



SEQUENCED FASTENING PROCESS

Manual no.: 6159932780-00

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WARNING

With a view to constantly improving its products, GEORGES RENAULT reserves the right to introduce all the changes as it may deem necessary to the products described herein, without prior notice.

This document includes important notes relating to safety. These are mentioned as follows:



Safety note

This document also includes essential instructions to use the product as well as general information. These are mentioned as follows:



Essential instruction



General information



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1 - INTRODUCTION

This manual explains how to use the SFP software (Sequenced Fastening Process)

The software is designed to be used with the TWINCVI controllers.

This application offers a complement to the use of the controller and allows the operator to run several fastening sequences at various torques:

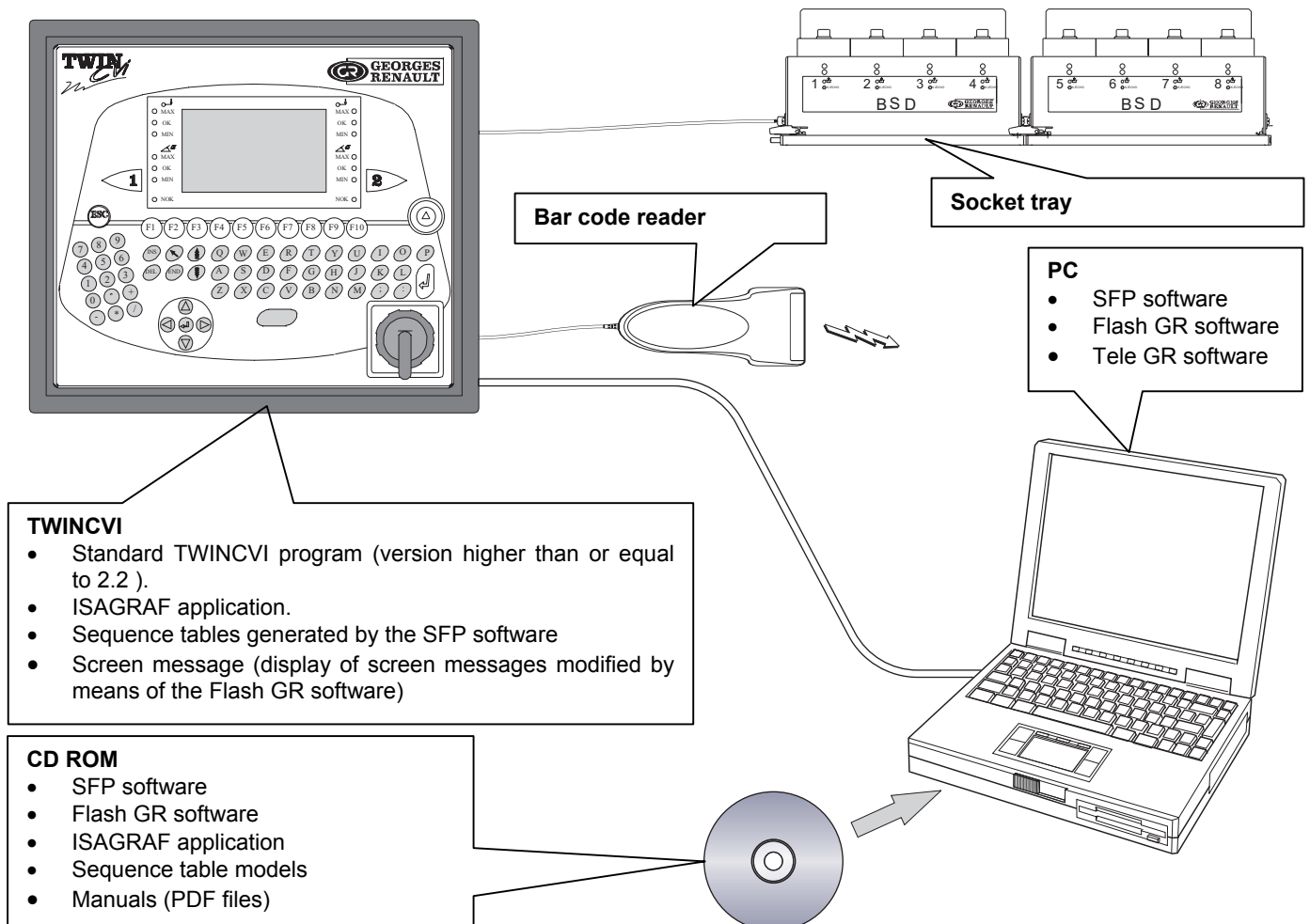
- screws of various sizes on the same component.
- when several components are to be assembled by the same operator at various torque values.
- Rework stations
- Flexible fastening stations with many fastening points at various torques. They must be performed by one operator running 1 or 2 tools according to the torque range to be covered (both tools can operate in synchronous or asynchronous mode).

The SFP software allows you to:

- Create tables with various structures
- Enter or change parameters
- Download these tables to the TWINCVI

The software can equally operate on all platforms higher than WINDOWS 95

2 - DESCRIPTION





The application is designed as an IsaGRAF program installed in the tightening controller with a PC-based SFP program



As soon as the application is installed, it is systematically run by the controller
The controller is standard again once the application is erased.

A sequence table generated by the SFP software is downloaded to the controller by the user. The tables are downloaded to the TWINCVI via the same network as the network used by the CVIPC 2000 software. As a result, the SFP and CVIPC 2000 programs can be installed on the same PC.

To start a sequence, a code must be received by the system.
This code is of the alphanumeric type; it can be:

- keyed in manually using the TWINCVI keyboard
- read by a bar code reader
- or sent via a ground network.

The system runs the programmed fastening sequence.

When the sequence is over, the system waits until it receives a new code to start a new sequence.

The following options are available:

- associate the selection of cycles with the selection of sockets, using a socket tray. In this case, the fastening task can be performed only if the operator picks up the socket indicated by the blinking lamp on the socket tray.



In synchronous mode (using two spindles simultaneously), the socket tray is managed differently. Only one socket tray can be connected to the TWINCVI which is used to control spindle 1 only. In this case, the operator is assumed to pick up from another socket tray (not connected to the TWINCVI) the same socket as on the socket tray connected to the TWINCVI.

- start a step of the sequence by reading a bar code.
- display a message for the operator who must validate his/her action to go to the next step of the sequence (using the FlashGR software).
- skip a step of the sequence if it is not possible or necessary to run it.

The language selection is linked to the language selection in the SERVICE \ LANGUAGE menu of the TWINCVI:

- French when French is selected
- English when any other language is selected.

3 - PHASES TO IMPLEMENT THE SFP APPLICATION

To make the SFP software operational, it is necessary to:

1. Connect the TWINCVI to the PC
2. Download the ISAGRAF application to the TWINCVI tightening controller
3. Install the SFP software on the PC.
4. Create the cycle sequences with the SFP software.
5. Transfer the cycle sequences to the tightening controller.
6. Program the parameters of the tightening controller (cycles, station and peripheral menus).
7. Connect the various peripherals to the tightening controller.



4 - DOWNLOADING THE ISAGRAF APPLICATION TO THE TWINCVI

Connect the TWINCVI RSPC connector to the COM1 port on the PC via PC cable PN 615 917 0470

The application can be installed in two different ways: either from a diskette containing the "teleGR" object program or from the "FlashGR" software.



The TWINCVI must contain a software version higher than or equal to 2.2 (for screen management).
The ISAGRAF application is protected by a dongle installed on the parallel port of the TWINCVI

4.1 - Downloading from the "teleGR" software

- With the TWINCVI controller switched off
- Click on Install
- Switch on the controller.
- A bar indicator shows the progression of the downloading of the application to the controller.
- As soon as the downloading is over, the controller is ready to receive the programming of the sequence of cycles.

4.2 - Downloading from the "FlashGR" software

- With the TWINCVI controller switched off
- Open the "FlashGR" software
- Click on the "Grafcet" button. Using the "Search" command, select one of the two files "ST1AS_#.x6m" (for asynchronous operation) or "ST_SY_#.x6m" (for synchronous operation). # corresponds to a letter which indicates the program version.

ST1AS_#.x6m program: This program controls a dual-spindle or single-spindle tightening controller, configured in asynchronous mode. This configuration allows the operator to connect two tools with complementary powers, in order to cover a wide torque range.

ST1AS_#.x6m program: This program controls a dual-spindle or single-spindle tightening controller, configured in synchronous mode. In this configuration, 2 spindles are used simultaneously.

- Open
- Validate
- Switch on the controller; the "Download" and "Upload" buttons are now active.
- Click on "Download"
- A bar indicator shows the progression of the downloading of the application to the controller (a few seconds).
- As soon as the downloading is over, the controller is ready to receive the programming of the sequence of cycles.



The name of the ISAGRAF application now appears in the bottom left-hand corner, *ST1AS_#* (for asynchronous operation), *ST_SY_#* (for synchronous operation).



5 - INSTALLING THE SFP SOFTWARE ON THE PC

5.1 - Hardware and Software Requirements

The computer should be PC type (Pentium 75 as a minimum) or compatible, with a RAM of 32Mo available as a minimum and a serial port.

5.2 - SFP Software Protection

The SFP software is freeware and can be duplicated on all the stations where its installation is necessary.

5.3 - Installation

The software is installed by means of the CD-ROM.

Insert CD-ROM D:\Sequenced Fastening Process\SFP programmable\SFP 2.4\DISK1 and click on Setup.exe.

Select the path for the software installation (by default C:\Program Files\GEORGES RENAULT\Sequenced Fastening Process) and follow the instructions to complete the installation.



If SFP is to be installed in Windows NT / Windows 2000, you shall use an administrator account. Using the Windows shortcuts, the SFP can be started in various directories. This allows you to define several station sites.

5.4 - Upgrading the Controller Software

Before upgrading the software, it is recommended to save all the data on adequate support.

5.5 - Upgrading the SFP Software

The SFP software can be updated by overwriting the former version.
Please contact us.



In Windows NT / Windows 2000, you do not need to use an administrator account for updating.

5.6 - Initiating the Program

Click on the Start menu in the Windows task bar, point the mouse to Programs and select the "Sequenced Fastening Process" program in the list. Click on "Sequenced Fastening Process" to start.



You can access to the menus/buttons directly from the keyboard (without using the mouse) by using the Alt key and the shortcut key (underlined letter of the menu or button).
The Tab key allows you to scroll forward through the menus/windows.
Pressing simultaneously the Shift+Tab keys allows you to scroll backward.

5.7 - Selecting a Language

You can change the language for the menus and dialog boxes by selecting it in the list.

To do so, go to the "Service" menu, then to the "change the language" menu. Two languages are available:

- French
- English

Select your language and validate.

6 - PROGRAMMING A SEQUENCE

A sequence means a sequence of tasks to be performed.

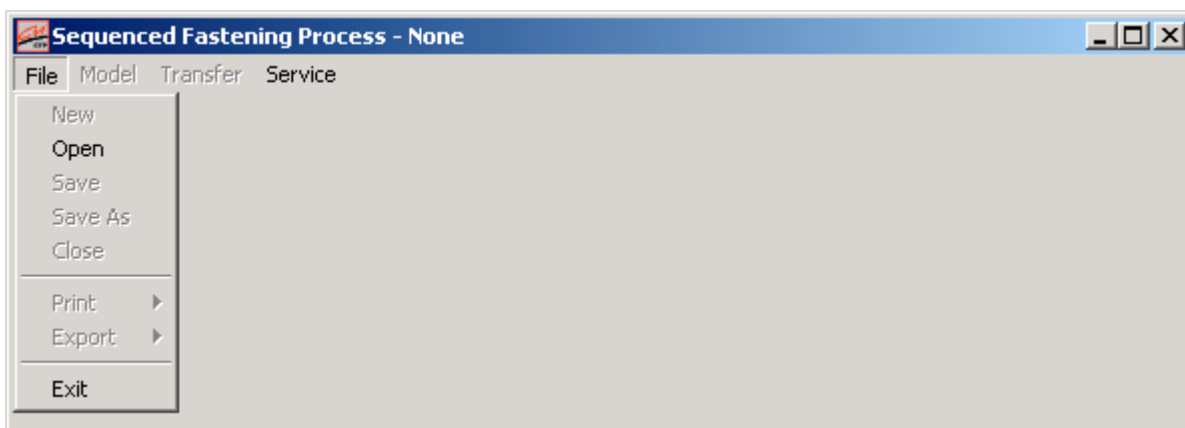
The application includes a "sequence model" directory. This directory contains table model files (file with grd extension). These files contain table models that you can copy and modify to suit your application.

Each new table created will be saved on the PC in a file of the "name of file.grd" type.

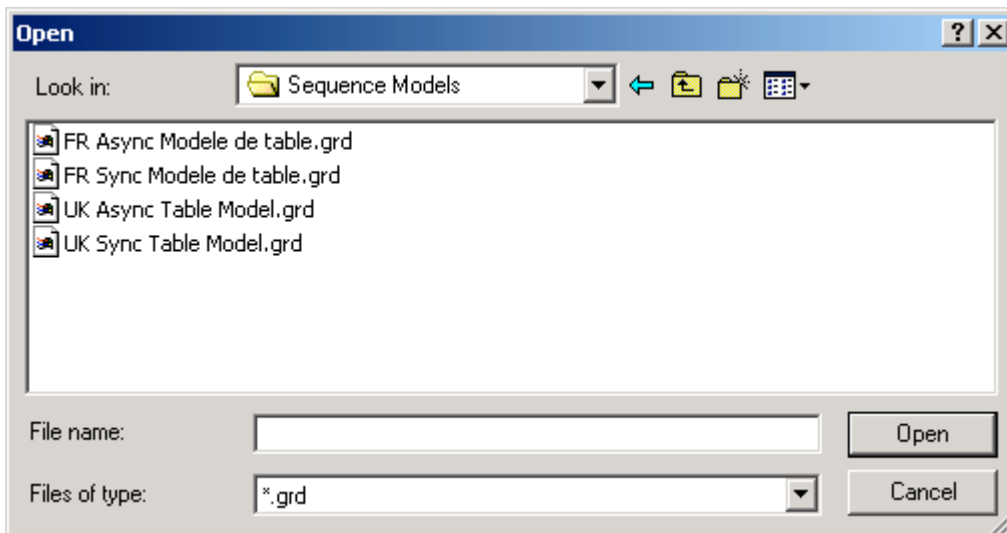


The "ISAGRAF" application downloaded to the TWINCVI can only operate with this file model.
The TWINCVI can contain up to 40 different sequences.
Each sequence can run up to 10 actions.

After starting the software, click on "File" then on "Open".



Select the Synchronous or Asynchronous table model, as well as the language of the model (FR: French, UK: English)



Double click on table model to open it or click on "Open".

Sequenced Fastening Process - \\Serveur_2000\D\Electronique\Sequenced Fastening Pr...

File Model Transfer Service

Station Name Table Standard
 Size of one model (bytes) 356
 First Address used 2000
 Last Address used 3067

Model Description
 Code 000001
 Variable Field

	N°	description	Status	Spindle	Cycle	Fixing	Socket	Barcode
Action 1	1	Pump1	0	1	1	3	1	000000
Action 2	2	Cover1	0	1	2	4	2	
Action 3	3	Bolt1	0	1	3	1	3	
Action 4	4	Pump2	0	2	1	3	1	000000
Action 5	5	Cover2	0	2	2	4	2	
Action 6	6	Bolt2	0	2	3	1	3	
Action 7	7		0	0	0	0	0	
Action 8	8		0	0	0	0	0	
Action 9	9		0	0	0	0	0	

Model 1 selected Available memory : 2000 - Used : 1068 - Remaining : 932

Before modifying the parameters of the table, you must unlock the model.

Sequenced Fastening Process - \\Serveur_2000\D\Electronique\Sequenced Fastening Pr...

File Model Transfer Service

Station Name
 Size of one model (byte)
 First Address used
 Last Address used

Change language
 Login
 Logout
 Change Password
 Clear CVI memory
 About

Go to the "Service" menu and click on the "Login" submenu

Please enter password

Enter password:

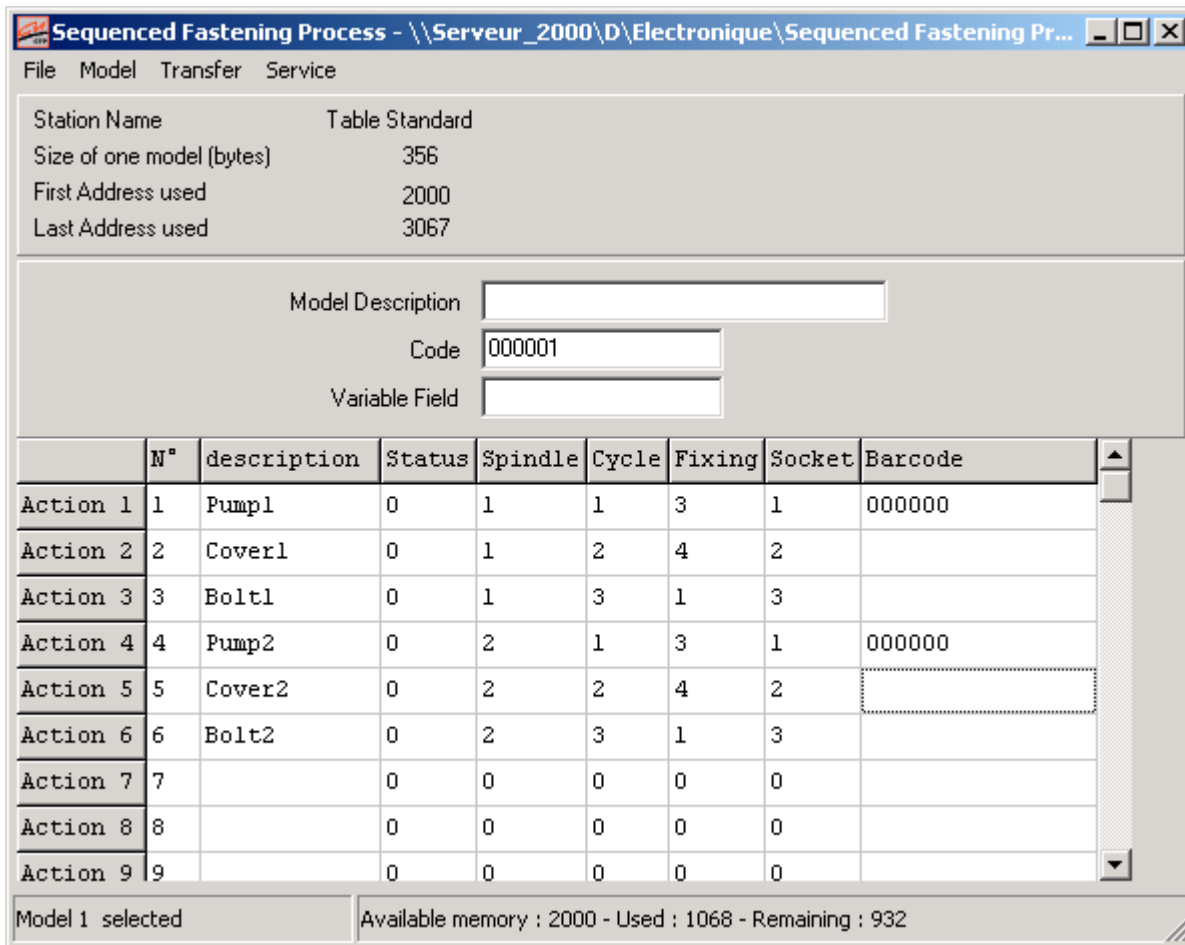
OK Cancel

Enter your password and click on OK (or press "Enter")



There is no password in the tables supplied with the software. Click on OK or press "Enter" to make changes.

6.1 - Description of a Model Sequence



	N°	description	Status	Spindle	Cycle	Fixing	Socket	Barcode
Action 1	1	Pump1	0	1	1	3	1	000000
Action 2	2	Cover1	0	1	2	4	2	
Action 3	3	Bolt1	0	1	3	1	3	
Action 4	4	Pump2	0	2	1	3	1	000000
Action 5	5	Cover2	0	2	2	4	2	
Action 6	6	Bolt2	0	2	3	1	3	
Action 7	7		0	0	0	0	0	
Action 8	8		0	0	0	0	0	
Action 9	9		0	0	0	0	0	

6.1.1 - Model Description

Optional comment for better identification of the sequence described in the table

6.1.2 - Code

Enter the code to be allocated to the model in the code field. This is the only way to allocate a table model to a code that characterizes the component to be assembled. The code shall not exceed 16 characters.

A bar code can include for example a serial number that can be different from one part to another. In this case, it can be interesting to enter the characters that are useful to select the sequence only, and replace the undesirable characters by #

6.1.3 - Variable Field

This is a free data capture field which allows you to enter a common parameter for a model, eliminating the need to create an additional column with the same value in all the lines. Its number of bytes can be programmed. For example, it can correspond to the maximum number of corrective actions allowed after a Reject RP. This parameter is an option; it is not active in this application.

6.1.4 - Action Number Column

This column is for information only. Do not enter data in this column. When not filled, it does not affect the operation of the system.



You shall only enter the actions that you want to perform (as in above example), in the table order, without leaving any action in blank. The program starts with action number 1 and finishes the sequence when finding an empty line.

6.1.5 - Description Column

This column includes a comment to help the operator understand the sequence; it should not exceed 12 characters.

On the TWINCVI control screen, only the first 4 characters of the comment are displayed for the operator.

On the screen which allows you to display the phase sequence of the table (F8), the 12 characters are displayed.

To inform the operator without performing any fastening action, enter the message in this field and leave all the other fields in blank.

Note that if the field is not completed, the operation of the system is not affected.

Editing a message: You can allocate an action from the table to a task that must be performed by the operator before running another action. For example, you can request in an action that a cylinder head gasket be placed, and in the next action, the cylinder head will be tightened. This prevents the operator from forgetting to put the gasket. To go from the empty action to the fastening action, the operator shall validate his/her task by pressing a push-button (or other) connected to the TWINCVI. To program this type of action, just enter the desired comment in the "description" field and leave all the other fields in blank. (To add messages for the operator, see section - 9.3 - in this manual)

6.1.6 - Status Column

This column is not to be completed. It is only used by the ISaGRAF program to save the status of actions. It can take several values:

"N" : to indicate that the action has not been performed (Not done).

"A" : to indicate that the action has been performed correctly (Accept).

"R" : to indicate that the action has been rejected manually by the operator (Reject).

"U" : to indicate that the action is under way (under way).

"0" : to indicate that the action should be totally omitted.

6.1.7 - Spindle Number Column

This column determines the spindle of the TWIN that should be used to perform the action; it must contain value 1 or 2 according to the desired spindle. Except for an empty action (message for the operator), another value will stop the sequence.



In synchronous mode, both spindles are used at the same time. Therefore, you cannot choose the spindle number.

6.1.8 - Cycle Number Column

This column determines the number of the cycle to be run. Its value must range between 1 and 31. Otherwise, except for an empty action (message for the operator), another value will stop the sequence.

6.1.9 - Fixing Column

This column determines the number of fastening tasks to be performed in this action. Its value must be different from 0. Except for an empty action (message for the operator), another value will stop the sequence.



6.1.10 - Socket Number Column

This column indicates which socket should be picked up from the socket tray by the operator. Its value must range from 0 to 16 (up to 4 socket trays can be controlled with the SFP software).

When the value is equal to 0, it means that no socket is used for this action; the program does not wait for the operator to pick up a socket before validating the fastening.

Except for an empty action (message for the operator), another value will stop the sequence.



In synchronous mode, the socket tray is managed differently. There is only one socket tray connected to the TWINCVI, which is used to control spindle 1 only. The operator is therefore assumed to pick up from another socket tray (not connected to the TWINCVI) the same socket as on the socket tray connected to the TWINCVI.

6.1.11 - Bar Code Column

This column indicates which bar code should be read to start the action. The maximum number of characters allowed for this bar code is 16. When no bar code is entered in this box, the program assumes that there is no reading to be performed.

This code can result from the reading of a bar code or a PLC. If no bar code can be read or no code can be received via a serial link, then the operator can enter the bar code manually in the TWINCVI. To do so, press the function key "F8" of the TWINCVI, type the bar code, and press the function key "F10" to validate.



A bar code can include for example a serial number that can be different from one part to another. In this case, it can be interesting to enter the characters that are useful to select the sequence only, and replace the undesirable characters by #.

If the code received, i.e. bar code, code from the PLC, or code entered manually, cannot be found in the table, an error message will automatically be displayed on the screen of the TWIN.

6.2 - Action Skip

If for one reason or another, the action cannot be performed (missing part, for example), then you can skip to the next action in the table by simply pressing a push-button (or other) connected to the TWIN. The action that has just been skipped will then be considered as rejected. With this functionality, you can return at any time to a rejected action. For example, if you are performing the last action in the table, and you reject action number 2, if you press the appropriate push-button, you will return automatically to action 2.



Warning: If you do not use this functionality, no stage can be skipped, even in the event of incorrect fastening.

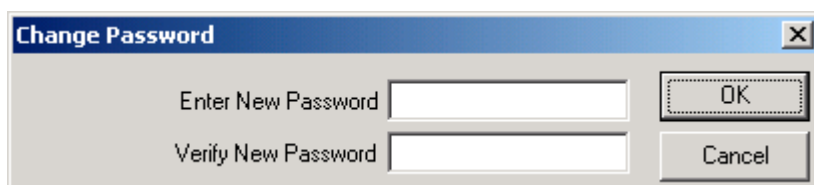
6.3 - Table Copy

A full copy of the table can be obtained by copying the file ("grd" extension) in the Windows explorer.

6.4 - Protection by Password

Access to the modifications of fastening sequences can be locked by entering a password:

Select the **"Service"** menu then the **"Change Password"** menu. Enter the same password twice, then validate.





When you receive the software, no password is entered. However, it is necessary to enter the "Login" menu to unlock access then press ENTER.



When a password has been stored, it is necessary to enter it to be allowed to modify the fastening sequences. Otherwise, you can only consult the sequence table.

The "Logout" menu allows you to lock the application again.

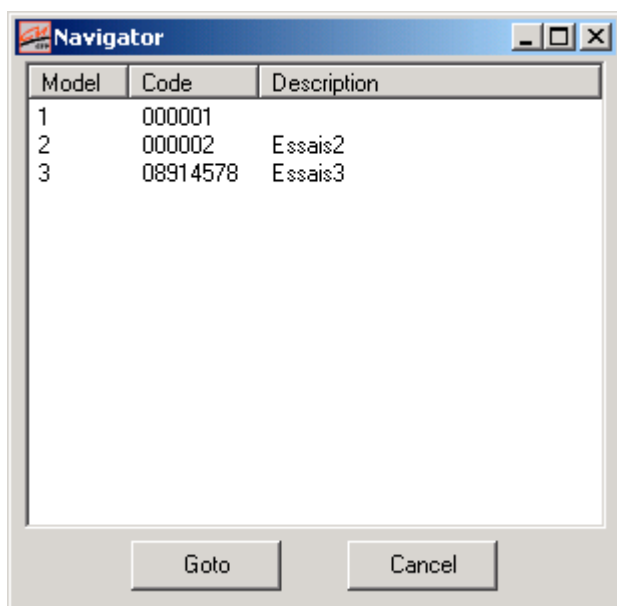
7 - SELECTING A SEQUENCE

In the same file, there can be several models. To go from one model to another, press "page up" or "page down" on the PC keyboard.

The "model" menu also allows you to select various sequences (models) by selecting:

- First model
- Next model
- Previous model
- Last model

When clicking on the "List Models" menu, the following window will be displayed: in this case, select the desired model and click on "see".



Select the desired model and click on "See".
This summary list allows you to display all models.



The sequence (model) number is displayed in the bottom left-hand corner of the screen.

7.1 - Creating a New Sequence

It is possible to add a new sequence (model) to the existing ones: go to the model menu and select "new model". Confirm the model no. then enter your parameters.

7.2 - Deleting a Sequence

It is possible to delete a sequence (model): display the model to be deleted, go to the "model" menu and select "delete model". Confirm.



7.3 - Copying a Sequence

It is possible to copy an existing sequence (model) and duplicate it. This function is interesting when two sequences are similar except for a few parameters.

Go to the "model" menu, select "Copy Model" and confirm the proposed model number.

Then select the new sequence and modify the parameters, starting with the code.



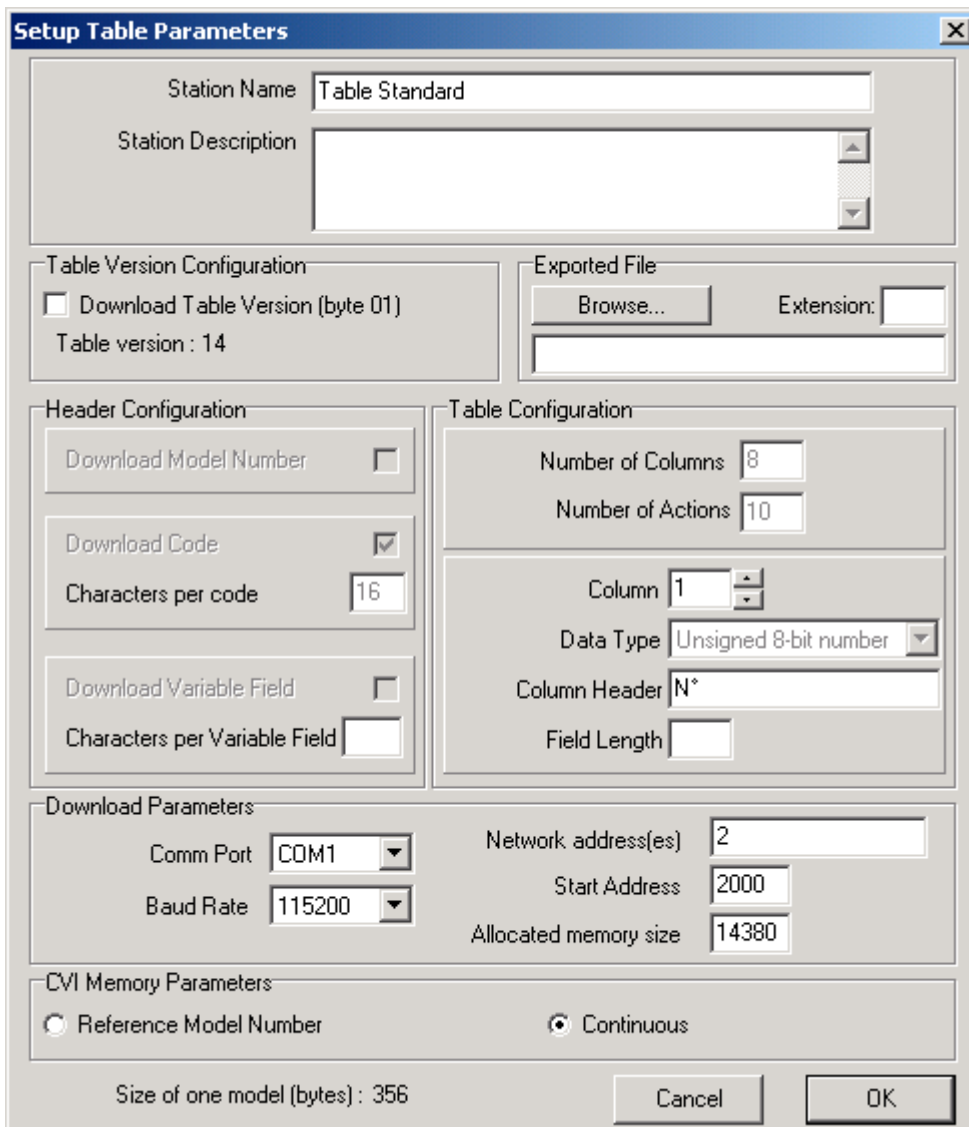
Two identical codes can cause faulty operation.

8 - DOWNLOADING

Once the sequence(s) has (have) been created, it is necessary to transfer them to the TWINCVI, so that the application can perform the data in the table. Conversely, it can be interesting to save the sequences which are in the TWIN controller. To do so, use the standard RSPC cable connected to the PC port of the TWINCVI. Before transferring the data, it is recommended to make sure that the "PC network" address and the communication parameters are identical between the PC (SFP software) and the TWINCVI.

8.1 - Communication Parameters

Select the "Models" menu, then "Update Descriptors". In the screen which is displayed (see below), modify the downloading parameters if necessary:



Setup Table Parameters

Station Name: Table Standard
 Station Description: [Empty]

Table Version Configuration
 Download Table Version (byte 01)
 Table version : 14

Exported File
 Browse... Extension: [Empty]

Header Configuration
 Download Model Number
 Download Code
 Characters per code: 16
 Download Variable Field
 Characters per Variable Field: [Empty]

Table Configuration
 Number of Columns: 8
 Number of Actions: 10
 Column: 1
 Data Type: Unsigned 8-bit number
 Column Header: N*
 Field Length: [Empty]

Download Parameters
 Comm Port: COM1
 Baud Rate: 115200
 Network address(es): 2
 Start Address: 2000
 Allocated memory size: 14380

CVI Memory Parameters
 Reference Model Number
 Continuous

Size of one model (bytes) : 356
 Cancel OK

- Serial port
- Baud rate
- Network address
- Start address = must be 2000.
- Allocated memory size = 14380 to be able to store up to 40 different sequences.

8.2 - Downloading from PC to TWIN

Select the "Transfer" menu, then "PC -> CVI" and validate. During the transfer, a progression bar indicates the downloading status.



Prior to any transfer, the TWINCVI must not be running a sequence. To make sure that no sequence is under way, it is preferable to switch off the controller, and then to switch it on again.

8.3 - Uploading from TWIN to PC

Select the "Transfer" menu, then "CVI -> PC" and validate. During the transfer, a progression bar indicates the uploading status.



The open table must have the same structure as the table that you want to import from the TWINCVI (the controller only contains data and is not capable to re-create the name of the various fields in the table).

9 - CONFIGURING THE TWINCVI

9.1 - Asynchronous Mode

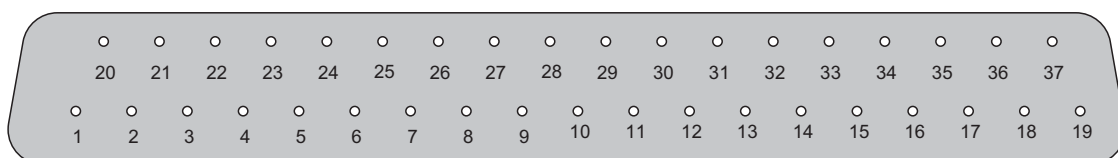
- Input / Output

Port 1 :

Input	Pin no.	Description
1	24	
2	25	
3	27	
4	29	
5	31	
6	32	Start cycle
7	33	Run reverse
8	34	N.C.
9	N.C.	Emergency stop
10	36	Reset
11	26	Error acknowledgement
12	28	Skip action
13	30	Validate empty action

Output	Pin no.	Description
1	15	
2	13	
3	11	
4	09	
5	08	
6	07	Accept spindle 1 report
7	06	Reject spindle 1 report
8	05	End all tightenings OK
9	03	In cycle
10	02	Ready
11	18	Reject spindle 2 report
12	19	Accept spindle 2 report

SubD 37 point contact socket (Controller side)



Port 2: Nothing to connect!

- Serial ports

RSA : station 1 bar code: RS232 ; 9600 bauds ; 8 bits ; 1 stop bit, no parity.

RSB: unused.

RSPC: Uploading to PC: RS232; 19200 bauds; 8 bits; 1 stop; no parity.

- Station parameter

Mode	Asynchronous
Torque unit	Nm
Cycle source	I/O
Spindle validation	I/O
Error acknowledgement	Available
SCY pulse	No
Correct spindle	No
Lock on Ncycle OK	No
Spindle validation in run reverse	Available

9.2 - Synchronous mode

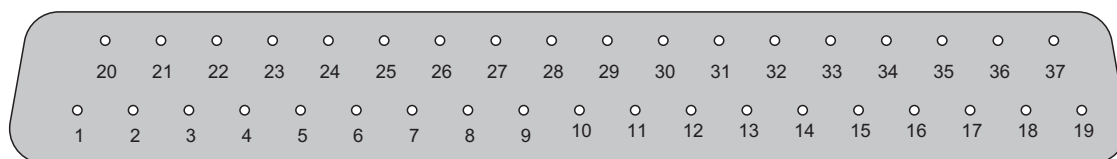
- Input / Output

Port 1 :

Input	Pin no.	Description
1	24	
2	25	
3	27	
4	29	
5	31	
6	32	Start cycle
7	33	Run Reverse
8	34	N.C.
9	N.C.	Emergency stop
10	36	Reset
11	26	Error acknowledgement
12	28	Skip action
13	30	Validate empty action

Output	Pin no.	Description
1	15	
2	13	
3	11	
4	09	
5	08	
6	07	Accept report 2 spindles.
7	06	Reject report 1 or 2 spindles.
8	05	End all tightenings OK
9	03	In cycle
10	02	Ready
11	18	Accept spindle 1 report
12	19	Accept spindle 2 report
13	14	Reject spindle 1 report
14	12	Reject spindle 2 report

SubD 37 point contact socket (Controller side)



Port 2: Nothing to connect!

- Serial ports

RSA : station 1 bar code: RS232; 9600 Bauds; 8 bits; 1 stop bit, no parity.

RSB: unused.

RSPC: Uploading to PC: RS232; 19200 bauds; 8 bits; 1 stop; no parity.

- Station Parameter

Mode	Synchronous
Torque unit	Nm
Cycle source	I/O
Spindle validation	I/O
Error acknowledgement	Available
SCY pulse	No
Correct spindle	No
Lock on Ncycle OK	No
Spindle validation in run reverse	Available

9.3 - Operator Messages



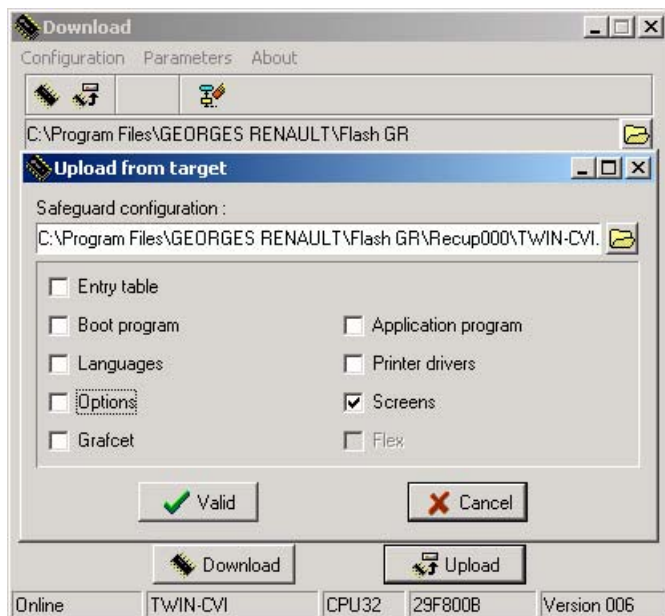
The TWINCVI must contain a software version higher than or equal to 2.2 (for screen management).

The application allows you to display messages for the operator:

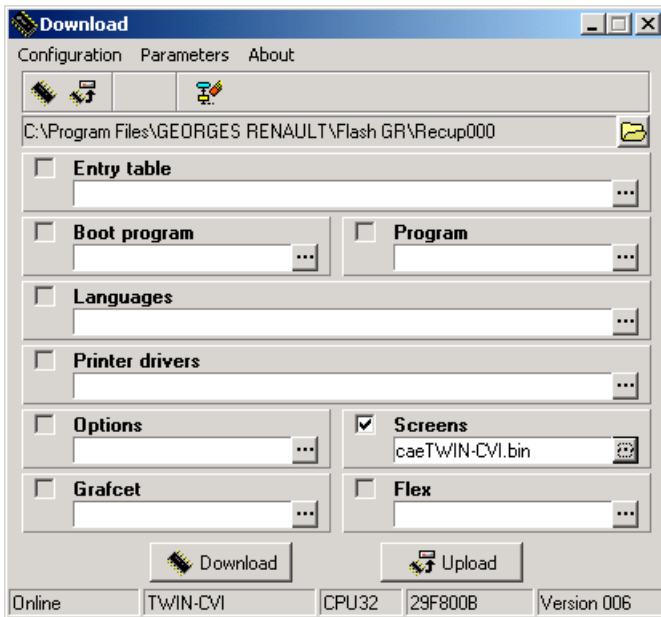
- About the fastening task to be performed (port 1 or port 2 according to the tool selected).
- About a specific action to be performed (systematically on port 1 since no tool is selected in this case).

The standard screen of the TWINCVI controller does not display these messages but it is possible to add them using the "FlashGR" software.

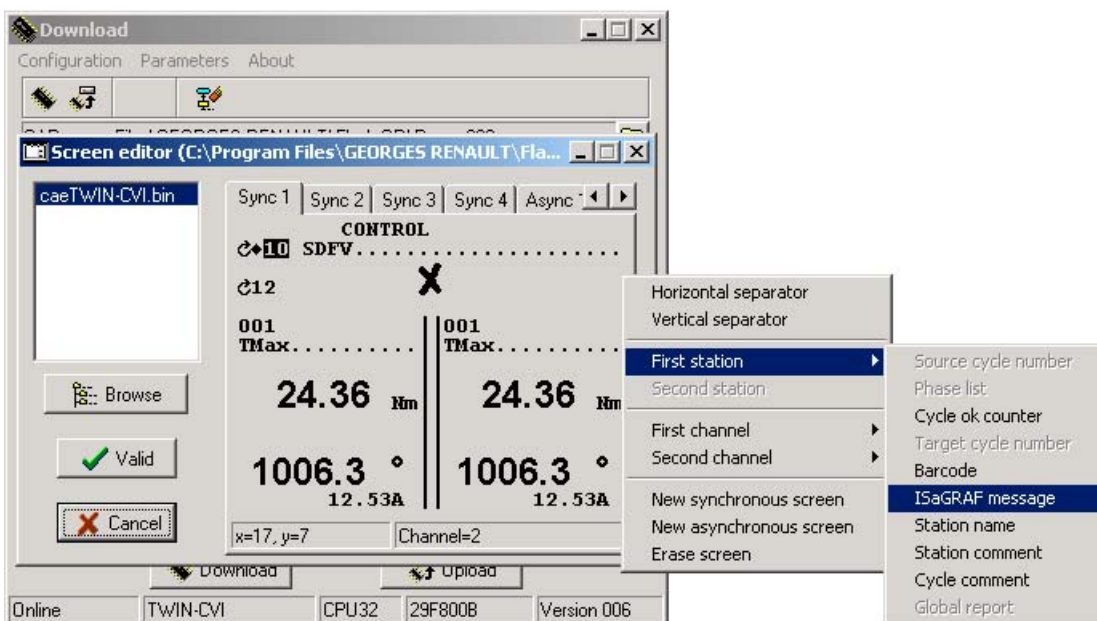
- Connect the PC port of the TWINCVI to the COM1 port of the PC.
- Open "FlashGR"
- Switch off the controller then switch it on; the "Download" and "Upload" buttons are now active.
- Click on "Upload"



- Check off the "Screens" option and validate. The following screen is displayed:



- Click on the "Screens" button

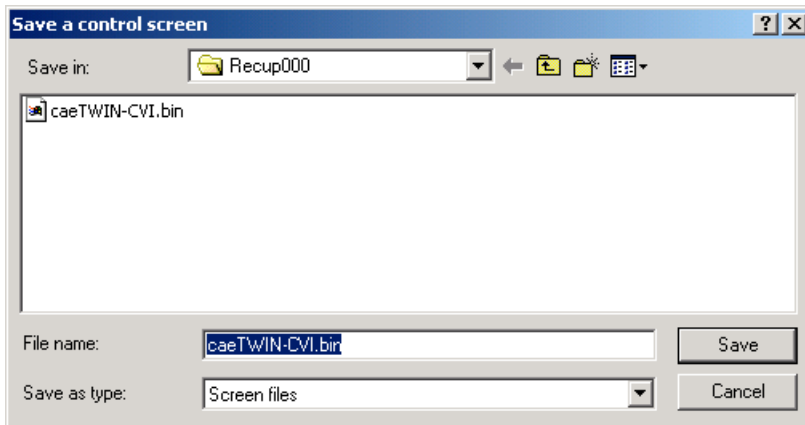


- Select the screen in which you want to display the message.



For asynchronous operation, select one of the 3 tabs "Async 1; Async 2; Async 3".
For synchronous operation, select one of the 3 other tabs "Sync 1; Sync 2; Sync 3".

- Click with the right-hand button of the mouse to display the option menus
- Select "First station" then "ISaGRAF Message" to insert the message linked to port 1.
- A message simulation is displayed on the screen. Position it in the desired place, in the area allocated to port 1.
- Repeat steps for port 2 if required
- After performing your modifications, click on "Validate".



- Determine the name of the new file and save it by clicking on "Save".



The name of the file must begin with the letters cae.
For example: cae rework.bin

- Click on "Download" to finish the operation by downloading this new screen option file to the TWINCVI.

10 - OPERATION

Once the sequence table has been downloaded to the TWINCVI and the various pieces of equipment connected to the TWINCVI (screwdrivers, socket tray, bar code reader, etc), the system is ready to operate.

To start a sequence, a code must be received by the system.

This code is of the alphanumerical type; it can be:

- keyed in manually using the TWINCVI keyboard
- read by a bar code reader
- or sent via a ground network.

The system runs the programmed fastening sequence.

When the sequence is over, the system waits until it receives a new code to start a new sequence.

At any time after receiving a known code, the operator can be informed of the sequence process status. When he/she presses the function key "F8" on the TWINCVI, the first three columns of each action in the table are displayed on the TWINCVI screen, i.e. action number, description and status. The 'status' column can take up 4 different values:

- Not done
- Accept
- Reject
- Under way



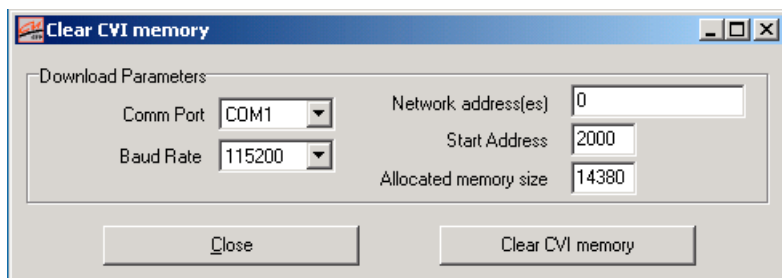
Example of what could be displayed with the sequence table as shown above:

Code: 01234567		
1	Pump 1	Accept
2	Cover 1	Reject
3	Screw 1	Under way
4	Pump 2	Not done

11 - BACK TO "STANDARD" TWINCVI

To go back to a standard TWINCVI controller, you must clear the "grafcet", i.e. the ISaGRAF application which runs the sequence of cycles. This first task is performed with the "FlashGR" software, using the "Clear grafcet" icon.

In other applications, it may be necessary to erase the sequence table when a lower sized table must be loaded. This function erases all the data from the start memory address and in all the memory area specified by the size. Select the "Service" menu, then "Clear CVI memory".



Complete the fields:

Serial port: COM1/.../COM10

Baud rate: 9600 – 115200 Bauds

Network address

Start address = must be 2000

Memory size = 14380 (for the application concerned).