


APPENDIX

APOLLO OPERATING MANUAL: IBM PC VERSION
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A APOLLO PACKAGE DESCRIPTION

The Apollo package consists of

- The Apollo Modelling Manual, which describes how to model an aggregate plant using Apollo (Chapter 7 is essentially a modified and expanded version of this manual).

- The Apollo Operating Manual, which describes how to run the Apollo program package on the IBM PC/XT personal computer (essentially, this Appendix is the Operating Manual).

- The Apollo PROGRAM Diskette, which contains the actual Apollo program and the necessary files to get it started, as well as some input files used by Apollo. An example Apollo model of a plant is also included. The diskette is configured for 360K double-sided storage, 9 sectors per track.
B COMPUTER REQUIREMENTS

Memory

At least 256 K total memory (use the DOS CHKDSK command to verify this), and either:

- two double-sided diskette drives (IBM PC), or
- a fixed (hard) disk and one double-sided diskette drive (IBM XT).

Monitor

A monochrome monitor is sufficient (there are no graphics in Apollo). Apollo will automatically recognise if a colour monitor is the default monitor: if so, Apollo will operate in 'techni-colour'.

8087 Maths Co-Processor Chip

It is highly recommended that the 8087 'Math Co-Processor' is installed, to speed up the execution of the Apollo programs. Without the co-processor chip, the runtime required to solve a very large problem may exceed 45 minutes: the chip will reduce the run-time by a factor of about 5.
B  COMPUTER REQUIREMENTS

Memory

At least 256 K total memory (use the DOS CHKDSK command to verify this), and either:

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8087 Maths Co-Processor Chip

It is highly recommended that the 8087 'Math Co-Processor' is installed, to speed up the execution of the Apollo programs. Without the co-processor chip, the runtime required to solve a very large problem may exceed 15 minutes: the chip will reduce the run-time by a factor of about 5.
C INITIAL PREPARATION FOR A DUAL-DISKETTE SYSTEM (IBM PC)

(If your system uses a fixed (hard) disk, you may skip this section)

Since you will be operating Apollo using diskettes, you should make your own copy of the original PROGRAM diskette for day-to-day use: instructions to do this follow shortly. Once you have made a working copy, put the original diskette away in a safe place. Do not remove the write-protect tab on this diskette!

Furthermore, Apollo is not distributed with a copy of DOS on the PROGRAM diskette. The following steps will also transfer your own copy of DOS (must be DOS version 2.0 or later) to a new PROGRAM-S diskette. This will allow you to power up ('boot') the system with the new PROGRAM-S diskette (S = 'soft', referring to a dual-diskette system as opposed to a hard-disk system).

1. Switch the system on ('boot' it) with your usual DOS system diskette in drive A.

2. Get two new diskettes (unformatted are OK) and, using a felt-tip pen, label them PROGRAM-S and DATA.

3. Keep your usual DOS system diskette in A: and insert the new blank PROGRAM-S diskette in B:. Format PROGRAM-S by typing

   A> FORMAT B:/S (and press RETURN ↓)

   The /S option transfers the 'hidden' DOS files and the file COMMAND.COM to the new PROGRAM-S diskette.

4. When the PROGRAM-S diskette is formatted, the computer will ask:

   "Do you want to format another diskette (Y/N):"
So type Y

Then, following instructions on the screen, remove the (now formatted) PROGRAM-S diskette from drive B:, insert the DATA diskette in drive B:, and format it.

5. Place the original PROGRAM diskette in A: and the new PROGRAM-S diskette in B: and copy the contents of PROGRAM onto PROGRAM-S. Type

A> COPY *.* 3:

6. Leave the original PROGRAM diskette in A: and place the new DATA diskette in B: and copy the data files from the original PROGRAM diskette. Type

A> COPY EXAMPLE.* B:

7. Take the original PROGRAM diskette and store it in a safe place; it is no longer needed.

8. To avoid the possibility of accidently executing the HARDISK.BAT program (which is only to be used if you are setting up Apollo to run on a fixed-disk system), re-name it so that it cannot be run as a batchfile. Place the new PROGRAM-S diskette in A: and nothing in B: and type

A> REN HARDISK.BAT *.HRD

9. Using a felt-tip pen, label the PROGRAM-S diskette with the words 'DRIVE A' and the DATA diskette with the words 'DRIVE B' to help you remember which drives they go in when you want to operate Apollo.
To operate the Apollo package, place PROGRAM-S and DATA in drives A: and B: respectively, and either

- switch on the power (i.e. 'boot' the system), or

- if already powered up using the PROGRAM-S diskette, type

  A> APOLLO

Apollo requires that the two files CONFIG.SYS and ANSI.SYS are available and read by DOS when the system is 'booted'. These two files are contained on the PROGRAM-S diskette. That is why this diskette must always be used to 'boot' the system. If you boot the system using your normal DOS diskette, or some other diskette, you may find that Apollo does not work.

Note that the new PROGRAM-S diskette is configured to operate Apollo on a dual-diskette system ('soft' diskette system), not on a fixed-disk system. PROGRAM-S is therefore not a mirror copy of the original PROGRAM diskette.

If at some stage you wish to set up Apollo on a fixed-disk system, it will be necessary to use the original PROGRAM diskette supplied, rather than the new PROGRAM-S diskette. (You could use PROGRAM-S, but first you would have to restore the program HARDDISK.HRD to its original name, HARDDISK.BAT, so that it can be run as a batchfile.)
D INITIAL PREPARATION FOR A FIXED-DISK SYSTEM (IBM XT)

(If your system is a dual-diskette system, you may skip this section.)

The fixed disk (hard disk) is known as drive C:. The diskette drive is drive A:.

It is highly recommended that the reader familiarises himself with the directory structuring of his fixed disk; this is explained in the DOS manual.

1. Get two new diskettes (unformatted are OK) and, using a felt-tip pen, label them PROGRAM-H and DA (H = 'hard', referring to a fixed-disk system as opposed to a dual-diskette (soft) system).

2. Switch the system on ( 'boot' it) with nothing in drive A: so that the default drive is C: . Make sure that the current directory contains the DOS COMMAND.COM file as well as the file FORMAT.COM (these are probably on the root directory). If you are not sure how to do this, see Section J, or consult your DOS manual.

3. Format the two new diskettes. Insert the new PROGRAM-H diskette in drive A: and type

   C> FORMAT A:/S (and press RETURN

   The /S option transfers the DOS system files onto the diskette, so that you can power up ( 'boot' ) the system with the new PROGRAM-H diskette. (Apollo is not distributed with a copy of DOS on the original PROGRAM diskette.)

   When asked whether you want to format another diskette, type Y, place the new DATA diskette in drive A:, and follow instructions.
4. Check if a directory called AGMODEL already exists on the fixed disk (hardly likely). To do this, type

C> CD \ AGMODEL
C> TREE

and watch the screen to see if the word AGMODEL appears. If it does appear, find out who created it, and if necessary, copy its contents onto diskettes in case the data is valuable (see Section J to see how to copy files from the hard disk to drive A:).

Then, if it does exist, kill it by typing the following:

C> CD \ AGMODEL
C> DEL *.*
C> CD \ AGMODEL
C> RD \ AGMODEL

5. You are now ready to copy Apollo onto the fixed disk. Place the original supplied PROGRAM diskette in drive A: (but ensure its write-protect tab has not been removed).

The batch-file HARDDISK.BAT on the original PROGRAM diskette is a special 'driver' file that does the following, automatically, when run:

- it creates a new directory called AGMODEL on the fixed disk and copies the contents of the original PROGRAM diskette to this directory

- it modifies some of the files on the AGMODEL directory so that Apollo is configured for a fixed-disk system (rather than a dual-diskette system).
To run this driver file, type

C> A:HARDDISK

The following should appear on the screen:

C:
CD \MD AGMODEL
CD AGMODEL
COPY A:*. *

{list of files copied}

COPY AUTOEXEC.HRD *.BAT
COPY APOLLO.HRD *.BAT
C>

6. Take the original PROGRAM diskette out of drive A: and store it in a safe place: it is no longer needed.

7. Copy the contents of the AGMODEL directory to the new PROGRAM-H diskette. To do this, put PROGRAM-H in drive A: and type

C> COPY *.* A:

The new PROGRAM-H diskette will now contain your DOS operating system files, as well as the contents of the directory AGMODEL.

8. Note that the files on the new PROGRAM-H diskette are especially configured to run Apollo on a fixed disk system and will not work on a dual-diskette system. PROGRAM-H is thus not a mirror copy of the original PROGRAM diskette.

If at some stage you wish to set up Apollo on a dual-diskette system, it will be necessary to use the original PROGRAM diskette supplied, rather than the new PROGRAM-H diskette. (You could use PROGRAM-H, but first you will have to copy the contents of AUTOEXEC.SFT to AUTOEXEC.BAT and APOLLO.SFT to APOLLO.BAT.)
To operate the Apollo package, place PROGRAM-H in drive A: and switch on the power ('boot' the system). Apollo will run automatically.

To re-run the package, type

C> APOLLO

NOTE:

Apollo requires that the two files CONFIG.SYS and ANSI.SYS are available and read by DOS whenever the PC is 'booted'. These two files are contained on the PROGRAM-H diskette. (That is why this diskette must always be used to 'boot' the system correctly for Apollo. If you boot the system without the PROGRAM-H diskette, Apollo may not run.)

If you copy these two files to the root directory of the fixed disk (see next instruction), you can operate Apollo without any diskettes at all. In this case, Apollo can be run by doing the following:

Power up ('boot' the system) without any diskettes in drive A:. Then type

C> CD \AGMODEL
C> APOLLO

To copy the files CONFIG.SYS and ANSI.SYS to the root directory, type

C> CD \  
C> COPY \AGMODEL\*.SYS

Now you can run Apollo without any diskettes.

The DATA diskette has not been used yet: it is used to store back-up copies of the data files created by Apollo (see Section J for details on how to copy files).
The IBM keyboard is divided into three sections: the Typewriter Area, the Function Keys (which Apollo never uses), and the Numeric Keypad.

It is useful to know the functions of certain keys in the Numeric Keypad area:

- **NUMLOCK**
  - Pressing NUMLOCK places the number keys 0 through 9 (located below the NUMLOCK Key) in numeric mode.
  - Pressing NUMLOCK again returns keys 0 through 9 to cursor control.

While operating Apollo, these keys must **not** be placed in numeric mode - they are needed for cursor control.

To enter numbers while operating Apollo, use the numeric keys on the top row of the Typewriter Area.
RETURN While Apollo is not operating, this key is used to 'enter' an instruction that you have typed (the function of this key changes while Apollo is operating).

While Apollo is operating, the Cursor Control keys listed below are used to complete the Apollo masks:

ARROW KEYS The four arrow keys move the cursor one space to the left / right / up / down.

HOME Moves cursor to the top left corner of the display.

END Has a special function. Pressing it while completing a mask will cause the information entered on the mask to be verified, and any illegal input will be deleted.

PGUP Moves the cursor to the beginning of the previous field on the mask.

PGDN Moves the cursor to the beginning of the next field on the mask.

RETURN While completing masks, the RETURN key serves to move the cursor to the beginning of the first field on the next line.

ESC (Located in the Typewriter Area) Is used to 'escape' from a mask after you complete the information input required. This key should only be pressed after the END key has been pressed and the mask examined to see if all the data is correct.

SHIFT + PRTSC If you have a printer and want to print what is currently on the screen, first make sure the printer is on. Then press and hold SHIFT and then press PRTSC.
PREPARATION OF THE INPUT DATA

In order to run the Apollo program the following data has to be obtained beforehand (details in Chapter 7):

- Raw material grading
- Plant flow diagram (which must be suitably modified)
- Screen mesh sizes and deck areas
- Crusher product gradings
- All machine capacities
- Various costs
- Annual product demand.

To facilitate entering the data into the computer, it is necessary to fill in four different types of forms before running the program. These forms are duplicated as 'masks' on the computer screen when the program is run.

The four types of forms/masks are:

Plant-Model Data:

- Mask 1 Plant size, raw material and scalper data.
- Mask Type 2 Crusher data (one form for each crusher).
- Mask Type 3 Screening-Line data (one mask for each line).

Market-Demand Data:

- Mask 4 Market-Demand data and available production hours.

Instructions for completing each of these forms are given on the pages following. Note that the Apollo flow diagram of the plant should be at hand, otherwise, it will be very difficult to complete the forms correctly.

(An example of a set of completed forms for an hypothetical plant is given in Chapter 7.)
### MASK 1: PLANT SIZE, RAW MATERIAL, AND SCALPER DATA

<table>
<thead>
<tr>
<th>MASK 1</th>
<th>*** PLANT SIZE AND PARAMETERS ***</th>
<th>FILE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLANT TITLE:</td>
<td></td>
<td>b</td>
</tr>
<tr>
<td>No. of SCREENING LINES (MAX. 20):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of CRUSHERS (MAX. 12):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of SILOS / STOCKPILES (MAX. 40):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of SIEVE SIZES / LEVELS (MAX. 20):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCALPER MATERIAL:</td>
<td></td>
<td>d</td>
</tr>
<tr>
<td>% retained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCALPER GRADE (ton/hr):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCALPER CAPACITY (ton/hr):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAW MATERIAL GRADE:</td>
<td></td>
<td>c</td>
</tr>
<tr>
<td>% retained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAW MATERIAL S/N:</td>
<td></td>
<td>e</td>
</tr>
<tr>
<td>% retained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAW MATERIAL COST (ton):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESTINATIONS:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVER SCALPER routed to:</td>
<td></td>
<td>f</td>
</tr>
<tr>
<td>UNDER SCALPER routed to:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRUSHER</td>
<td>SCR.LINE</td>
<td>SILO</td>
</tr>
</tbody>
</table>

**a)** This field can be ignored when completing the forms. During program execution, it reflects the file name of the plant model currently in memory. It will reflect the word 'EMPTY' if a new plant model is being created. If a plant model which has been retrieved from the diskette is being modified, the field will reflect the file name under which the plant model was previously saved.

**b)** The plant title consists of two fields (20 characters max and 20 characters max) and serves to identify the model on the solution printouts.

**c)** The number of sieve sizes/levels should include all mesh sizes that are used anywhere in the plant. For convenience, these mesh sizes will usually correspond with the standard sieve-sizes used by the plant laboratory for grading material.

**d)** Refers to the percentage of raw material that is larger than the scalper. In some plants there is no physical scalper, so that 100% of the raw material is larger than the 'scalper' in the model.

**e)** Refers to the grading of the raw material that falls through the scalper. Some examples follow:
Example 1

19% of the raw material is larger than the scalper mesh size.

<table>
<thead>
<tr>
<th>SCALPER</th>
<th>% retained</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAW</td>
<td>level</td>
</tr>
<tr>
<td>MATERIAL</td>
<td>sieve size</td>
</tr>
<tr>
<td>GRADING</td>
<td>% retained</td>
</tr>
<tr>
<td></td>
<td>53.0</td>
</tr>
<tr>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

10% of the material is larger than 53 mm but smaller than the scalper.

No material is larger than 19 mm and smaller than 26.5 mm.

17% of the material is larger than 13.2 mm and smaller than 19 mm.

Note that the sum of the grading percentages is
19 + 10 + 15 + 11 + 17 + 7 + 11 + 5 + 5 = 100%.

If this is not entered correctly, the computer will automatically alter the percentages in proportion so that they do add up to 100%.

Example 2

<table>
<thead>
<tr>
<th>SCALPER</th>
<th>% retained</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAW</td>
<td>level</td>
</tr>
<tr>
<td>MATERIAL</td>
<td>sieve size</td>
</tr>
<tr>
<td>GRADING</td>
<td>% retained</td>
</tr>
<tr>
<td></td>
<td>53.0</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

A zero is equivalent to a blank.

Here, all the material is larger than the scalper mesh. In essence, this means that in the physical plant there is no scalper.

Material over the scalper can be fed only to crushers, designated as C01 (crusher 1), C02, etc.

Material under (through) the scalper can be routed to silos (S01, S02, etc.), screening lines (L01, L02, etc.) or crushers (C01, C02, etc.).

Note that space is provided for up to 6 destinations in each case.
a) This field can be ignored when completing the forms. During program execution it reflects the file name of the plant model currently in memory. It will reflect the word 'EMPTY' if a new plant model is being created. If a plant model which has been retrieved from diskette is being modified, the field will reflect the file name under which the plant model was previously saved.

b) Product from crushers can be routed to screening lines (L01, L02, etc.), silos (SO1, SO2, etc.) or other crushers (C01, C02, etc.). Space is provided for up to 6 destinations from each crusher. Take care that a crusher does not feed itself: Crusher 3 cannot route material to C03!

c) The sieve sizes are the same as those entered in MASK 1. The computer will automatically complete these fields.

d) The crusher product-grading is entered as the percentages retained on each mesh. For example:

<table>
<thead>
<tr>
<th>Level</th>
<th>Sieve Size</th>
<th>% Retained</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53.0</td>
<td>66%</td>
</tr>
<tr>
<td></td>
<td>37.5</td>
<td>12%</td>
</tr>
<tr>
<td>2</td>
<td>26.3</td>
<td>6%</td>
</tr>
<tr>
<td>3</td>
<td>19.0</td>
<td>3%</td>
</tr>
<tr>
<td>4</td>
<td>13.2</td>
<td>1%</td>
</tr>
<tr>
<td>5</td>
<td>9.5</td>
<td>1%</td>
</tr>
<tr>
<td>6</td>
<td>6.7</td>
<td>0%</td>
</tr>
<tr>
<td>7</td>
<td>4.75</td>
<td>7%</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

68% of the product is larger than 53 mm
3% of the product is larger than 19 mm and smaller than 26.5 mm
No crusher product is larger than 4.75 mm and smaller than 6.7 mm

If the grading percentages do not add up to 100%, the computer will adjust them in proportion so that they do.
F.3 MASK TYPE 3: SCREENING-LINE DATA

<table>
<thead>
<tr>
<th>MASK TYPE 3</th>
<th>*** SCREENING LINE No.</th>
<th>***</th>
<th>FILE</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST OF SCREENING (/ton)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>SIEVE</td>
<td>CAPACITY (t/h)</td>
<td>UNDERSIZE</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a) This field can be ignored when completing the forms. During program execution it reflects the file name of the plant model currently in memory. It will reflect the word 'EMPTY' if a new plant model is being created. If a plant model which has been retrieved from diskette is being modified, the field will reflect the file name under which the plant model was previously saved.

b) The sieve sizes are the same as those entered in MASK 1. The computer will automatically complete these fields.

c) For details on how to enter screen capacities, see Chapter 8.

d) It is not possible for Level 1 to have any oversize! Similarly, if there are 9 levels in a particular model, the ninth level cannot have any undersize - see Chapter 8.

It is suggested that the oversize and undersize columns are ignored until the model is working satisfactorily - see Chapter 8.

e) If, for example, a sieve routes material to Crusher 3 or Screening-Line 4, we would enter C03 L04 on the relevant level. Note that space is provided for up to six destinations from any level. Take care that a screen does not route material to itself!
### F.4 MASK 4: MARKET-DEMAND DATA AND AVAILABLE PRODUCTION HOURS

<table>
<thead>
<tr>
<th>SILO</th>
<th>PRODUCT NAME</th>
<th>BUDGET (tons)</th>
<th>DUMPING COST /t</th>
<th>SHORTAGE COST /t</th>
<th>OPERATING TIME (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
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<td>4</td>
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<td>17</td>
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<td>18</td>
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<td>19</td>
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<td></td>
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<tr>
<td>20</td>
<td></td>
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</tr>
</tbody>
</table>

This field can be ignored when completing the forms. During program execution it will reflect the name of the market-demand schedule currently in memory. It will reflect the word 'EMPTY' if a new market-demand schedule is being created. If a schedule which has been retrieved from diskette is being modified, the field will reflect the file name under which the market-demand schedule was previously saved.

**NOTE:** This file name differs from the plant-model file name, because the market-demand files are separate from the plant-model files.
G RUNNING THE APOLLO PROGRAM

G.1 STARTING APOLLO

G.1.1 Dual-Diskette System (IBM PC)

Insert the PROGRAM-S diskette in drive A: and the DATA diskette in B: and switch on the power. Apollo will execute automatically.

If the system has already been powered up ('booted') using the PROGRAM-S diskette, type

A> APOLLO

G.1.2 Fixed-Disk System (IBM XT)

Insert the PROGRAM-H diskette in drive A: and power up the system ('boot' it). Apollo will execute automatically. Once Apollo is running, you can remove the PROGRAM-H diskette: it is no longer needed.

If the system has already been 'booted' (using the PROGRAM-H diskette), type

C> APOLLO

If this does not work, it may be because you are not in the AGMODEL directory. So type

C> CD \AGMODEL
C> APOLLO
NOTE: If the files CONFIG.SYS and ANSI.SYS are resident on the root directory of the fixed disk, you can start Apollo running without any diskettes at all, by doing the following:

Power up ('boot') the system without a diskette in drive A: Then type

C> CD \AGMODEL
C> APOLLO

(Instructions on how to put the files CONFIG.SYS and ANSI.SYS on the root directory are given in Section D.)

G.2 THE 'MAIN MENU'

Apollo is a user-friendly menu-driven program package. When the program is run, the MAIN MENU automatically appears.

<table>
<thead>
<tr>
<th>Aggregate Production Optimisation - APOLLO</th>
</tr>
</thead>
<tbody>
<tr>
<td>*** MAIN MENU ***</td>
</tr>
<tr>
<td>Type the number of the option required and press ESC key</td>
</tr>
<tr>
<td>1. CREATE A NEW PLANT MODEL</td>
</tr>
<tr>
<td>2. ALTER AN EXISTING PLANT MODEL</td>
</tr>
<tr>
<td>3. OPTIMISE</td>
</tr>
<tr>
<td>4. PRINT SOLUTION</td>
</tr>
<tr>
<td>5. ERASE AN EXISTING PLANT MODEL</td>
</tr>
<tr>
<td>6. ERASE AN EXISTING MARKET DEMAND SCHEDULE</td>
</tr>
<tr>
<td>7. QUIT</td>
</tr>
</tbody>
</table>

As can be seen, the operator is offered a number of options. On completion of any of these options (except option no. 7), the program will return to this menu.
These options are detailed below.

G.2.1  **Option 1: Create a New Plant Model**

The CONTROL MENU appears on the screen. This menu allows the user to complete and correct all the relevant data masks that make up a plant model and a market-demand schedule. The CONTROL MENU also allows the completed masks to be saved on disk so that the model can be solved (Option 3: Optimise).

The operation of the CONTROL MENU is described in Section G.3, after the MAIN MENU options have been detailed.

G.2.2  **Option 2: Alter an Existing Plant Model**

A list of what plant models are stored on disk is displayed on the screen. The operator chooses which plant model he wants by locating the cursor over the required file name (use the PgUp, PgDn, Uparrow and Dnarrow cursor control keys) and pressing the ESC key.

After the operator enters his choice, the CONTROL MENU appears, with the chosen plant model now current in memory.

If no plant model in the list is acceptable to the operator, he can escape by locating the cursor over the word 'EMPTY' and pressing the ESC key.

G.2.3  **Option 3: Optimise**

This option will solve the equations that make up a plant model.

The operator is first presented with a list of plant models on disk and he makes his choice as described in Section G.2.2. He is then presented with a list of market-demand schedules, and likewise makes a choice.
The optimisation process then begins, and the operator should see a display similar to the one below:

ESTABLISHMENT OF MATHEMATICAL MODEL

PLANT EXAMPLE.PLT
MARKET DEMAND SCHEDULE EXAMPLE.SCD

NUMBER OF VARIABLES (FLOWS) : 51
NUMBER OF EQUATIONS (NODES) : 76

MODEL IS DONE. OPTIMISATION PROGRAM LOADING

UNUSED MEMORY RESERVE AT LEAST: 42742 BYTES

SOLVE EQUATIONS

OPTIMISING

PRODUCE: 453367
PURCHASE: 9278
DUMP: 22646
COST: 2564981

END OF OPTIMISATION

Once optimisation is complete, the MAIN MENU will automatically reappear, with the solution saved on a special file on disk.

G.2.4 Option 4: Print Solution

The solution, which has been saved on a special file on disk, is displayed on the computer screen, after the operator has been asked whether he requires a printout and has been instructed how to obtain one.

An example solution-printout is included in Chapter 7.

G.2.5 Options 5 and 6: Erase Data Files

To avoid an accumulation of unwanted data-files (which use up disk memory), the operator can delete files of his choice.

He is presented with a list of files and chooses which file to delete in the same way as described in Section G.2.2.
Use this option carefully, otherwise valuable data-files may be inadvertently deleted!

G.3 THE 'CONTROL MENU'

The CONTROL MENU allows the user to complete and correct all the relevant data masks that make up a plant model and a market-demand schedule. The CONTROL MENU also allows the completed masks to be saved on disk so that the model can be solved.

<table>
<thead>
<tr>
<th>*** CONTROL MENU ***</th>
<th>Position the cursor, type * and press ESC key.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLANT MODEL</td>
<td>Current plant model file name ...... XXXXXXXX</td>
</tr>
<tr>
<td>A: Mask 1</td>
<td>PLANT SIZE AND PARAMETERS ........</td>
</tr>
<tr>
<td>B: Mask type 2</td>
<td>C01_ C02_ C03_ C04_ C05_ C06_ C07_ C08_ C09_ C10_</td>
</tr>
<tr>
<td>CRUSHERS</td>
<td>C11_ C12_</td>
</tr>
<tr>
<td>C: Mask type 3</td>
<td>L01_ L02_ L03_ L04_ L05_ L06_ L07_ L08_ L09_ L10_</td>
</tr>
<tr>
<td>SCREEN LINES</td>
<td>L11_ L12_ L13_ L14_ L15_ L16_ L17_ L18_ L19_ L20_</td>
</tr>
<tr>
<td>DEMAND SCHEDULE</td>
<td>Current schedule file name ...... XXXXXXXX</td>
</tr>
<tr>
<td>D: Mask 4</td>
<td>CURRENT SCHEDULE ..................</td>
</tr>
<tr>
<td></td>
<td>GET SCHEDULE FROM DISK .............</td>
</tr>
</tbody>
</table>

The operator selects which mask he wants to complete by positioning the cursor (using the cursor-control keys) at the desired mask. When in position, the operator types * and presses the ESC key. The requested mask will appear on the screen.

After completing each mask, the CONTROL MENU reappears and the operator can select the next mask he wishes to complete.

The format of the CONTROL MENU (steps A to G) follows the same logical sequence that must be followed in setting up a complete model:
First, the plant model is completed (steps A, B and C), then the market-demand schedule (step D). Thereafter the plant model and the market-demand schedule are saved as separate files on disk (steps E and F) for use later in the program. The operator then returns to the MAIN MENU (step G).

These steps are now described:

G.3.1 Completing the Input Masks

For details on how to complete these masks, see Section F.

With regard to MASK 1, the first four fields, which define the size of the model, should be completed first. Before continuing, press the END key, so that the rest of the mask is correctly configured to accommodate the size of the model.

<table>
<thead>
<tr>
<th>No. of SCREENING LINES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of CRUSHERS</td>
<td></td>
</tr>
<tr>
<td>No. of SILOS / STOCKPILES</td>
<td></td>
</tr>
<tr>
<td>No. of SIEVE SIZES / LEVELS</td>
<td></td>
</tr>
</tbody>
</table>

When entering data into the masks, make sure that the CAPS LOCK key is active: only capital letters are acceptable.

For MASK TYPE 2 (Crushers), note that a separate mask has to be completed for each crusher.

For MASK TYPE 2 (Screening Lines), the same applies: a separate mask must be completed for each line.

With regard to MASK 4 (Market-Demand Schedule), note that one as a choice. Either: