variant then in the case of two or three existing technologies a menu choice appears again (here the two technology case is shown):

1: technology 1 2: technology 2

Pressing «1», «2» (or «3») you indicate which existing technology do you want to rehabilitate.

After having defined the investment type, the following screen will be called:

Screen 12



The selected type of the current variant appears automatically in the first row of the *VARNAME* window. In the example of *Screen 12* rehabilitation of *technology 1* is selected. (In the place of *technology 1* always the technology name defined by the "Tech_names" command of *CENTRAL MENU* stands). If you have selected the new plant type investment, then *NEW PLANT* appears.

The maximum length of a variant name is 25 characters. Numbers and spaces are allowed in the name, but the first character should be a letter of the English alphabet.

The maximum possible length of the investment process is 6 years (including the first and last year). *First year of the start-up period* is the year, when the investment project begins to produce for sale. Natural requirements for the first and last year of the investment process and for the first year of the start-up period can be seen in *Screen 12*. The first year of the start-up period may be less than or equal to the last year of the investment period, that is the investment can begin to produce (although not on full capacity) before finishing the whole investment process. This is allowed in the case of rehabilitation type investments as well, but in practice most of the rehabilitation type investment processes are completed within a year.

If you have finished filling in the *VARNAME* table, press «Alt» and «F» together. The usual menu appears on the control panel:

File Quit

"File" confirms that you really want to create a variant with the

given name and settings. If the variant name and the year settings are correctly entered (otherwise you will get an error message and can correct the wrong settings), EMEPS completes the file-creation, modifies the *QUANTITIES* table, adds the name and type of the investment variant to the *STATUS* table (see *Screen 10* in *Subsection 5.2.3*) and the newly added variant becomes the current variant.

"Quit" will bring you back directly to *VARIANTS MENU*, without creating a new variant. You are advised to do this if you have selected "Add" by mistake or if you have pressed «Alt» «F» accidentally.

Pressing «Esc» in this menu you get back *VARNAME* window again. If it is needed, you can modify here the variant settings and press «Alt» «F» repeatedly.

After selecting "File" in the previous submenu, the control is not returned straight to *VARIANTS MENU*, but a menu appears again:

Quantities Variants

According to the short explanation accompanying this menu on the screen, by selecting "Quantities" the *QUANTITIES* table is loaded and you can define the capacity, production and sales data of the newly added investment variant. (The effect of this command is the same as the effect of the "Quantities" command in *CENTRAL MENU*.)

Selecting "Variants" the control is returned to *VARIANTS MENU*, you can perform further commands from this menu. Nevertheless - except for the case if you change yc r mind and erase the newly added variant - you should load *QUANTITIES* before selecting "Investment" or "Production" in *VARIANTS MENU* because they use the data to be specified in *QUANTITIES*.

Modifications in the *QUANTITIES* table

As a result of the "Add" command (and the "File" subcommand) the *QUANTITIES* table (see *Table 7* in *Subsection 5.2.3*) is also changed, a new block is inserted into it after blocks describing existing technologies:

. . . . .	. . .	
. . . . .	. . .	
PLANNED: variant 1		
STATUS: Active		
* Capacity	0	CAP(var1)
* Production	0	PROD(var1)
Capacity utilization rate (%)	0	util%(var1)
* Quantity of export sales	0	QXsal(var1)
Quantity of domestic sales	0	QDsal(var1)
. . . . .	. . .	

In the case of more investment variants the order of their blocks in *QUANTITIES* is the same as the order of the variants in *LIST OF VARIANTS*.

After the *PLANNED* word the variant name can be seen. The status

of the newly added variant is always active. Consequently, if you begin to fill in the table, the quantities you type in, are immediately added to the respective totals in the last block of the table. The data structure of the block is the same as what we have described for the existing technologies.

In the case of rehabilitation type investments the data always refer to the whole rehabilitated technology and not only to the capacity increment. If the investment process begins later than the base year, then variable values before the beginning of the investment should be identical with the corresponding values of the original existing technology. During the investment process - before the rehabilitated technology begins to work on full capacity - the capacity and the production are usually decreased.

It is possible to define more rehabilitation investments for one existing technology, in order to analyze them. These variants and the related existing technology however mutually exclude each other. Only one of them may occur in every supply scenario. Thus, if you add a rehabilitation type investment to the component then the status of the related existing technology and investment variants, rehabilitating this technology change to passive.

"Quantities"

It is the same as in *CENTRAL MENU (Subsection 5.2.1)*.

"Choose"

If you have already defined more variants, you can choose another variant as current variant. If you want to erase a variant, which is not the current variant you have to select "Choose" before using "Erase". Similarly, you have to select "Choose" before "Investment" or "Production", if you want to work with a variant other than the current one.

Selecting "Choose" brings you to *LIST OF VARIANTS*. Here both types of investment variant are listed and their types are indicated (in the case of rehabilitation type investments including the reference to the name of the original technology). Select the serial number of the desired variant and press «Enter» (if you accidentally select an empty row you return to *VARIANTS MENU*). You will return to *VARIANTS MENU* and the parameters of the selected variant appear in *CURSET* window.

"Modify"

Selecting "Modify" allows you to rename the current variant and/or change some of the year settings. You cannot alter the type of the investment in this way, because the structure of the tables used later is different in the two cases.

By selecting "Modify" the *VARNAME* window is displayed again with the actual settings. Here you can revise them. After any revision press «Alt» «F». You will return to *VARIANTS MENU* and in *CURSET* window the modified settings will be displayed. The consistency of the year settings is controlled in the same way as in the case of

"Add".

"Erase"

By selecting "Erase" you can erase the current investment variant from EMEPS. If you have erased a variant you cannot recover it within the framework of EMEPS.

As when erasing a system (see *Subsection 2.2.2*), after selecting "Erase" you have to confirm this command. If you press any button except «y» (or «Y») then nothing happens, and you return to *VARIANTS MENU*. If you press «y» (or «Y»), then the current variant is erased, you will return to *VARIANTS MENU* and in *CURSET* window the variant settings will be cleared. If you want to continue your work with another variant you have to select "Choose" or create a new variant with "Add".

You can erase only the current variant.

"Investment" and "Production"

As a result of using the "Investment" command the *INVESTMENT PROCESS* table belonging to the current investment variant is loaded. A detailed description of this tables is given in the next subsection.

As a result of "Production", the *PRODUCTION PROCESS* table belonging to the current investment variant is loaded. *Subsection 5.4.3* provides further details on this table.

The *INVESTMENT PROCESS* and the *PRODUCTION PROCESS* tables do not use data from each other, so you can work with them in any order.

When you invoke "Investment" or "Production", EMEPS controls whether the year settings related to the system (the base and target years) and the variant (first and last year of the investment process, first year of the-start up period) are consistent. In spite of the similar control when defining a new variant, there is a danger that these year settings become inconsistent. This can occur if you modify the base and/or the target year of the system (e. g. from dummy years you switch over to real years) but forget to adjust the year settings of the existing investment variants. In this case you get an error message. You have to select "Modify" from *VARIANTS MENU* and correct the year settings of the current variant. After the correction you can select "Investment" or "Production" again.

"Return"

By selecting "Return" the control is returned to *CENTRAL MENU*.

5.4.2. THE INVESTMENT PROCESS TABLE

After using the "Investment" command in *VARIANTS MENU* you obtain the following table:

Table 10

VARIANT NAME: variant 1 -- INVESTMENT PROCESS

System: test Component: product1	1st year 1991	Last year 1992	1993
MAIN INPUTS of the INVESTMENT PROCESS			
TOTAL INPUTS IN PHYSICAL UNITS			
* name (and unit) 1	0		
. . . . .	.	.	.
* name (and unit) 5	0		
PRICES			
Unit $ cost of import			
* name (and unit) 1	0		
. . . . .	.	.	.
* name (and unit) 5	0		
Rate of imp. taxes, tariffs etc.(%)			
* name (and unit) 1	0		
. . . . .	.	.	.
* name (and unit) 5	0		
Other costs per import product unit			
* name (and unit) 1	0		
. . . . .	.	.	.
* name (and unit) 5	0		
Price of imports (in nat. curr.)			
name (and unit) 1	0.00		
. . . . .	.	.	.
name (and unit) 5	0.00		
Price of domestic products			
* name (and unit) 1	0		
. . . . .	.	.	.
* name (and unit) 5	0		
DISTRIBUTION OF INPUTS ACCORDING TO ORIGIN			
Quantity of imported inputs			
* name (and unit) 1	0		
. . . . .	.	.	.
* name (and unit) 5	0		
Quantity of domestic inputs			
name (and unit) 1	0		
. . . . .	.	.	.
name (and unit) 5	0		
COST OF MAIN INPUTS			
Domestic			
name (and unit) 1	0		
. . . . .	.	.	.
name (and unit) 5	0		
Imported			
name (and unit) 1	0		
. . . . .	.	.	.
name (and unit) 5	0		
out of which taxes & tariffs	0		
TOTAL $ EXPENSES OF MAIN INPUTS	0		
MAIN TYPES OF LABOR INPUT (domestic)			
Quantity			

* category of labor 1	0
. . . . .	. . .
* category of labor 5	0
Wage (per used labor unit)	
* category of labor 1	0
. . . . .	. . .
* category of labor 5	0
Wage cost	
category of labor 1	0
. . . . .	. . .
category of labor 5	0
Personal income tax	
category of labor 1	0
. . . . .	. . .
category of labor 5	0
CALCULATION OF INVESTMENT COSTS	
COST of INPUT PRODUCTS in the INV. PROCESS	
Domestic inputs	
Cost of main domestic inputs	0
* Other domestic inputs	0
Total cost of domestic inputs	0
Imported inputs	
Cost of main imported inputs	0
Other imported inputs	
* Costs in $	0
* Rate of imp. taxes, etc. (%)	0
* Other costs (nat. currency)	0
Total cost of other imp. inputs	0
Total cost of imported inputs	0
TOTAL cost of inputs	0
LABOR COST	
Domestic labor	
Wages in main labor categories	0
* Other wages	0
Wage taxes	0
Social security, paid by employer	0
Total cost of domestic labor	0
Foreign labor	
* Wage cost in $	0
* Other costs (in nat. currency)	0
Total cost of foreign labor	0
TOTAL cost of labor	0
OTHER INVESTMENT COSTS	
Domestic	
* Costs related to preparation	0
* Taxes minus subsidies on investm.	0
* name of other domestic cost 3	0
* name of other domestic cost 4	0
* name of other domestic cost 5	0
Total of other domestic costs	0
Foreign (in $)	
* name of other foreign cost 1	0
* name of other foreign cost 2	0
* name of other foreign cost 3	0
Total of other foreign costs (in $)	0
TOTAL of other investment costs	0

TOTAL COST OF INVESTMENT	0
- out of which FOREIGN COSTS in $	0
in national currency	0
- out of which GOVERNMENT TRANSFER	0
Social security payments	0
NEEDED LOANS	
* Domestic	0
* Foreign in $	0
in national currency	0
Total of needed loans	0

TABLE

The table is the same for both the new plant type and the rehabilitation type investment variants. The years in the top heading are from the first to the last year of the investment process. If these years coincide with each other then only one year is in the top heading. On the screen you can see four columns, filled in with zeros, but you cannot work with these.

The aim of this table is to account for the investment cost. In the course of this data from *Table 5 (DATA COMMON TO EVERY COMPONENT)* are used.

The structure of the *INVESTMENT PROCESS* table is similar to the structure of *Table 8* (*PRODUCTION PROCESS, Subsection 5.3.1*). So, the treatment of this table can be suitable abridged.

The most important inputs of the investment process can be investigated separately, giving their amount in physical units. This is done in the *MAIN INPUTS* data block. Material inputs are understood in wide sense; including transportation, energy, etc. You can work with at most 5 main inputs, there name can be written into the left title with the help of «Alt» «M» menu's "Heading" command. Other inputs of the investment process are taken into account in aggregated form later in this table.

Just the same way as in *Table 8*, total required input quantities are divided into those that are domestically produced and those that are imported. The price of imported goods is built up from the *unit $ cost*, the *import tax on the input* and the *other import costs*.

From the quantity and price of inputs the cost of main domestically produced and imported inputs is calculated. By adding to this the cost of other inputs (in the case of imports we include taxes and tariffs) we obtain the *total cost of inputs* in the investment process.

As in the production, also in the investment process five labor categories can be distinguished (their names can be written into the left title). From *quantity of labor input* and *wages* the wage costs and the personal income tax of the different labor categories are calculated.

By adding *other wages*, *wage taxes* and *social security paid by the employer* to the cost of the main labor categories we obtain *total cost of domestic labor*. By comparison with the cost calculations in

Table 8 the only difference here is that in the investment process employment of *foreign labor* is allowed. Foreign labor is paid in convertible currency (this practice is frequent in developing countries). The wage tax rate and social security rate defined in *DATA COMMON TO EVERY COMPONENT* are not applied to foreign labor, because it is usually taxed in another way. Taxes paid after foreign labor can be included into *other costs on foreign labor*. Summarizing these cost items *total cost of labor* is obtained.

Within *other investment costs* costs to be paid in national and foreign currency are distinguished. *Costs related to preparation* may include design, land acquisition, land preparation (for new plant type investments), etc. If there are special taxes levied on any stage of the investment process, or if the investment project is subsidized the amount of it can be written into the *taxes minus subsidies on investment* row (that is in the case of subsidies with negative sign). The name of further three other domestic cost items and the name of the three possible foreign investment cost items can be defined by the user. They may include licenses, financial costs, etc.

If you do not know the details of the investment process, then you can leave the main input part of the table as it is (i. e. you can leave zeros everywhere). In this case the cost component estimations can be written into the different rows covering other costs.

At the end of the cost calculations, summarizing all of the cost items we get the *TOTAL COST OF INVESTMENT*. Within it *foreign costs* and *government transfer* (including import taxes and tariffs, wage taxes, personal income tax and the tax item in other costs) are demonstrated separately. The last row of this block contains the *social security payments*, including social security paid by both the employer and the employee. (In some countries this is part of the government transfer, in other places social security is independent from it.)

The last block of the table contains data about the loans required for the investment process. These data are not used in the computations. Summarized over the active investment variants (that is which are included into the supply scenario they are presented in the *OUTPUT TOTAL* table of the component so as to have all of the data required for decision-making in one table.

«Alt» «M» menu

In the case of *Table 10* the «Alt» «M» menu [illegible] are:

Copy Multiply Format Heading Print Load Return

The first five command function in the usual way (see *Subsection 4.2.1*).

"Load" serves to load the subsequent table of the investment variant calculations. By selecting "Load" a submenu appears on the control panel:

Production Output

In both cases the current *INVESTMENT PROCESS* table is first saved. By selecting "Production" the corresponding *PRODUCTION PROCESS*, by selecting "Output" the corresponding *OUTPUT* table is loaded. The *PRODUCTION PROCESS* table for investment variants is treated in the following subsection. The *OUTPUT* table and the so called present value calculations belonging to it are described in *Subsection 5.4.4* and *5.4.5*.

The output calculations use data both from the *INVESTMENT PROCESS* and the *PRODUCTION PROCESS* tables, so both tables have to be filled in before you invoke the "Output" command.

Selecting **"Return"** the usual submenu appears on the control panel (cf. *Subsection 3.2.1*):

Save Quit

By selecting "Save" the *INVESTMENT PROCESS* table is saved, and the control is returned to *CENTRAL MENU*. By selecting "Quit" you can return without saving. In this case your work done since last invoking "Present" command is lost (or since the last application of «Alt» «S» saving utility).

5.4.3. THE PRODUCTION PROCESS TABLE OF THE INVESTMENT VARIANTS

The "Production" command both from the *VARIANTS MENU* and from the «Alt» «M» menu of the *INVESTMENT PROCESS* table (in this latter it is a subcommand of "Load") loads the *PRODUCTION PROCESS* table of the current investment variant.

Apart from the title (and partly the top heading) the table is identical with the *PRESENT -- PRODUCTION PROCESS* table (*Table 8, Subsection 5.3.1*).

New plant type variants

The title of the table is:

NEW PLANT VARIANT: variant name -- PRODUCTION PROCESS

In contrast to *Table 8* the years in the top heading cover the first year of the start-up period (that is the year, when the investment begins to produce for sale) to the target year. This fact is shortly indicated also in the text above the first date of year (*1.year of START UP* instead of the usual *BASE year*).

Rehabilitation type variants

In addition to the title, there is also a note above the table:

REHABILITATION VARIANT: variant name -- PRODUCTION PROCESS
First year of production on rehabilitated capacities: year

The note serves only as a reminder. In other respects the table is identical with *Table 8*, also the years are from the base year to the target year.

As we have already mentioned, the rehabilitated capacities take the place of the existing capacities. So, before the first year of production on rehabilitated capacities, the data in this table and in the *PRESENT -- PRODUCTION PROCESS* table of the existing technology under rehabilitation are usually the same. (The only exception may be when, because of rehabilitation work, the existing capacities are temporarily reduced during the investment process). In subsequent years the two tables can also be very similar to each other. To expedite filling in the table, EMEPS offers a time saving facility.

In the case of rehabilitation type investment variants, before loading the table, EMEPS shows the next screen:

Screen 13

```
Leave the REHAB. VARIANT -- PRODUCTION PROCESS table as it is        MENU
Leave     Present_copy

  If you select "Present_copy" then data (excluding production level)
     from the corresponding PRESENT -- PRODUCTION PROCESS table
    are copied into the REHABILITATION VARIANT table to be loaded.

                              WARNING!
          The procedure overwrites the former data in the
                  REHABILITATION VARIANT table!
          If you select "Present_copy" ACCIDENTALLY then call
    «Alt» «M» menu, select "Return" and then "Quit" without saving!
                                                          PRESENT_COPY
```

By selecting "Present_copy" you can copy the data from the corresponding *PRESENT -- PRODUCTION PROCESS* table into this table (excluding the production). So, the *REHABILITATION VARIANT -- PRODUCTION PROCESS* table appear on the screen filled in with data of the *PRESENT* table. Only *production level* is taken from *QUANTITIES*. However later on you must be very careful. If you fill in this table and return to it again, then you must select "Leave". Otherwise your data on the rehabilitated capacities will be overwritten with data on the existing capacities.

If you select "Present_copy" accidentally you can correct your mistake. Invoke the «Alt» «M» menu and select "Return". Now, you will find a menu with the commands "Save" and "Quit" (cf. *Subsection 5.3.1*, the description of the «Alt» «M» menu's "Return" command). By selecting "Quit" you return to *CENTRAL MENU* without saving the overwritten table. In *CENTRAL MENU* you can call again the "Variants" command and then from *VARIANTS MENU* select again "Production". You return once more to *Screen 13*, and by selecting "Leave" your original rehabilitation variant data are loaded.

Pressing «Esc» within the menu of *Screen 13* has the same effect as selecting "Leave".

«Alt» «M» menu

Both in the new plant type and rehabilitation type cases «Alt» «M» menu is identical with the «Alt» «M» menu of the *INVESTMENT PROCESS* table (see *Subsection 5.4.2*). The only modification is that the submenu within the "Load" command is as follows:

Investment Output

Both commands save the current *PRODUCTION PROCESS* table. Then the "Investment" command loads the corresponding *INVESTMENT PROCESS* table. The "Output" command loads the corresponding *OUTPUT* table.

The output calculations use data both from the *INVESTMENT PROCESS* and the *PRODUCTION PROCESS* tables, so both tables have to be filled in before you invoke the "Output" command.

5.4.4. PRESENT VALUE CALCULATION

The present value (or with another terminology the capital value) calculation constitutes an important part of the investment evaluation. Before describing the *OUTPUT* table of the investment variants we have to shortly discuss it.

To make variables, which are changing over time (namely the cost and revenue items of the different investments) comparable we have to discount the variable values in different years to values in a given year, that is calculate their present values in the given year. First we describe the relations of the present value calculations in general, then specify it to our case.

Denote the interest rate (or discount rate) with r (in %)! The present value of an $\underline{x} = \{x(t_0), x(t_0+1), \ldots, x(t_1)\}$ income stream in year t_0 is:

$$PV(\underline{x}) = x(t_0) + \frac{x(t_0+1)}{1+r/100} + \ldots + \frac{x(t_1)}{(1+r/100)^{t1-t0+1}}$$

The future values are here discounted to year t_0 with the rate r. (As it was mentioned already in *Subsection 5.1.1* the interest rate should be real if the income stream is measured at constant prices and nominal if you use current prices).

To obtain the **capital value** of an investment project, we have to calculate the present value of the difference of its revenues and costs (investment and operation costs together) during the *life span* of the investment project. If this capital value is negative, then with the given interest rate the investment costs will not be recovered.

In the case of new plant type investments, EMEPS calculates the present value in the base year of *SALES* (total value of sales from the production of the investment project) and *COSTS* (total of investment and production costs). The difference of these present values gives the capital value of the investment in the base year.

In the case of rehabilitation type investments only the difference between the sales from rehabilitated and old capacities is due to the investment (the same also applies to the costs). Calculating *SALES differences* and *COSTS differences*, sales and costs of the existing (old) technology should be taken beside full capacity utilization level. So, the present value calculations are performed on the base of these differences, giving the capital value of the investment.

The life span of the investment begins with the first year of the start up period. Usually the life span comes to an end after the target year, and we do not have data for years after the target year. What follows in this subsection does not concern to the case when the life span is finished before the target year.

In EMEPS it is assumed that after the target year the real value of sales and costs (or sales and cost differences) is constant. Nevertheless you can take into account the inflation (to be more exact the average of the inflation), you can rate up this value with a given percentage. This means that in the year subsequent to the

target year nominal sales (or costs) are obtained by multiplying the sales (or costs) data of the target year with the inflation factor, and so on, sales in a year after the target year are obtained in the same way from sales in the previous year.

Denote the base year with *t0*, the target year with *T*, the first year of the start up period with *s*, the last year of the life span with *t1*, and finally the average rate of inflation (in %) with *u*. Now the present value of sales in the base year is calculated with the following equation:

$$PV(SALES) = \frac{SALES(s)}{(1+r/100)^{s-t0}} + \ldots + \frac{SALES(T)}{(1+r/100)^{T-t0}} +$$

$$+ \frac{(1+u/100)*SALES(T)}{(1+r/100)^{T-t0+1}} + \ldots + \frac{(1+u/100)^{t1-T}*SALES(T)}{(1+r/100)^{t1-t0}}$$

We begin the summation in *s*, because there are no sales prior to this year. The first row of the equation contains the present value for the time period between the base and target year; the second row for the time period after the target year. The present value of COSTS is calculated in a similar way, the summation starts in the first year of the investment process.

If you are working with constant prices, then set the *u* inflation rate to zero.

5.4.5. THE OUTPUT TABLE OF THE INVESTMENT VARIANTS

The "Output" command in the «Alt» «M» menu of the *INVESTMENT PROCESS* and *PRODUCTION PROCESS* tables loads the *OUTPUT* table of the current investment variant. In many respects the table is the same as *Table 9 (PRESENT -- OUTPUT, Subsection 5.3.2)*. So we confine ourselves to describing the differences between the present and investment variant tables. Apart from the present value calculations there is no data input in this table, results are summarized here.

There are modifications common to new plant type and rehabilitation type variants.

The *Employment from main types of labor* row (the last row in the first block, cf. *Table 9*) contains the employment also in the investment process. Similarly, items in the *TOTAL ACCOUNTS* block co ain the value of the corresponding variable in the investment process.

After the *NET PROFIT* row in the *TOTAL VALUES* block a new row is inserted into the table: *PRODUCTION and INVESTMENTS COSTS together*. This is the sum of *COSTS of production* (above with four rows in this table) and *TOTAL COST OF INVESTMENT* in the corresponding *INVESTMENT PROCESS* table. These summarized cost values are used in the present value calculations.

New plant type variants

The years in the top heading of the table cover the first year of the investment process to the target year. This fact is shortly indicated also in the text above the first date of year (*1st year of inv.* instead of the usual *BASE year*). In the time period between the first year of the investment process and the year when the investment begins to produce variables relating to the production process are set to zero.

Beside the previously mentioned modifications the table is augmented with the present value calculations:

Table 11

```
NEW PLANT VARIANT: variant name -- OUTPUT
==========================================================================
   .     .     .     .     .     .     .     .     .

   .     .     .     .     .     .     .     .     .
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
PRESENT VALUE CALCULATIONS (present value in the base year)

                  Interest rate (%):        0

 I. In the time period between the base and target year

  SALES                                     0
  COSTS (total of inv. and prod. costs)     0
  SALES - COSTS                             0

 II. Present value in the time period between the base year and the
```

last year of the investment's life-span, beside the given rate of inflation	
Life-span (from year 0):	0
Inflation after the target year (%):	0
SALES	0
COSTS (total of inv. and prod. costs)	0
SALES - COSTS	0

TABLE

The present value calculations are interpreted in detail in the previous subsection. The value of the interest rate was entered at *COMPONENTS MENU* (see the text after *Screen 7, Subsection 5.1.1*). It is loaded automatically into this table. The results of the present value calculations are comparable when using the same interest rate in every investment variant. Modifying the interest rate in *COMPONENTS MENU* and loading again the *OUTPUT* tables, you can experiment with the effect of different interest rates on the capital value of the investments.

The results of the calculations described in the previous subsection can be seen in *Table 11* under *point II* of the present value calculations. The life-span of the investment and the predicted inflation rate after the target year (denoted with *u* in the previous subsection) are the only figures in this table which you can change.

The inflation rate is an average rate for the time period between the target year and the last year of the life span, so its value may depend on this last year. Inflation rates used in different investment variants should be the same if the last year of the life span of the investments is the same. Even in the case when these years differ, the applied rates may be different only if you estimate that the inflation rate will increase or decrease over time.

Under *point I* in *Table 11* EMEPS displays the present values of the sales and costs in the time period between the base and target year. These values are not suitable for calculating the capital value of the investment. Nevertheless, they help to evaluate the investment processes during the planning period.

Rehabilitation type variants

The time period covered by the table is from the base to the target year. Before the first year of the investment process data in this table and in the *PRESENT -- OUTPUT* table of the corresponding existing technology are the same.

After the *TOTAL ACCOUNTS* block of the table there is a new block:

REHABILITATION VARIANT: variant name -- OUTPUT	
. . . . .	
. . . . .	
DIFFERENCES between data on	

rehabilitated and existing cap.		
SALES difference	0	0
COSTS difference	0	0

PRESENT VALUE CALCULATIONS (present value in the base year)

Here the differences between *SALES* in this table and in the corresponding *PRESENT* table, as well as the difference of *PRODUCTION and INVESTMENTS COSTS together* in this table and *COSTS of production* in the corresponding *PRESENT* table can be seen (cf. previous subsection). Thus computing this table not only the *COMMON* tables, *QUANTITY* and the *PRODUCTION PROCESS* and *INVESTMENT PROCESS* tables are used but also the *PRESENT -- OUTPUT* table of the corresponding existing technology. Consequently, if you change some of the data in *COMMON* tables (*Table 6* and *Table 7*) then to obtain adjusted results in the present value calculations you have to first load the corresponding *PRESENT* tables and only afterwards (with the *PRESENT* tables recalculated) should you load the tables of the rehabilitation type investment variant.

We do not repeat the present value calculation part of the table. It is the same as in *Table 11*, the only deviation is that *SALES* and *COSTS* are substituted by *SALES differences* and *COSTS differences*.

To get correct results in the present value calculations *PRESENT -- OUTPUT* should be calculated previously at full capacity production level (the production level is specified in *QUANTITIES*, see *Table 7*). If this condition is not satisfied, then before EMEPS loads the *REHABILITATION VARIANT -- OUTPUT* table you get a warning and also a menu choice appear:

Continue Return

Selecting "Continue" (or pressing «Esc») EMEPS loads the *REHABILITATION VARIANT -- OUTPUT* table. Apart from the present value calculations the table is correct. Select this option if at this stage of your work you are not interested in the present value calculations.

Selecting "Return" you go back to *CENTRAL MENU*. There select "Quantities", correct the production level and recalculate the corresponding *PRESENT -- OUTPUT* table before loading this table again!

«Alt» «M» menu

The «Alt» «M» menu commands are the following:

Format Print Return Invest_Return Central_Return

"Format" and "Print" commands function as usual. All three of "Return", "Invest_Return" and "Central_Return" saves the table (what is needed for the totalization of the component). The first one loads the corresponding *PRODUCTION PROCESS*, the second one the *INVESTMENT PROCESS* table, while the third one returns the control to *CENTRAL MENU*.

5.5. COMPONENT SUMMARIES

5.5.1. SUPPLY SCENARIOS

With the help of the *OUTPUT* tables you can investigate the existing technologies and planned investment variants one by one, irrespective of the demand and supply relations. In the first stage of the analysis it is expedient to prepare the *OUTPUT* tables assuming full capacity utilization level, to get a clear picture about profitability, employment, foreign currency effects, etc. of the different technologies. In the next stage demand and supply should be harmonized.

We refer to a group of (existing and planned) technologies with given level of production and domestic sales as a *supply scenario*. (From variants, rehabilitating the same existing technology - including also the existing technology itself - only one may occur in every supply scenario). The aim of *OUTPUT TOTAL* table is to summarize the variables concerning a supply scenario.

You can compile a supply scenario from the different technologies in the *QUANTITIES* table (*Table 7, Subsection 5.2.3*). Those existing and planned technologies are incorporated into the actual supply scenario, status of which is set to *Active*. You can change the status of the technologies by loading the *STATUS TABLE*, with the help of the "Active/Passive" command in *QUANTITIES'* «Alt» «M» menu.

The *STATUS TABLE* has been already treated at the end of *Subsection 5.2.3*, confined to the case of existing technologies. Now we repeat it with an example using also investment variants.

Screen 14

STATUS TABLE (Supply scenario)

Select an item and press «Enter» to change its status!
If you change a technology or rehabilitation variant to "Active" the status of the related rehabilitation variant or technology is changed to "Passive" automatically.

Select 0 to leave this table!

	Name	Status	Type
0			
1	technology 1	Active	PRESENT
2	technology 2	Passive	PRESENT
3	variant 1	Passive	NEW PLANT
4	variant 2	Active	REHAB of technology 2
5	variant 3	Passive	REHAB of technology 2
6	variant 4	Passive	REHAB of technology 2
7	variant 5	Active	NEW PLANT

STATUS

In this example there are two existing technologies and five possible investment variants in the component under investigation. Three of the investment variants are rehabilitation projects of *technology 2*. If you select for instance item *5*, that is *variant 3* then its status becomes *Active*, while the status of *variant 2* changes automatically to *Passive*. Similarly, selecting *technology 2* its

status changes to *Active*, the status of *variant 2* changes automatically to *Passive*. But if you change the status of *variant 2* to *Passive* then nothing happens with the other items. Similarly, the status of new plant type investment variants and existing technologies which have no rehabilitation projects can be changed independently from the status of other items.

The actual supply scenario consists of the active existing technologies and investment variants. In *TOTALS* block of *QUANTITIES* only the elements of the actual supply scenario are taken into account. The supply scenario is fully specified with the production and domestic sales data.

There is another connection between supply scenarios and the *QUANTITIES* table. Demand induced by a component (see *Subsection 5.2.3*) depends on the supply scenario. So, if the investigated component uses an intermediate good which is also analyzed in a component, then modifying the supply scenario - to obtain consistent system calculations - you should accordingly modify the *induced demand* in the *QUANTITIES* table of the intermediate good.

If you have not defined yet investment variants or the status of every investment variant is set to passive - that is the actual supply scenario consists of the existing technologies - then *OUTPUT TOTAL* provides the projection of the present situation, summarizing the variables related the different technologies. You should call *OUTPUT TOTAL* even in the case when the supply scenario contains only one technology, because it provides some new information compared with the *OUTPUT* table (concerning supplementary import), and what is more important, this table is used later in the *SYSTEM TOTAL* table.

After this preparation we can turn to the description of the "Output_total" command in *CENTRAL MENU* (see *Subsection 5.2.1*). As a result of the command you get the following screen:

Screen 15

Continue loading the OUTPUT TOTAL table **MENU**
Continue Active/Passive Quantities Return

OUTPUT TOTAL MENU

The set of actually active existing technologies and investment variants is the actual supply scenario.
You can change it with the help of "Active/Passive" command!
The OUTPUT TOTAL table of the actual supply scenario is compiled from the results of the OUTPUT calculations of the active technologies and investment variants. If these calculations are not performed yet select "Return" and perform them!
After selecting "Continue" you can give a name for the actual supply scenario to help to identify the OUTPUT TOTAL table.
OUTTOT

If in the actual supply scenario either the domestic or the export supply exceeds the corresponding demand in a year, then below this window also a warning can be seen, which calls your attention to this fact.

To correct some of the data before loading *OUTPUT TOTAL* select **"Quantities"** from *OUTPUT TOTAL MENU*, to load *QUANTITIES* table. If you modify data in *QUANTITIES* then you should recalculate the *OUTPUT* tables of the affected existing technologies or investment variants before calling again "Output_total".

If you want to modify the actual supply scenario select **"Active/Passive"** from *OUTPUT TOTAL MENU*, to load *STATUS TABLE*. If you call the table from this menu, then leaving it (by selecting *0*, see *Screen 14*) you return to *OUTPUT TOTAL MENU*. (Calling the *STATUS TABLE* from *QUANTITIES'* «Alt» «M» menu, you return from it to *QUANTITIES*).

By selecting **"Return"** you go back to *CENTRAL MENU*. You are advised to do this if you have forgotten to calculate the *OUTPUT* table of some of the active (existing or planned) technologies.

By selecting **"Continue"** the *OUTPUT TOTAL* table is loaded (the table is described in the next subsection). Before it you get a message: *Type a scenario name (max. 14 char.) and press «Enter»!* This name serves only to identify the supply scenario on the printouts of the *OUTPUT TOTAL* table, because only the table of the last actual supply scenario is saved in the computer. If you change the supply scenario (either the active technologies or only the production or sales levels) and load *OUTPUT TOTAL* again then the previous table is lost.

5.5.2. THE OUTPUT TOTAL TABLE

By selecting "Output_total" in *CENTRAL MENU* and then "Continue" in the submenu you load the following table:

Table 12

SUPPLY SCENARIO: version1 -- OUTPUT TOTAL

System: test Component: product1 Main product unit: metric ton	BASE year 1991	1992	1993	TARGET year 1994
QUANTITIES				
Total demand	0			
Domestic demand	0			
Export demand	0			
Capacity	0			
Average capacity util. rate (%)	0			
Production	0			
Quantity of domestic sales	0			
Quantity of export sales	0			
Excess demand above sales from prod				
Excess total demand	0			
Excess domestic demand	0			
Excess export demand	0			
Quantity of supplementary import	0			
TOTAL DOMESTICALLY AVAILABLE AMOUNT	0			
EXCESS DOMESTIC DEMAND (incl. imp.)	0			
Demand fulfillment ratio (%)	0			
Employment from main types of labor (incl. investment process)	0			

PRICES	
Domestic selling price	0.00
Producer's price	0.00
Export price in $	0.00
in national currency	0.00
TOTAL VALUES	
Domestic sales at selling price	0
Sales	0
Domestic sales at producer's price	0
Sales of by-products	0
Export sales	0
Value added	0
Production cost (incl. taxes)	0
Net profit	0
Investment cost	0
Needed loans	0
$ loans from previous	0
PROD. and INVESTMENT COST togetner	0
SUPPLEMENTARY IMPORT (of main prod.)	
Sales from import at selling price	0
Sales at importer's (prod) price	0
Salestax on imports	0
Import taxes & tariffs	0
Total cost of import	0
$ cost of import	0
Importer's gross profit	0
Profit tax	0
Importer's net profit	0
TOTAL ACCOUNTS excl. suppl. import	
Government account	0
Social security payments	0
Foreign currency account	0
Export sales in $	0
Imports and other $ costs	0
TOTAL ACCOUNTS incl. suppl. import	
Government account	0
Foreign currency account	0
Export sales in $	0
Imports and other $ costs	0
SCENARIO IDENTIFICATION	
TECHNOLOGY 2	
Type: PRESENT	
Production	0
Quantity of domestic sales	0
VARIANT 1	
Type: NEW PLANT	
Production	0
Quantity of domestic sales	0
VARIANT 2	
Type: REHAB of technology 1	
Production	0
Quantity of domestic sales	0

TABLE

The scenario name what you have given after "Continue" can be seen in the title of the table.

In the first block of the table some data from *QUANTITIES (Table 7)* are repeated: total, domestic and export demand from *DEMAND* block; production, quantity of domestic and export sales from *TOTALS* block. *Capacity* is the sum of capacities of existing and planned technologies in the investigated supply scenario. (In what follows we omit this explanation. The summation is always performed over the respective variables of the above mentioned technologies.) *Average capacity utilization rate* is the ratio of *production* and *capacity*, expressed in percentages.

Excess total, domestic and export demand is taken again from *TOTALS* block of *QUANTITIES*.

In EMEPS it is supposed that you import the main product of the component only to supplement domestic production, satisfying domestic demand (if there are no import restrictions). It is possible however that imports are cheaper than some technologies of domestic production (you can analyze this issue based on the *OUTPUT* tables and on the import block of *DATA COMMON TO EVERY TECHNOLOGY*). In this case - if import restrictions make it possible - you can define another supply scenario neglecting the less efficient technologies. If importing appears more efficient than production on the new capacities and there are no import limitations, then the planned capacities should not be built up at all.

According our assumption *quantity of supplementary import* is the minimum of *excess domestic demand* and *upper limit on import in physical terms*. The latter variable is taken from *Table 6 (DATA COMMON TO EVERY TECHNOLOGY)*.

The *total domestically available amount* is the sum of *quantity of domestic sales* and *supplementary import*. The *excess domestic demand (incl. imp.)* row of the table contains the difference of *domestic demand* and the *total domestically available amount*. If there are no import limitations then this variable is zero. *Demand fulfilment ratio* is the ratio of *total domestically available amount* and *domestic demand*, expressed in percentages.

The last, *employment from main types of labor* variable of this block is the sum of the same variables in the *OUTPUT* tables (labor used in the investment processes is included).

In the next block of the table different kinds of main product prices taken from *Table 6* are repeated.

In *TOTAL VALUES* block the *investment cost*, *needed loans* and *needed $ loans* variables are the sums of the respective variables of the *INVESTMENT PROCESS* tables (*Table 10*) belonging to the investment variants of the supply scenario. (If only existing technologies constitute this supply scenario then the value of these variables is zero). The other variables of this block are the sums of the respective variables of the *OUTPUT* tables.

The fourth block of the table contains value data on the supplementary import calculated in this table. That is quantity of

supplementary import is multiplied with the selling price, the producer's price, the salestax per unit, etc. We remind you that *salestax, import taxes & tariffs, import cost, $ import cost, gross profit* on one unit of import were calculated in *Table 6 (DATA COMMON TO EVERY TECHNOLOGY)*.

The first part of the *TOTAL ACCOUNTS* block contains again the sum of the respective variables of the *OUTPUT* tables. In the second part of *TOTAL ACCOUNTS* data from the supplementary import calculations are added to the corresponding variables: *salestax, import taxes* and *profit tax on the supplementary import* to the *government account*; *$ cost of supplementary import* to *imports and other $ costs*. (*Export* is just repeated, to see it together with *foreign currency account*).

Finally a *scenario identification* is appended to the table. The aim of it to help you identify the different supply scenarios on the printouts if you have already a lot of them. The scenario identification lists the existing and planned technologies used in this *OUTPUT TOTAL* table. Every block contains the name and type of the technology, the production level and the quantity of domestic sales, taken from *QUANTITIES*. If there is only one existing technology in the component (and it is incorporated into the supply scenario) then instead of the first two rows the *EXISTING TECHNOLOGY* text can be read in the corresponding block.

«Alt» «M» menu

The «Alt» «M» menu commands are the following:

Format Print Return Comps_Return DOS_Return

"Format" and "Print" commands function as usual. All three of **"Return"**, **"Comps_Return"** and **"DOS_Return"** saves the table (what is needed for the totalization of the system). The first one returns the control to *CENTRAL MENU*, the second one to *COMPONENTS MENU*, the third one to DOS.

5.6. SYSTEM TOTAL TABLE

The aim of the *SYSTEM TOTAL* table is to list and summarize the most important variables of the *OUTPUT TOTAL* tables of the components within the current system. You can call this table from *COMPONENTS MENU*, with the help of "System_total" command. In *Subsection 5.1.1* we already described the "Continue" - "Return" submenu of the command. We refer again to the fact that you can get a complete summation of the current system if you have calculated the *OUTPUT TOTAL* tables of all of the components.

By selecting "System_total" and then "Continue" in the submenu the next table is loaded:

Table 13

SYSTEM TOTAL SYSTEM: test	BASE 1991	1992	1993	TARGET 1994
1. CAPACITY UTILIZATION RATIO (%)				
.....	0.0			
.....	0.0			
2. DOMESTIC DEMAND FULFILMENT RATIO (%)				
.....	0.0			
.....	0.0			
3. EMPLOYMENT				
.....	0			
.....	0			
TOTAL of EMPLOYMENT	0			
4. SALES TOTAL (at producer's price)				
.....	0			
.....	0			
TOTAL of SALES	0			
5. VALUE ADDED				
.....	0			
.....	0			
TOTAL of VALUE ADDED	0			
6. NET PROFIT				
.....	0			
.....	0			
TOTAL of NET PROFIT	0			
7. VALUE OF EXPORT IN $				
.....	0			
.....	0			
TOTAL of EXPORT	0			
8. FOREIGN CURRENCY ACCOUNT IN $				
.....	0			
.....	0			
TOTAL of FOREIGN CURRENCY ACCOUNT	0			
9. GOVERNMENT ACCOUNT				
.....	0			

.....	0
TOTAL of GOVERNMENT ACCOUNT	0

TABLE

There are twenty rows in every block (plus a summarizing row where the summation makes sense) according to the maximum possible number of the components in a system. In the place of the dotted lines in the left title the component and scenario names are automatically written, separated by a comma. If you have say twenty components already in the current system then loading the table may take some time (perhaps 1-2 minutes).

The variables of the table are taken from the *OUTPUT TOTAL* tables. *Foreing currency account* and *government account* contain also the supplementary import of the main product.

If the components cover the whole system (and there are no different versions for the same product among the components) then the summations are the totals for the whole system.

«Alt» «M» menu

The «Alt» «M» menu commands in this table are the following:

Format Print Graph Return Sys_Return DOS_Return

"Format" and "Print" function as usual. With "Return" you can return the control to *COMPONENTS MENU*, with "Sys_Return" you return to *SYSTEMS MENU* and with "DOS_Return" to DOS. The table is not saved, because it is built up always from the actually saved *OUTPUT TOTAL* tables.

"Graph"

By selecting "Graph" you obtain the following menu:

Screen 16

View graph EMPLOYMENT TOTAL MENU
Employment Value Foreign Government Quit

GRAPHS MENU

Select a choice from the menu at the top of the screen
by pressing the initial character or
by highlighting and pressing «Enter»!
From graph you can return to this menu by pressing «Esc»!

With the help of the commands in *GRAPHS MENU* you can view the bar graphs of system totals. These graphs can help you to view the

changes of the most important variables over time.

By selecting "Employment" the values of the *TOTAL of EMPLOYMENT* row are shown. The yearly employment data are represented with bars.

By selecting "Value" you call a representation of *TOTAL of SALES*, *TOTAL of VALUE ADDED* and *TOTAL of NET PROFIT* in one graph.

The "Foreign" command gives the graph of *TOTAL of EXPORT* and *TOTAL of FOREIGN CURRENCY ACCOUNT*, while "Government" calls the graph of *TOTAL of GOVERNMENT ACCOUNT*.

By selecting "Quit" you can return from *GRAPHS MENU* to the table.

You cannot print the graphs from EMEPS, they are only displayed. If you are familiar with Symphony you can print the graphs with the help of its PrintGraph facility: press «Esc» in *GRAPHS MENU*; the menu disappears and only the *G* window remains on the screen; use window *TABLE* and from there you can work with the graph settings.

If you press «Esc» accidentally in *GRAPHS MENU* then call the «Alt» «M» menu again and select "Graph".

From the graphs you can return to *GRAPHS MENU* by pressing «Esc».