

THE SOCASIN EXPERT

PC Software for guidance of

operation and use of

ST1 digital motion controller

024.8038.C

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This upgraded and improved version replaces all the previous. We reserve the right to amend this document without prior notice and decline all responsibilities for eventual errors.

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1. CONDITIONS OF SALE AND USE

1.1 COPYRIGHT

The ST1-EXPERT software is the sole property of :

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2. HARDWARE

2.1 REQUIRED COMPUTER

This software can be run on a PC XT, AT or compatible computer, where the minimum configuration must be as follows :

- Operation system MS-DOS , version 2.1 or later versions.
- 640 kB of RAM memory, of which a minimum of 580 kB are free or a memory extension. Use the DOS "CHKDSK" command to check the amount of free memory. If the free memory is insufficient, delete one or more of the other resident programs.
- Two disk drives 720 kB or more, or one hard disk and one 360 kB disk drive.
- One RS232 serial communication port.

2.2 CONNECTION WITH THE "ST1 DIGITAL MOTION CONTROLLER"

2.2.1 Access via the test card

To be able to use this program, it is important to correctly connect your PC to the ST1 digital motion controller. The use of the connecting cable proposed by SOCAPEL SA, part no. 024.77842 is recommended. This part is delivered with a 9 to 25 pole adaptor for the PC XT.

On the PC side, the cable should be connected to one of the serial ports COM1 or COM2. On the ST1 side, the cable should be connected to the D-sub connector on the test card and the card shall be plugged on to the ST1 digital motion controller.

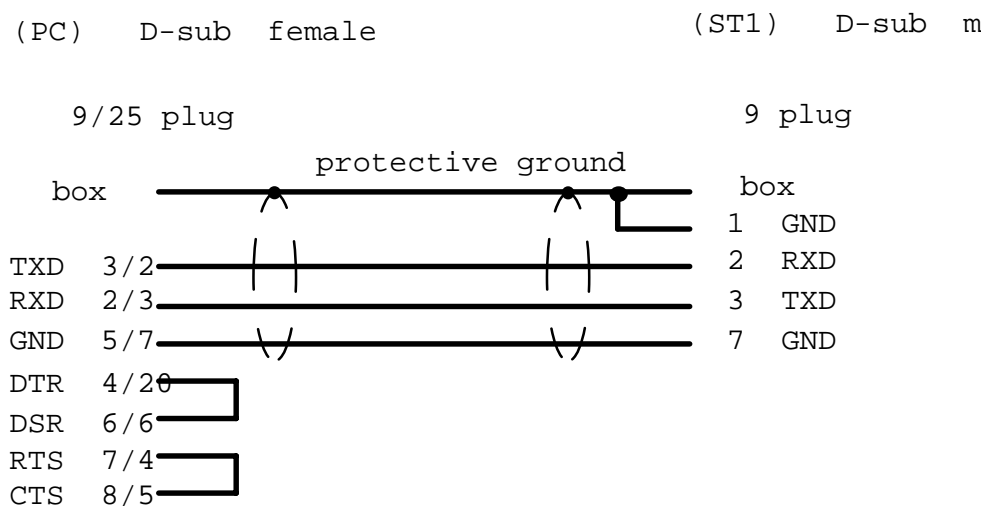


Fig. 1 : PC cable <-> test card

2.2.2 Access via the LS interface board

RS232 Interface

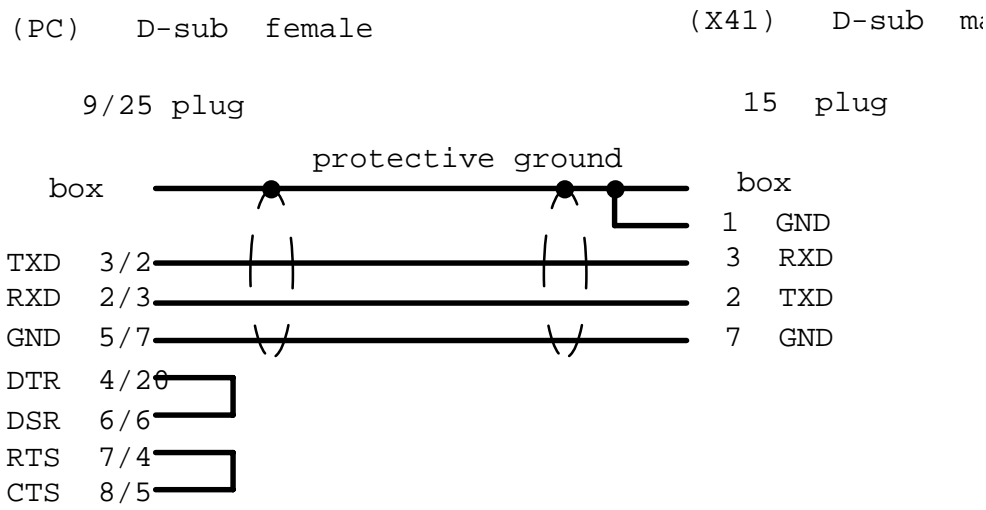


Fig. 2 : PC cable <-> LS-232

RS485 Interface

The connection via the LS-485 interface board requires a RS485 or RS422 serial port in the computer or an adequate interface in the connection.

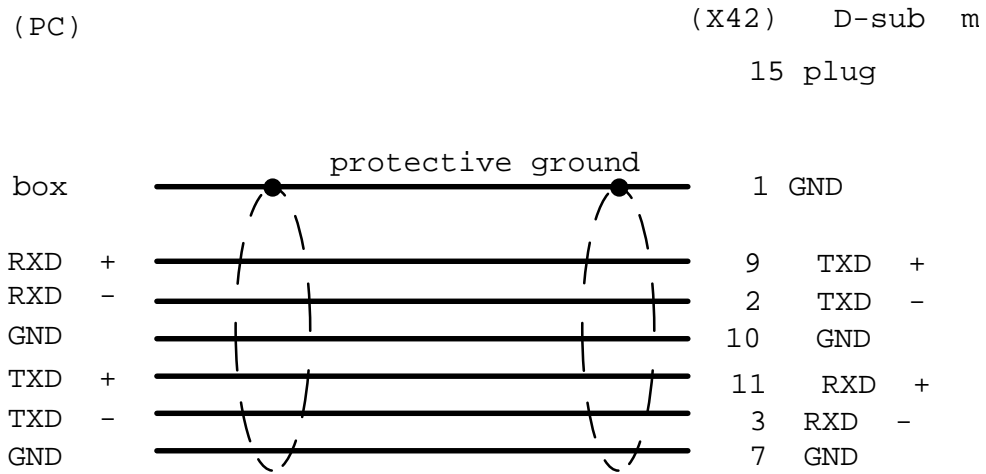


Fig. 3 : PC cable <-> LS-485

20 mA current loop adaptation

The connection via the LS-BC interface board requires a serial port with a 20 mA current loop interface in the computer or an adequate external serial interface board.

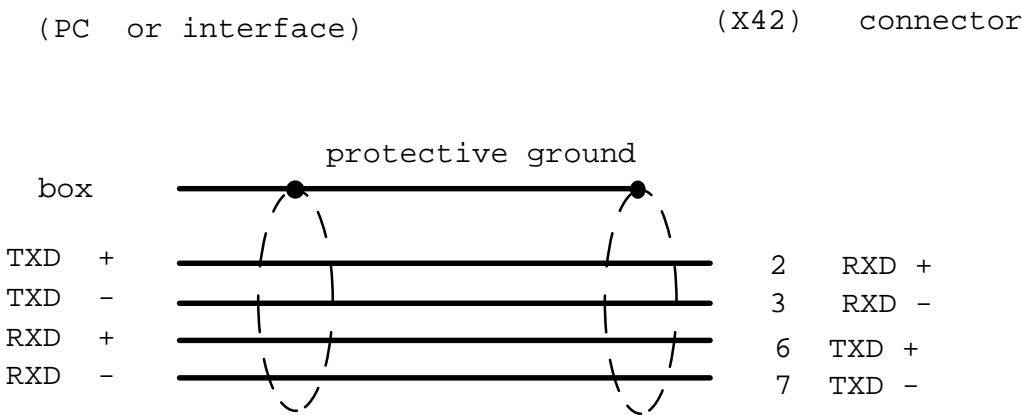


Fig. 4 : PC cable <-> LS-BC

2.2.3 Access via the LIO interface board

The connection via the LIO interface board requires a serial port with a 20 mA current loop interface in the computer or an adequate external serial interface board.

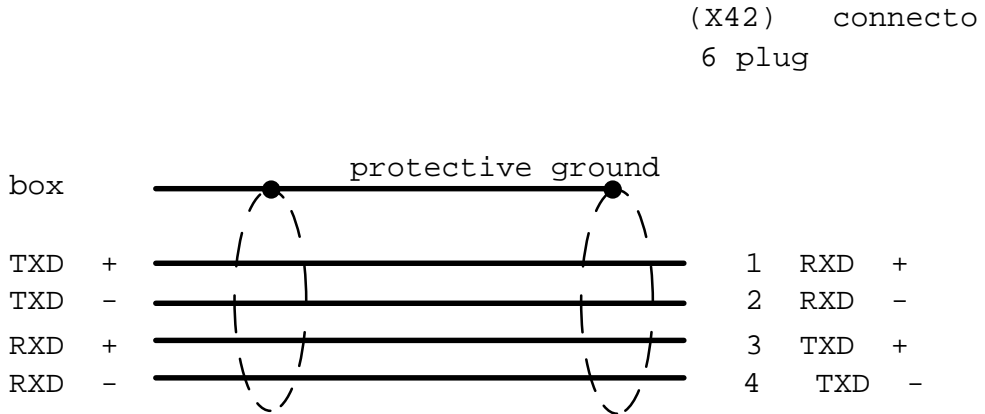


Fig. 5 : PC cable <-> LIO

3. START-UP

3.1 INSTALLATION OF THE PROGRAM

It is recommended that working copies be made of the set of disks with the original disks remaining available as a safety precaution.

In order to install the ST1-EXPERT software, place the INSTALLATION NO. 1 disk in disk drive "A" and type :

INSTALL

Follow the instructions appearing on the screen .

If your choice is the complete installation. ("Install, EXPERT + MOTOR LIBRARY + ONLINE)", the program produces directories on the destination disk, unless they already exist. These are arranged as bellow. Only the main directory can be define by the user, the default name is "SOCAEXP"

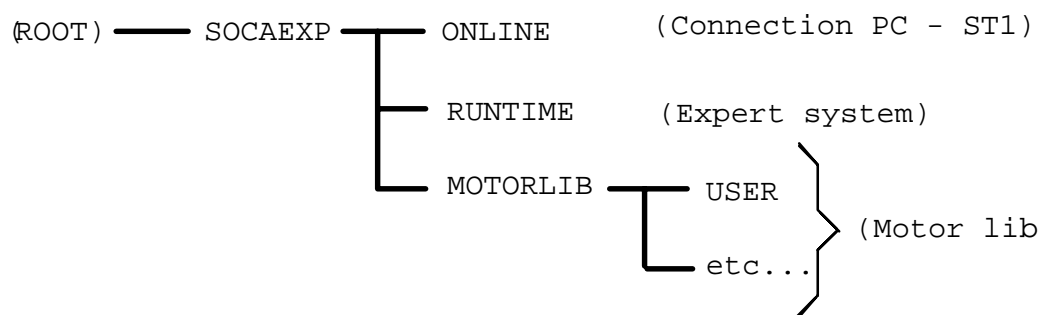


Fig. 6 : Directory ST1-EXPERT

The program also produces a batch file on the root of destination disk, with the name "SOCASIN. BAT", which allows the program to start. This file may be transferred to another directory or placed on another disk in order to adapt the program call to the computer file organization.

3.2 INSTALLATION OF MOTOR LIBRARIES

If your choice includes the motor library ("Install ... + MOTOR LIBRARY "), then the installation of libraries is automatique.

It is possible to produce additional directories for the motor libraries by using the usual DOS commands.

3.3 USE OF EXTENDED MEMORY

If the computer has an extended memory (1 MB or more), it is possible to modify the "SOCASIN.BAT" file in order to allow its use by the auxiliary programs to the parametrization. It is sufficient to replace "pos" with "pcsext" in :

```
pcs (runtime.app compiler.fsl pcpibm.xli runtime.fsl) motorst1
```

```
pcs (runtime.app compiler.fsl pcpibm.xli runtime.fsl) paramst1
```

The result is the following :

```
pcsext (runtime.app compiler.fsl pcpibm.xli runtime.fsl) motorst1
```

```
pcsext (runtime.app compiler.fsl pcpibm.xli runtime.fsl) paramst1
```

In this case, the 580 kB active memory limit becomes obsolete.

3.4 LOCATION OF THE FILES IN THE DIRECTORIES

The following diagram shows the various functions available as well as the files created or used by ST1-EXPERT:

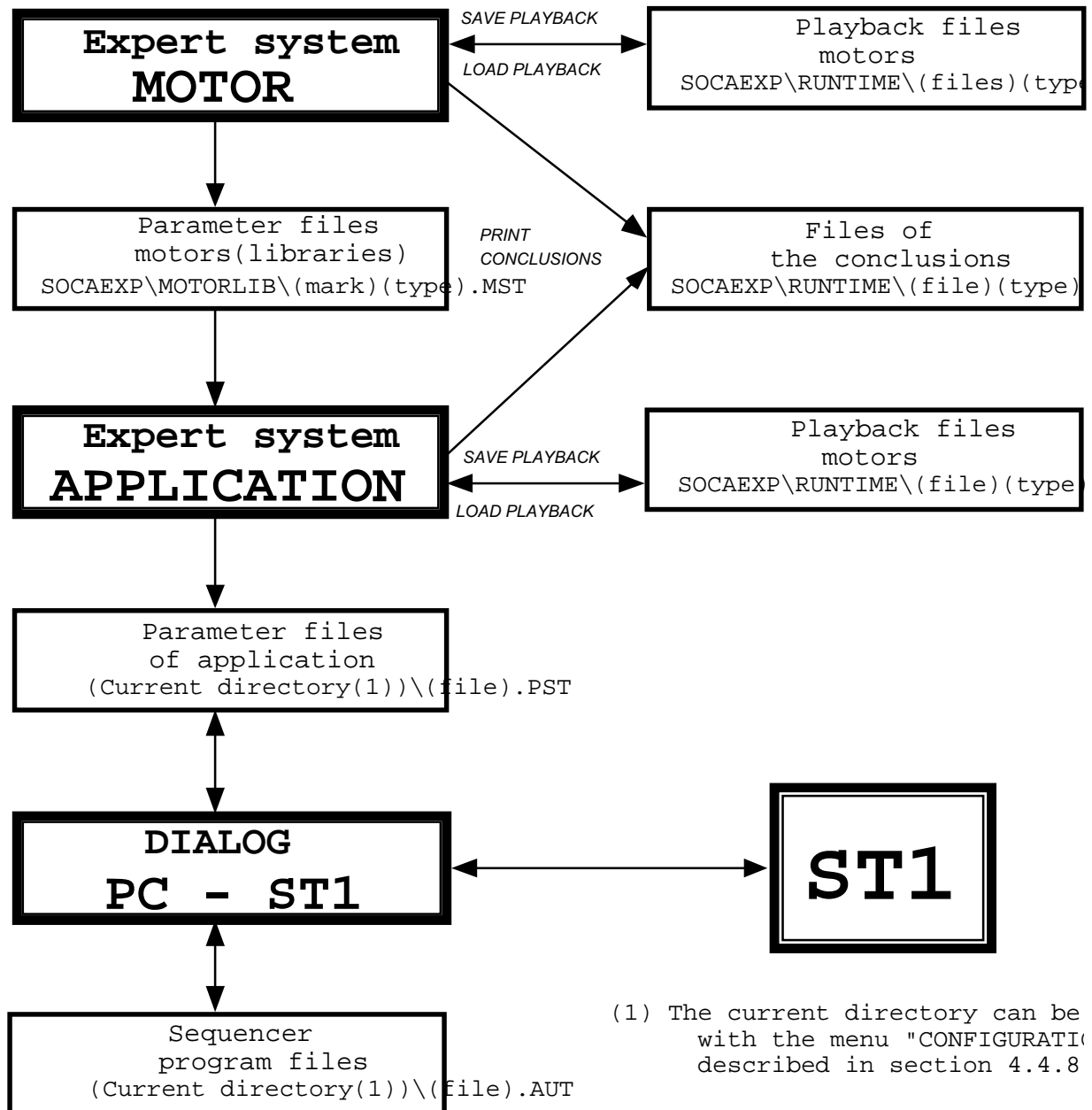


Fig. 7 : Disposition of the files

4. THE "EXPERT" PART OF PROGRAM

4.1 CALLING THE PROGRAM

Using the usual DOS commands, one obtains the desired working directory. In this way, the list of parameter and sequence files is provided.

Then call the program with the C:\SOCASIN command

4.2 MAIN MENU

If the "EXPERT" part has been installed, the following menu appears on the screen when the C:\SOCASIN command is called :

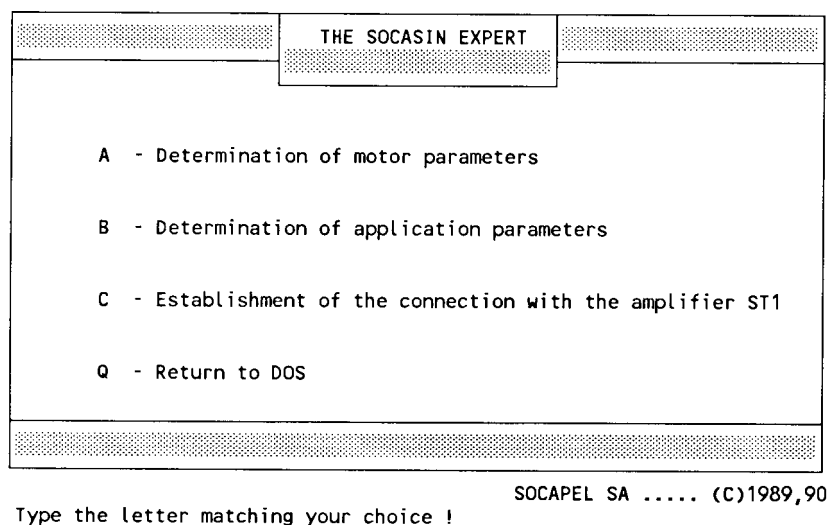


Fig. 8 : The ST1-EXPERT menu

There are two types of possible choices :

- The auxiliary (bias) programs to the parametrization which use the artificial intelligence and guide the user in the definition of the parameters and their application with the commands :
 - < A > Allows the completion of the motor parameter library.
 - < B > Allows the creation of a parameter file containing all the application characteristics. This file can be loaded later to the ST1 digital motion controller with the help of the choices below.
- The interface board program which permits communication with the ST1 digital motion controller and loading the parameter files or sequence files.
 - < C > Allows the establishment of the connection with the ST1 digital motion controller via the test card.

The < Q > command returns to DOS.

4.3 ASSISTANCE TO THE PARAMETRIZATION

```
*** THE SOCASIN EXPERT ***

Current objective:

    You enter in the intelligent program to determine

        the MOTOR parameters for the

        SOCASIN ST1 from SOCAPEL SA

- F1 = invoke help          - F2 = invoke the commands menu
- Use a point (instead of a comma) for the numerical values

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Version 1.1
S/N : 123456789-B

** End - press ENTER to continue.
```

Fig. 9 : Current objective

After having selected one of the auxiliary programs to the parametrization (choice <A> or B >), it is possible to use the function keys :

- < CR > (or ENTER or RETURN key) to continue in the program.
- < F1 > To immediately obtain an explanation concerning the present question or
- < F2 > to immediately obtain different choices depending on the development of the program. The selection is made with the help of the cursor commands or by typing the first letter. The following choices are possible :

CONTINUE

Select CONTINUE to advance in the consultation. If the system has already displayed the conclusions, CONTINUE starts a new consultation.

PLAYBACK

Select PLAYBACK to restart a consultation which has been saved with the help of the SAVE PLAYBACK command. After making your choice, it is possible to make one or more responses with the cursor control keys, after entering new responses when it was consulted.

COMMENT

Select COMMENT to find out how the system came to a conclusion. It is then possible to select a parameter and obtain a list of rules which show the logic which has determined the value of this parameter.

WHY

Select WHY to find out why the system wants a response to the present question. At the end of the message it is possible to ask for an explanation of the preceding logical reasoning step by pressing the combination of keys ALT-W.

NEW START

Select NOUVEAU DEPART to interrupt the present consultation and restart from the beginning.

PRINT CONCLUSIONS

Select PRINT CONCLUSIONS to print a report of the consultation possible to send this report to a printer or save it as a file.

REVIEW

Select REVIEW to obtain a list of the questions and responses of the consultation. Then mark the responses which are to be changed. Next, the system starts the consultation allowing the changing of the value of these responses.

SAVE PLAYBACK

Select SAVE PLAYBACK to save a consultation report in a file. This command saves the consultation up to the point when this command was selected. It is then possible to start the consultation with the help of the PLAYBACK command.

QUIT

Return to the main menu.

5. THE "ST1 ONLINE" PROGRAM

5.1 CALLING THE PROGRAM

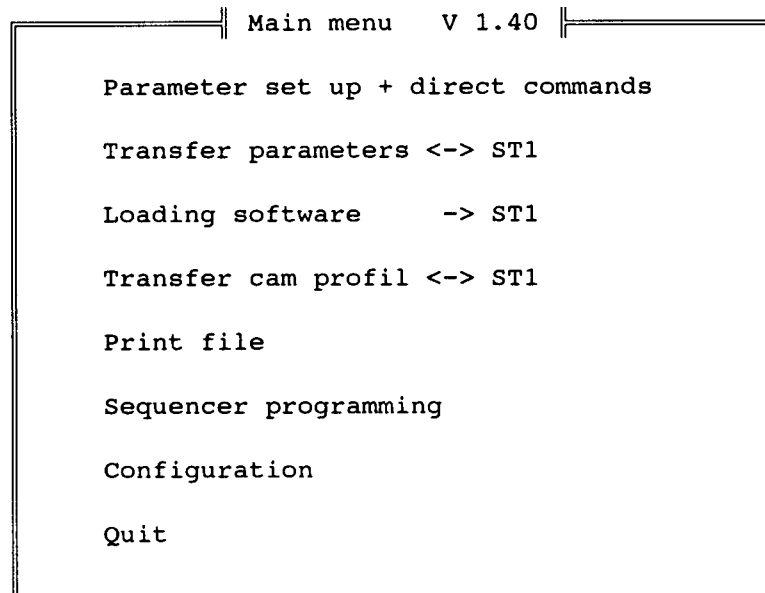
Using the usual DOS commands, one obtains the desired working directory. In this way, the list of parameter and sequence files is provided.

Then call the program with the C:\SOCASIN command

If the "EXPERT" part has been installed, then chose

"C - Establishment of the connection with the amplifier ST1" (section 4.2). Otherwise, the SOCASIN EXPERT menu does not appears and the ST1 ONLINE program starts immediately.

By the first time use of this program, other menus appears as described in next paragraph (section 5.2).



THE SOCASIN EXPERT

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Fig. 10 : PC - ST1 dialog menu

Select your choice by moving the cursor high/low and then press the < CR > key.

5.2 FIRST TIME USE OF THE PROGRAM

When the program is first started up, different menus appear at the screen :

- Configuration connection (section .5.9)
 - . the type of ST1 interface board used
 - . the PC communication port
 - . the characteristics of the communication port
- Configuration screen
 - . the type of screen used
- Configuration parameters' family
 - . matching of parameters' windows to the ST1 software-type
- Configuration directory
 - . the working list

The configuration may be saved on a disk, and later on, it will be applied every time the ST1-EXPERT program is called. Please see section 5.9 for additional information.

On the other hand, if the connection with the ST1 digital motion controller cannot be established, the "CONFIGURATION - CONNECTION" menu appears, allowing for necessary corrections.

5.3 INTRODUCTION OF THE NUMERICAL VALUES

In contrast to artificial intelligence programs, only integer values can be entered. Fractions and decimals are not allowed. Characters or spaces separating the thousands in higher values are also not permitted.

A negative value may be entered by preceding it with the usual symbol "-".

In certain cases, the "NA" displayed value indicates that the parameter is not active, which generally corresponds to a zero value. However, "NA" cannot be entered instead of the value corresponding to "not active".

The numerical base is usually decimal. Hexadecimal form values may be entered if followed by ":h" or preceded by ">".

Examples: "347D5:h", ">347D5", "-347D5:h", "->347D5".

When the hexadecimal base is chosen with the help of the "CONFIGURATION - CHOICE OF BASE" menu, a value in a decimal form may be entered followed by ":d" or preceded by a period ".".

Examples : "25345:d", ".25345", "-25345:d", "-.25345".

Whatever the numerical base may be, a value can also be entered in binary form. This option is particularly useful for the masks. To achieve this, the value must be followed by ":b" or each group of 4 bits (from the right) must be separated with an apostrophe " ' ".

Examples: "1011010:b", "101'1010".

5.4 PARAMETERS SET UP + DIRECT COMMANDS

This menu is used to establish a direct connection with the ST1 digital motion controller.

5.4.1 Parameters set up

This choice is used to establish a direct connection with the ST1 digital motion controller and to adjust or correct the parameters. The following menu is obtained :

Release : 548*	Controller		Resolver/motor	
Axis no. : 1	KPOS	>30	CURES	>600
	KVIT	>60	NPPOL	>4
	KTEGR	>0	CDEPHA	>0
	INERT	>0	KTINV	>2000
	FVISC	>0	KIGLIN	>0
	FSEC	>0	IMAGNN	>180
	FEXT	>0	VITN	>444
	DPOMA	>4000	VITMAX	>444
	SEUIL1	>800	COUMA	>200
			COULIM	>0

Proportional gain of position controller		
Limits	>0000 <-> >7FFF	Default = >0030

F1-Direct commands	F4-Status/Limits	F7-Etc...	
F2-Controller	F5-Unit conversions	F8-"SAVE"	F10-"STOP"
F3-Resolver/motor	F6-Set value generator	F9-Link again	F10-"PWROFF"

Fig. 11 : Parameters set up menu

The upper left window indicates the software version which resides in the ST1 digital motion controller, as well as its address in the serial connection with the host command. The '*' on the right on the version means that the software is a downloading software.

The two center windows allow one to continuously monitor two parameter groups. The values displayed correspond to the current values, just as they are memorized in the ST1 digital motion controller.

Other parameter groups may be selected with the help of the function keys. The up/down keys of the cursor allow the selection of a parameter in a window. The tabulation key allows the cursor to move from one window to another.

The bottom window gives the definition of the parameter designated by the cursor, its upper and lower limits, as well as its default value.

The value of the parameter designated by the cursor can be changed by using the keyboard. After having pressed the < CR > key, the new value is sent to the ST1 digital motion controller where it is accepted as the current value. This value is then read and displayed, verifying that the new value is actually stored.

The role of the function keys is as follows :

- | | |
|----------|--|
| < F1 > | DIRECT COMMANDS
Allows the exchange of the "PARAMETRIZATION" menu for the "DIRECT COMMANDS" menu described in section 5.4.2. |
| < F2 > | to < F6 > and < ^F2 > to < ^F6 >
These keys provide access to different parameter groups. The "^" symbol indicates that the < CTRL > key and the function key must be pressed together. |
| < F7 > | ETC
Allows the display of the other possible choices for the menu. |
| < F8 > | SAVE
Allows the transfer of the parameters' current values of the ST1 digital motion controller in its EEPROM parameter memory, thereby defining the new user's initial values which will be taken into consideration at each new start-up. |
| < F9 > | CONNECTION or ADDRESS
Allows the re-establishment of the communication with the ST1 digital motion controller (if communicating via the test card, or the changing of address if communicating via the parallel LIO or LS card). |
| < F10 > | STOP
Sends a "STOP" command to the ST1 digital motion controller. |
| < ^F10 > | PWROFF
Sends a "PWROFF" command to the ST1 digital motion controller. The "^" symbol indicates that the < CTRL > key and the function key must be pressed together. |
| < ESC > | Return to the preceding menu. |

5.4.2 Direct commands

This program is accessed from the "PARAMETERS SET UP" or "SEQUENCER PROGRAMMING" menus by pressing the < F1 > function key.

This choice is used to establish a direct connection with the ST1 digital motion controller and send direct commands to the ST1. The following menu is obtained :

<div>Release : 548*</div> <div>Axis no. : 1</div>	<div>Status</div> <div>A : 1000'0000</div> <div>B : 1000'0000</div> <div>C : 0000'0000</div> <div>D : 0000'0001</div>	<div>In/Out</div> <div>I 7-0 0000'0000</div> <div>I15-8 0000'0000</div> <div>O 7-0 1010'0000</div>	<div>Direct commands</div> <div>PWROFF</div> <div>PWRONS</div> <div>ERUN 0</div> <div>ERUN 1000</div> <div>ERUN -1000</div> <div>STOP</div> <div>ASKVAR URES</div> <div>RESSTS</div>
---	---	--	--

F1-Read status	F3-Scan variable(s)	F5-Zoom	F10-"STOP"
F2-Scanning status	F4-Analyse	F9-Link again	^F10-"PWROFF"

Fig. 12 : Direct commands

The role of the function keys is as follows :

< F1 > READING STATUS

Displays the actual state of STATUS (and of the inputs and outputs of the parallel LIO interface card, if necessary).

< F2 > SCANNING STATUS

Requests and displays continuously the state of STATUS (and the inputs and outputs of the parallel LIO interface card, if necessary).

< F3 > SCANNING VARIABLE(S)

Requests and displays continuously the state of the parameters and variables related to the instructions.

< F4 > ANALYZE VARIABLE

Graph on the displays the state of a variable.

< F5 > ZOOM VARIABLE

Zoom the amplitude of the ANALYZED variable.

< F9 > CONNECTION OR ADDRESS

Allows the re-establishment of the communication with the ST1 digital motion controller if communication is via the test card, or the changing of the address if one communicates via the parallel LIO or LS interface card.

- < F10 > STOP
Sends the "STOP" command to the ST1 digital motion controller.
- < ^F10 > PWROFF
Sends "PWROFF" command to the ST1 digital motion controller. The " ^ " symbol indicates that the < CTRL > key and the function key should be pressed together.
- < ESC > Return to the preceding menu.

This program is used to give the direct commands to the ST1 digital motion controller. It is thus possible to enable the power bridge, to command various moves, to display the state of several parameters or variables, etc. In addition, the status is displayed as well as the state of the inputs and outputs of the parallel LIO card, if used.

It is possible to send any values from this menu to the ST1 digital motion controller without carrying out any test.

One choice of commands is suggested. The up/down cursor allows the selection of either line. The selected line can be modified using the keyboard.

The commands are executed by editing or selecting an instruction and then pressing the < CR > key. Each instruction includes a mnemonic code, *possibly followed by data entered in numerical form*. Please see the reference manual "Software for ST1 digital motion controller" doc. no. 024.8008 for the structure of these instructions. All instructions describing a value to a data are entered under following form :

	INST	address	data
Example :	SETPAR	CVP	1000
	SETOUT	>D000	10

The variable and parameter addresses can also be entered by their mnemonic codes. All the mnemonic codes can be entered either in upper or lower case characters.

When the command corresponds to a numerical value question (variable or parameter) of the ST1 digital motion controller, the answer is fully displayed on the right.

5.4.3 Macro parameters and macro variables :

Certain values are processed by the ST1 digital motion controller in double precision. For example, the reference speed corresponds to the VIREFB (most significant) and VIREFA (least significant) variables. The direct command program allows in such cases the display or change of a value by using one of the following mnemonic codes :

Variable **PHI** Measured angular position PHIB/PHIA.

Variable **PHIRE** Measured angular speed position PHIREB/PHIREA.

Variable **PMAS** Measured master position PMASYTB/PMASTA

Variable **PMUS** Measured converted position PMUSC/PMUSB.

Variable **PCOR** Set position offset PCORC/PCORB.

Variable **INTV** Measured integral velocity INTVC/INTVB.

Variable **VIR** Measured angular speed VIRB/VIRA.

Variable **VIREF** Angular speed of the command VIREFB/VIREFA.

Variable **VGES** Gesvit speed VGESB/VGESA.

Variable **VMUS** Master converted speed VMUSB/VMUSA.

Parameter **CPL1H** Lift position stop CPL1HB/CPL1HA.

Parameter **CPL2H** Right position stop CPL2HB/CPL2HA.

Parameter **PERIM** Master perid PERIMC/PERIMB.

Parameter **PERIS** Slave perid PERISC/PERISB.

5.5 TRANSFER PARAMETERS <-> ST1

This menu allows the transfer of parameters files between the computer and the ST1 digital motion controller.

5.5.1 Load file parameters -> ST1

By default or choice <F2>

This choice allows the downloading of parameter files from the computer to the ST1 digital motion controller.

```
Release : 548*
Axis no. : 1
```

```
Load file parameters *.PST -> ST1

Enter file name : C:\APP_ST1\*.pst
```

```
F2-Load *.PST
F3-Save -> *.PST
```

```
F10-"STOP"
F9-Link again ^F10-"PWROFF"
```

Fig. 13 : Load file parameter -> ST1

All files with the ".PST" extension can be downloaded as long as they are part of the working DOS path. See sections 3. 2 and 5.9

The list of all the available parameter files appears by merely pressing the < CR > key. The desired file can then be selected with the help of the cursor commands and the < CR > key.

The file name can also be entered by using the keyboard. The downloading is initiated by pressing the < CR > key once.

5.5.2 Load motor library file-> ST1

Proceed as described in section 5.5.1, but replace the ".PST" by an ".MST" extension to select the proper library and then the motor file.

In that case, the parameter COUMA is set to nominal torque. The KPOS and KVIT controller parameters are proposed taking only motor inertia into account.

5.5.3 Save ST1 parameters -> file *.PST

Choice <F3>

This choice allows the uploading of all the parameters of an ST1 digital motion controller to the computer.

```
Release : 548*  
Axis no. : 1
```

```
===== Save ST1 parameters -> file *.PST =====  
  
Enter file name : C:\APP_ST1\*.pst
```

F2-Load *.PST
F3-Save -> *.PST

F10-"STOP"
F9-Link again ^F10-"PWROFF"

Fig. 14 : Save ST1 parameters -> computer file

It is possible to access all the files with the ".PST" extension as long as they are part of the working list. See sections 3.2 and .5.9.

The list of all the available parameter files appears by merely pressing the < CR> key. The desired file can then be selected with the help of the cursor commands and the < CR > key.

The file name can also be entered by using the keyboard. The uploading process starts by pressing the < CR > key once.

When an already existent file is modified in this manner, all the old values are replaced with the new ones. The old values are indicated within parentheses.

5.6 LOADING SOFTWARE FILE -> ST1

This choice allows the downloading of software (ST1-firmware) files from the computer to the ST1 digital motion controller.

```
Release : 548*  
Axis no. : 1
```

```
Loading software -> ST1 *.JED  
Enter file name : C:\APP_ST1\*.JED
```

```
F10-"STOP"  
F9-Link again ^F10-"PWROFF"
```

Fig. 15 : Loading software file to ST1

Such a transfer is possible as soon as all following conditions are met:

- The ST1's article number includes an up-grade index "B" or newer (example : 024.7715.B)
- The ST1 is fitted with the "software downloading" option (art. 024.7109). Thus, the parameter memory type is X2864 (and not X2804) and the tag of the program memory shows VB001 .. VB005,..(and not V0001,V0002,..)
- The software release which is to be downloaded supports this feature. Consult the latest listing of available softwares (art. 024.8072)

All files with the ".JED" extension can be downloaded.

The list of all the available software files appears by merely pressing the < CR > key.
The desired file can be selected with the help of the cursor commands and the < CR > key.

The file name can also be entered by using the keyboard. The downloading is initiated by pressing the < CR > key once.

Once the software has been loaded, it may be necessary to re-configure the PC to ST1 communication (section 5.9).

5.7 TRANSFER CAM PROFIL <-> ST1

This menu allows the transfer of cam profil files from the computer and the ST1 digital motion controller. It provides also for conversion of spreadsheet - standard *.CSV files into *.CAM files.

Upon this selection the following appears:

Release : 548*
Axis no. : 1

===== Load cam file *.CAM -> ST1 =====

Enter file name : C:\APP_ST1*.cam

F1-Offset cam [RU]	F3-Save cam ST1	F10-"STOP"
F2-Load *.CAM	F4-Import *.CSV	F9-Link again ^F10-"PWROFF"

Fig. 16 : Load CAM file

<F1> OFFSET CAM

Compute the length of the CAM (in RU) with the cam parameters definition

<F2> LOAD FILE CAM

Load cam file *.CAM from the computer to the ST1 digital motion controller. This choice is only possible when the interface card is of type LIO.

<F3> SAVE FILE CAM

Copies the contents of the cam memory of the ST1 into the computer index.

<F4> IMPORT *.CSV

Convert *.CSV files (Standard spreadsheet as created by EXCEL, etc) to *.CAM files for downloading into the ST1. Follow the instructions which appears on the screen.

```
===== Import cam file *.CSV (Excel, etc.) =====  
  
Enter source file name      *.CSV : C:\APP_ST1\WAGON\CAM\P180-180.CSV  
Enter destination file name *.CAM : C:\APP_ST1\WAGON\CAM\P180-180.CAM  
  
Enter column number        (A) : h  
Enter first line number    (1) : 40  
Enter last line number     (1024) : 1024  
Enter cam start adress     (0) : 0  
Enter CRCAM factor         (1) : 16  
Do you want to compress file [Y/N] : N
```

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Fig. 17 : Convert *.CSV file to *.CAM file

5.8. SEQUENCER PROGRAMMING

This choice is only possible when the interface card is of type LIO. It is used for editing and adjusting a sequencer program.

Version	: 548*
No. axe	: 1

Programmation séquenceur	
Entrez le numéro de pas de programme :	>0

F1-Commandes directes	F3-Créer fichier	F5-Pointeur = ?	F10-"STOP"
F2-Transfert -> ST1	F4-Editer	F9-Rétablir lien	F10-"PWROFF"

Fig. 18 : Sequencer programming

The role of the function keys is as follows :

- < F1 > DIRECT COMMANDS
Allows the exchange of the "PARAMETER SET UP" menu for the "DIRECT COMMANDS" menu described in section 5.4.2.
- < F2 > LOAD FILE INDEX
Transfers a sequencer file from the computer to the ST1 digital motion controller. The procedure is the same as for the parameter file ".AUT".
- < F3 > CREATE FILE INDEX
Copies the contents of the sequencer memory of the ST1 digital motion controller into the computer file index. The procedure is the same as for the parameter file transfer described in section 5.4.1 However, the extension is ".AUT". Any existent files with the same name is destroyed.
- < F4 > EDIT
This choice allows the editing or modifying of a sequencer file at the computer level without affecting the ST1 digital motion controller. See section 5 for additional details. After having selected < F4 >, the file name should be entered using the keyboard. A new menu appears then :
 - < F1 > HELP
List of editing functions.
 - < F2 > SAVING ON THE DISK
Saves the edited file on the disk and exits the editor.

< F3 > QUIT

Allows exit from the editor without transferring the changes to the disk. It still asks the question regarding saving if the file has been modified.

< F5 > POINTER = ?

Displays on the screen the instantaneous value of the ST1 digital motion controller pointer, corresponding to the last executed sequence step.

< F9 > CONNECTION OR ADDRESS

Allows the reestablishment of the communication with the ST1 digital motion controller if communication is via the test card, or the changing of the address if one communicates via the parallel LIO or LS interface card.

< F10 > STOP

Sends the "STOP" command to the ST1 digital motion controller.

< ^F10 > PWROFF

Sends "PWROFF" command to the ST1 digital motion controller. The " ^ " symbol indicates that the < CTRL > key and the function key should be pressed together.

< ESC > Return to the preceding menu.

Program steps:

A number of program steps can be entered using the keyboard. After pressing the < CR > key, the "MODIFY SEQUENCE" window appears, showing the content of the step chosen, just as it is memorized in the ST1 digital motion controller. A new menu then appears :

Release : 548*		Content of sequencer			
Axis no. : 1		>0 = PWROFF	>0	>FFFC	>0000
		>1 = STOP	>0	>FFFC	>0000
		>2 = WSTATA	>800	>FFFC	>0000
		>3 = RESSTS	>0	>FFFC	>0000
		>4 = END	>0	>FFFC	>0103
		>5 = SFF	>FFFFFF	>FFFF	>FFFF
		>6 = SFF	>FFFFFF	>FFFF	>FFFF
		>7 = SFF	>FFFFFF	>FFFF	>FFFF
		>8 = SFF	>FFFFFF	>FFFF	>FFFF
		>9 = SFF	>FFFFFF	>FFFF	>FFFF
		>A = SFF	>FFFFFF	>FFFF	>FFFF
		>B = SFF	>FFFFFF	>FFFF	>FFFF
		>C = SFF	>FFFFFF	>FFFF	>FFFF
		>D = SFF	>FFFFFF	>FFFF	>FFFF
		>E = SFF	>FFFFFF	>FFFF	>FFFF
		>F = SFF	>FFFFFF	>FFFF	>FFFF

F1-Clear screen	F2-Clear memory	F10-"STOP"
↑ ↓ PgUp PgDn -Used for moves	F9-Link again	^F10-"PWROFF"

Fig. 19 : Sequencer contents

The up/down cursor keys allow movement from one program step to another.

By pressing the left/right cursor keys it is possible to change the selected program step. Changes entered in this manner is saved in the sequencer memory location in the ST1 digital motion controller.

- < F1 > ERASE SCREEN
Erases the window display.
- < F2 > ERASE SEQUENCER
Erases the sequencer memory in the ST1 digital motion controller.
- < F9 > CONNECTION OR ADDRESS
Allows the reestablishment of the communication with the ST1 digital motion controller if communication is via the test card, or the changing of the address if one communicates via the parallel LIO or LS interface card.
- < F10 > STOP
Sends the "STOP" command to the ST1 digital motion controller.
- < ^F10 > PWROFF
Sends "PWROFF" command to the ST1 digital motion controller. The " ^ " symbol indicates that the < CTRL > key and the function key should be pressed together.
- < ESC > Return to the preceding menu.

5.9 CONFIGURATION

This choice permits the modification of the computer configuration for the use of the ST1-
EXPERT program.

The role of the function keys is as follows :

< F1 > LINK

Allow selection of the type of connection with the ST1 digital motion controller, as well as the characteristics of this connection. When the response has been given to all the questions, the program tries to establish the connection.

A new menu appears then :

```

Configuration Link
Connection via      [1]=Test device    [2]=Linking board : 2
Protocol format     [1]=Fixed binary   [2]=Optimum binary : 1
ST1 address                                     [1..254] : 1
Which port do you want to initialize           [1] [2] : 1
Enter the delay for transmission                [0 .. 100ms] : 2
Enter Baud rate                                     [110..9600] : 9600
Select parity                                     [0]=No [1]=Odd [2]=Even : 1
Select bit-number                                     [7] [8] : 8
Select number of stop bits                         [1] [2] : 1
Enter "ENDBYT" code                               [0..255] : 0

```

Press RESET on ST1 and [CR] on keyboard

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Fig. 20 : Configuration connection

< F2 > DIRECTORY

Allows one to change the choice of working list. This command also permits one to change the disk drive in use.

< F3 > SCREEN DEFINITION

Allows one to adjust the ST1-EXPERT program to different types of screens.

< F4 > NUMERICAL BASE

Allows one to modify the numerical base. The decimal base is the base by default.

< F5 > LANGUAGE CHOICE

Allows one to change the language of the text appearing on the screen (except when assisting the parametrization through artificial intelligence) .

< F6 > PARAMETERS' FAMILY

Allows one to choose the DOS file which defines the parameters' windows. The two possible choices are :

< 1 > Automatic selection

The best matching file will be selected at each new connection establishment, according to the actual ST1-configuration.

< 2 > Forced selection

The file is then to be selected. It never takes the actual ST1-confirmation into account.

< F10 > SAVE TO DISK

Saves the current configuration on the disk, so that it will again be valid at the next start-up of the ST1-EXPERT program. The numerical base is not memorized. The decimal base is chosen by default at each start-up.

5.10 QUIT

This choice allows the return to the preceding menu.

6. CREATION OF A SEQUENCER PROGRAM

The sequencer program files should have a name ending with the extension ".AUT". The editor included in this software (command < F4 > EDIT, see section 5.9) generates this extension automatically.

If the user so desires, he may use another editor. However, he should be certain that this other editor does not add any cache character.

The original disks of the ST1-EXPERT software include a test sequencer program with the name "EXEMPLE.AUT", listed in "SOCAEXP\ONLINE" (eventually defined in another directory at the installation).

When creating a sequencer program, a few rules must be followed in order to allow the compilation and the transfer to the ST1 digital motion controller. These rules are as follows :

- Each line should correspond to one program step of the sequencer or to one command (see below).
- Each line of the sequencer program step is in the following form :

(ppp =) instruction data INACTL INMASK comment.

With:

ppp Number of line steps, between 0 and 511, followed by the "=" symbol. This instruction is optional. If it is not indicated, the line number is incremented by 1 in comparison with the preceding step, defaulting for the 0 value.

instruction

Mnemonic code of the instruction should be executed at this program step. All the usable instructions are described in the reference manual of the sequencer. The mnemonic codes may be entered either in upper case or lower case characters.

data Data(s) following certain instructions. For example: desired speed, waiting period, etc. When the instruction does not require any data, it is nevertheless necessary to enter a value, for example 0.

Example : ERUN -1000 INACTL INMASK

If the instruction is requiring an address and a data, please refer to the "General description of the ST1 digital motion controller" doc. no. 024.8004 in order to determinate the sequence of 3 data bytes and to enter them in compact form. It is preferable to enter this value in hexadecimal form.

Example :

SETPAR >A603F8 equivalent to instruction SETPAR CA1 1000
SETOUT >0AD000 equivalent to instruction SETOUT 10 >D000

INACTL

Mask defining the active state of the 16 inputs IN15 . . . IN0. For reasons of clarity, it is preferable to enter this value in binary form, or if necessary, in hexadecimal form.

INMASK

Validation mask of the 16 inputs IN15 . . . IN0. For reasons of clarity, it is preferable to enter this value in binary form, or if necessary, in hexadecimal form.

comment

The rest of the line may be used for a comment; it is not necessary to insert a " ; ".

As a complement to the program steps of the sequencer, commands can also be entered affecting the compilation or causing the further loading of parameters whose values are read to the sequencer. The commands available are as follows :

ORG xxxx

Determines the origin of the program steps, with :

xxxx = IN0 . IN15 to define the origins of the inputs IN0 to IN15

Example : ORG IN8 defines the instruction pointer at step 128
 xxxx = \$E000 to define the exact address of the sequencer memory

BASE yyyy

Has to be entered *imperatively* at the beginning of the sequencer program to determine the numerical base in which the values appearing in the program are defined by default.

yyyy = DEC to define the decimal base

yyyy = HEXA to define the decimal base

Example : Base HEXA selects the hexadecimal base

SET mmmm vvvv

Example : SET CINACL 1111'1111'1111'1100
 SET CINMAS 0000'0000'0000'0101

Has to be used *imperatively* at the beginning of the sequencer program to define the initial values of the input masks (parameter CINACL and CINMAS). When transferred in the ST1 digital motion controller these values enter into the parameter memory.

7. TROUBLE SHOOTING

7.1 DIFFICULTIES WITH THE PARAMETRIZATION ASSISTANCE

After having pressed the < CR > key, nothing happens :

Certain calculations take a long time, especially when the computer is of a slow model. The word "active" should appear occasionally in the upper right corner. When uncertain, press again the < CR > key and wait at least 10 seconds.

The indication "Out of memory" appears superimposed :

The available computer memory is insufficient. See section 2.1.

Certain parameters are not calculated :

The suitability of a software like ST1-EXPERT for a product like the ST1 digital motion controller which is under constant development cannot always be guaranteed. It is nevertheless possible that a more recent version of this software is available from SOCAPEL SA.

The parameters corresponding to new functions which may not be determined by the parametrization assistance programs can always be entered manually when there is a dialog with the ST1 digital motion controller.

7.2 WIRING DIFFICULTIES

The cable plug cannot be connected to the computer :

Check that the cable is of the correct type. See sections 2.2.1 and following.

Note: the connectors at both ends are not identical.

Check that the computer actually has an adequate serial connection port. If necessary, use the 9 to 25 pole adaptor.

The cable is too short :

The RS232 connection cable may be extended, if necessary, with respect to the diagrams in sections 2.2.1 and following, including shielding. Beyond 15 meters, the problems inherent in the standard RS232 may appear.

7.3 CONNECTION DIFFICULTIES

The connection with the ST1 cannot be established :

In certain cases, the computer displays an error message which is sufficiently explicit.

Check that each response to the "CONFIGURATION-CONNECTION" menu is correct :

- Is it the correct interface board ?
- Does the dialog choice for the test card or for the interface board correspond to the ST1 side wiring ?
- Do the transmission characteristics correspond to these parameters of the ST1 digital motion controller ? When the connection is established via the test card, there are only two types of connection characteristics :
 - 9600 Baud, 8 bits + 1 stop bit, odd parity.
(if the interface card is of type LIO).
 - 1200 Baud, 7 bits + 2 stop bits, odd parity.
(if the interface card is of type LS, LR or LA).

In certain cases, the connection via the LS or LIO interface card can be difficult to establish. This may be caused by the following :

- Since the connections via the interface board are multiplexed, does the address entered in the computer correspond to that of the ST1 digital motion controller ?
- Is the serial interface of the computer adapted to the standard corresponding to the interface board (RS232, RS485 or the 20 mA current loop) ?
- Are the intermediate adapters supplied correctly ?
- If the connection parameters memorized in the ST1 digital motion controller are not known with certainty, the recommendation is to first establish the connection via the test card, to ask these parameters and to correct them, if necessary.

The connection with the ST1 is disrupted :

In spite of all the measures taken, the ST1 digital motion controller causes electromagnetic disturbances which may disrupt the serial transmission, especially if it is a RS232 connection. These disturbances appear essentially after the enabling of the power bridge (PWRONS commands, etc.). In that case :

- Is the grounding of the installed equipment and the computer correct (is the ground actually connected between the various assemblies) ?
- The shielding of the RS232 connection cable should be connected to ground at both ends, producing a ground loop. Check the shielding.
- The grounding of the test cards for the ST1 digital motion controller have recently been improved. Is your test card actually the newer model, recognized by the yellowish color of its case and by its part number 024.7701.A or B ?
- The cache command < CTRL > <F10 > allows one to visualize from certain menus all the bytes sent and received by the computer, in the command.
- After downloading a new ST1 software, the connection might have to be re-configured. Some softwares implement indeed a "terminal emulation" instead of the "fixed frame" protocole.

7.4 FILE ACCESS DIFFICULTIES***The parameter and sequencer files are unobtainable :***

The ST1-EXPERT software allows the placement of these files in any directory, and even in another disk drive. Verify, using the "CONFIGURATION - LIST" menu, that the working directory is indicated correctly.

A computer maneuver error may be the cause of the problem. Verify by means of the usual DOS commands that the files are actually in the directory shown and that they are neither "cached" nor write protected.

7.5 UNKNOWN MNEMONIC CODES

The adequacy of a software like the ST1-EXPERT for a product like the ST1 digital motion controller which is under constant development cannot always be guaranteed. It is nevertheless possible that a more recent version of this software is available from SOCAPEL SA.

The mnemonic codes of the instructions, parameters or variables may always be entered in a numerical form as follows :

\$cc data

With :

\$ Signalises an input in numerical form

cc Instruction code *in hexadecimal base*

data See paragraph 5.

Examples :

\$01 0 equivalent of instruction "NOOP"

\$3A 38060:h equivalent of instruction "SETPAR CURES 600:h" or
 CURES = 38:h.

\$09 -1000 equivalent of instruction "ERUN -1000", or - 1000
 is given in decimal base.

The codes in use are defined in the various descriptions of the ST1 digital motion controller. They are also given in the document pertaining to each ST1 software version.

7.6 FILE PRINTING DIFFICULTIES

In case of printing difficulties, the configuration of the computer and the printer should be checked independent of the ST1-EXPERT software.

If necessary, the printing of the file may be started with the DOS command.

Example : PRINT C:\EXEMPLE.AUT

7.7 MESSAGES ON THE SCREEN ARE NOT CLEARLY VISIBLE

The "CONFIGURATION - SCREEN" menu allows the modification of the adaptation of the ST1-EXPERT software to the screen type being used.