

FOREWORD

The information contained in:

- **REFRIBASE, REFREPAIR, REFRIDIAG, REFRILEC, CHILREPAIR, HYDRAUREPAIR** and the **MANAGER Software**
- the "**REFRIBASE Manual**"
- the "**REFREPAIR Manual**"
- and this "**User's Manual**"

are liable to be amended without warning.

The organisation KOTZA INTERNATIONAL cannot be held responsible for any omissions, nor for any damage, accidental or otherwise, that results from the supply or use of its Software or any of its Manuals.



In this Manual, **the individual in possession of the password** (the supervisor, trainer etc.) will be referred to as: **THE SUPERVISOR**. Those individuals not in possession of the password (students, trainees, technicians, engineers etc.) will be referred to as: **THE USER**.

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All versions of the software have been registered with the Software Protection Agency since 1990.

The Software will only operate on a multimedia PC using Windows /2000 / XP / Vista or Seven. The PC should be configured to a *minimum* of 800 x 600 point mode with 65536 colours in small fonts and have an USB port.

In effect, the Software referred to in this Manual will not function on a PC if the corresponding demonstration version of the Software does not function on that PC.

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CONTENTS

GENERAL

About this Manual & Hardware Requirements	4
The components of each program	5
Installing the Software	6
Meaning of the key codes	10

THE MANAGER

General and Password for file access	11
Accessing Groups	12
Add, Rename or Remove a Group	13
Copy a Group	14
Accessing User names	15
Add a User	15
Rename or Remove a User	16
Allocate a password to a User	17
Configure at start-up	18
Examine the Results	18
Results in REFRIBASE, REFREPAIR, REFRILEC CHILREPAIR or HYDRAUREPAIR	19
Results in REFRIDIAG	21
Changing Password	23
Configuring the Software	24
Leaving the MANAGER	26

REFRIBASE, REFREPAIR, REFRIDIAG, REFRILEC, CHILREPAIR, HYDRAUREPAIR

Accessing the User Menu	26
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REFRIBASE

- Using and Duration of Training 28
- The Theme of Each Step 30

REFREPAIR

- Using and Duration of Training 31
- The Theme of Each Step 32

REFRIDIAG

- Using and Duration of Training 33
- Sequence of Repairs 34
- Repairs at Levels I and II 37
- Repairs at Level III 38
- Repairs at Level IV 39
- A list of the 46 Faults 40

REFRILEC

- Using and Duration of Training 41
- The Theme of Each Step 42

CHILREPAIR

- Using and Duration of Training 44
- The Theme of Each Step 45

HYDRAUREPAIR

- Using and Duration of Training 47
- The Theme of Each Steps 48

QUESTIONS / ANSWERS / FAQ

- Problems in installing and un-installing the Software 49
- Display problems** 51
- Error Messages** 54
- Problems with Viruses 56
- Password Problems** 56
- Various questions 59
- Possible Scores 60
- Meaning of the icons in the Groups and Users Windows 62
- Our other Software 63

ABOUT THIS MANUAL



This User's Manual is designed for use with REFRIBASE, REFREPAIR, REFRIDIAG, REFRILEC, CHILREPAIR, HYDRAUREPAIR and the MANAGER. It explains how to install, configure and use these programs. It should also provide answers to many of the questions that you might have concerning these products.

We have designed all the Software to be simple to use, even if you do not have typing skills, or extensive knowledge of computers. The instructions needed to run the Software have been reduced to a bare minimum, and will always be displayed on the screen.

Wherever there is any possibility that information might be lost, warning messages will allow the Supervisor to step in and prevent any errors being made, as long as any instructions are carefully observed.



WARNING: NONE OF THE SOFTWARE WILL FUNCTION PROPERLY UNLESS THE SECURITY KEY IS CORRECTLY INSTALLED.

If you wish to use any of the Software without reading any further, then turn to page 6 to learn about installation procedures.

HARDWARE REQUIREMENTS

Our Software has been developed on 100% PC compatible hardware (the most widely available type of equipment). This has been done to ensure that straightforward, trouble free operation of the programs should result with most of the hardware currently on the market.

However, the following is the **MINIMUM** specification of equipment required:

- **A 100% PC compatible system with at least 256Mb RAM and Windows 2000 / XP / Vista or Seven as the operating system.** A Pentium PC is recommended as a minimum specification to produce a reasonable display speed.
- A CD-ROM drive.
- An USB Port
- A hard disk with at least 200 Mb available memories *plus* memory equivalent to the available RAM.
- **An SVGA graphics card (800 x 600 points in 65536 colours) *plus* a colour monitor.**



If you have display problems refer to questions 4 and 5 on pages 52 & 53.

THE COMPONENTS OF EACH PROGRAM

EACH PROGRAM is made up of 4 main elements:

- 1) **This User's Manual**, for use by the Supervisor.
- 2) **Software on CD (REFRIBASE, REFREPAIR, REFRIDIAG, REFRILEC CHILREPAIR or / and HYDRAUREPAIR)** for use with **Windows 2000 / XP / Vista or Seven** that will enable Users (engineers, trainees, apprentices etc.) to develop their knowledge and then put it into practice.
- 3) **Software on CD (THE MANAGER)** which will provide the Supervisor with quantitative and qualitative information on the Users' progress.
- 4) **An USB Security Key** which will allow you to run the Software package(s) that you have purchased.



A Security Key for one or several Software will not enable you to use any other one. Only Software package(s) allowed by the key code can be used (see meaning of the key codes page 10).

- **With REFRIBASE:** The 266 pages REFRIBASE Technical Manual is essential if you wish to acquire a proper understanding of the operation, installation and repair of stand alone A/C units.
- **With REFREPAIR, REFRIDIAG, REFRILEC, CHILREPAIR and HYDRAUREPAIR:** The 626 pages REFREPAIR Manual is an essential reference if you wish to gain maximum benefit from using these programs.

Every user of the Software should own a copy of the relevant Manual

The unauthorised reproduction of any parts of any Manual by any means or technique whatsoever is strictly illegal.

If you want a detailed description of the Software, turn to:

- REFRIBASE, page 28
- REFREPAIR, page 31
- REFRIDIAG, page 33
- REFRILEC, page 41
- CHILREPAIR, page 44
- HYDRAUREPAIR, page 47.

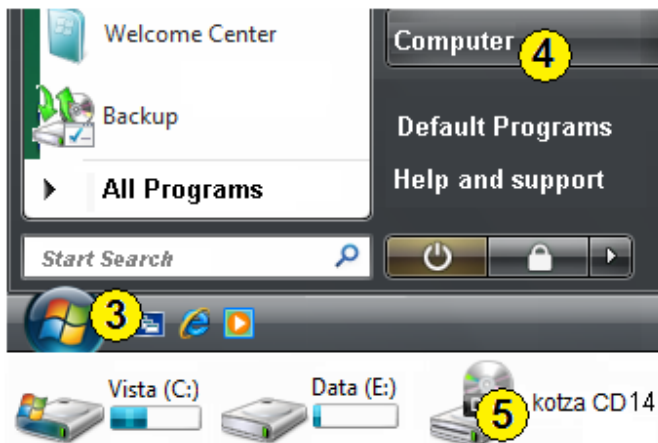
INSTALLING THE SOFTWARE: LAUNCHING

You should follow the instructions VERY CAREFULLY.



You should close all other applications before proceeding with the installation. In addition, you must have Administrator Rights. What's more, don't install the USB key for the moment.

1. Place the installation CD-ROM into the drive of your PC and close the drive. With most PCs, the drive will run automatically after a few seconds, and will load the installation program. **If necessary, allow demo.exe to run.**



If this does not happen:

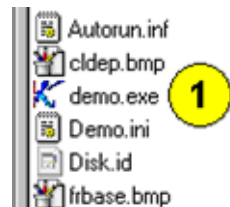
With Windows NT/2000 or XP open "My Computer" from Windows Desktop.

With Vista or Seven, click on Windows icon (marker 3) and then on "Computer" (marker 4).

Double click on the icon for your CD drive, marker 5 (this is usually **D:** or **E:** or **F:** depending on your system).

If the drive still doesn't start to operate, double click on the [Demo] icon that appears (marker 1).

The time the program takes to install will depend on the speed of your CD-ROM drive, but should be less than a minute or so.



Install demonstration programs

Install commercial programs 2

When the installation screen appears, **click on "Install commercial programs"** (marker 2).

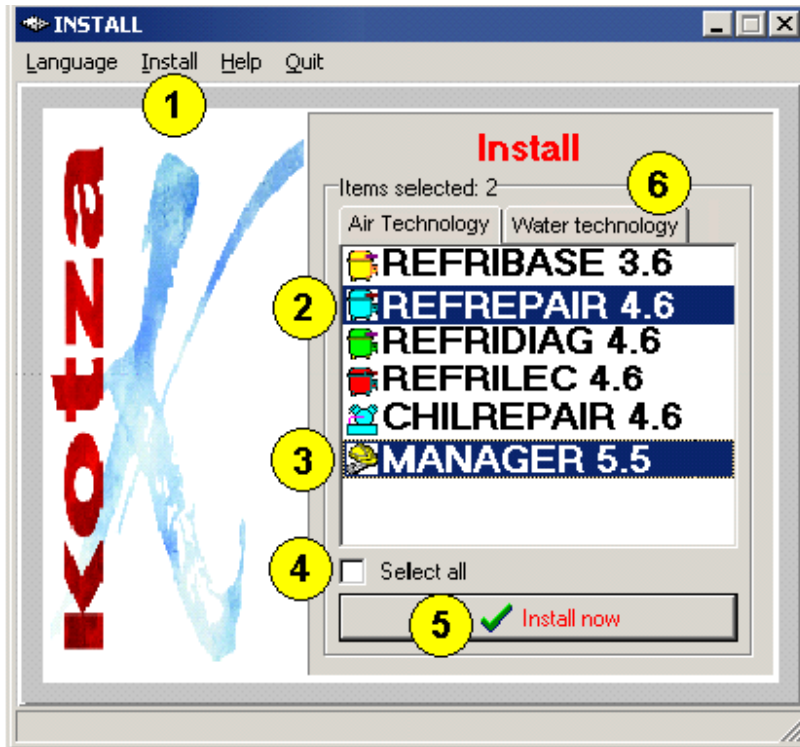
The warning message shown below will then appear, asking you whether you actually have the USB security key.

If you have an USB key for the Software item(s) that you wish to install, then click on [Yes] but **don't install the key for the moment.**





WARNING: If you click on [Yes] but do not possess the USB key for the Software that you wish to install, then installation will proceed, but when you try and run the program, an Error Message will be displayed.



VERY IMPORTANT: when the installation program is displayed on the screen, click on [Install] in the menu bar of the installation program (marker 1 opposite).

Select the Software you wish to install from the list. In this example, only REFREPAIR (marker 2) and MANAGER (marker 3) have been selected.

You can also click on [Select All] (marker 4) directly to select all the available programs.



In order to install or uninstall HYDRAUREPAIR, first you have to click on [Water technology] (marker 6).

IF AN ITEM OF SOFTWARE HAS ALREADY BEEN INSTALLED THEN IT WILL NOT APPEAR ON THE LIST.

In the example opposite, only REFRIBASE and REFRIDIAG appear (marker 3).



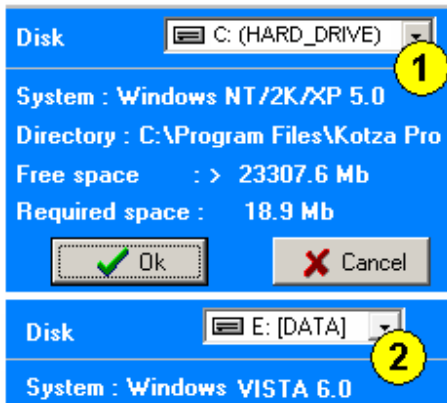
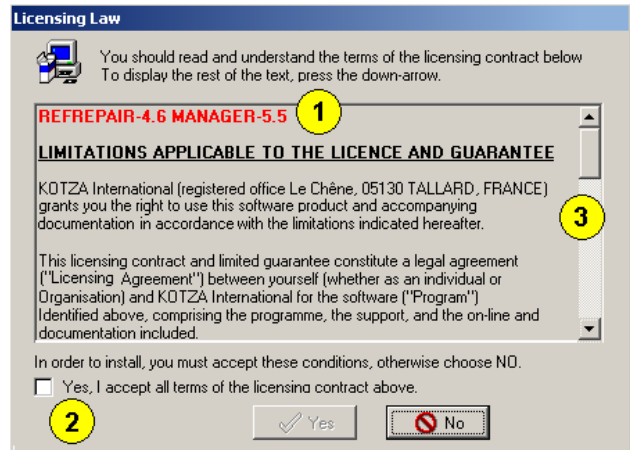
This means that the other Air technology Software packages (REFREPAIR, REFRILEC, CHILREPAIR and the MANAGER) are already installed.

Also, next to the **[Install]** option (marker 1 *previous page*, used to install REFRIBASE and/or REFRIDIAG in this example) there now appears the **[Uninstall]** option (marker 2, to be used if you wish to remove REFREPAIR, REFRILEC, CHILREPAIR, and/or MANAGER from your hard disk). Once you have selected the Software you wish to install, click on the **[Install Now]** button (marker 5 *previous page*).

The User's Licence window now appears with the name of the programs to be installed (marker 1) and the list of the licence and guarantee conditions. Use the slide bar (marker 3) to display all the conditions.

Tick the box (marker 2) to accept the terms of the licence, and then click on **[Yes]** to continue with the installation.

Another window will open. Some information about your PC will be displayed



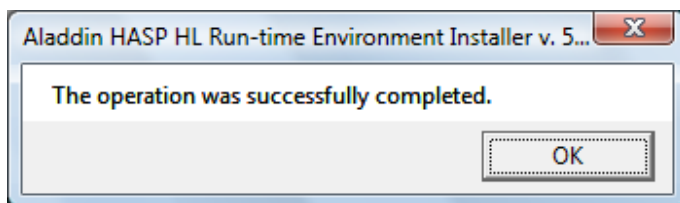
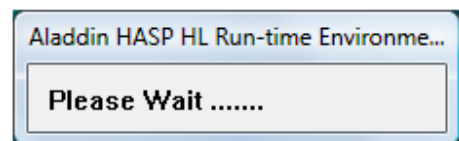
If you have to install the Software onto a hard disk other than the default drive suggested (usually **C:**), then click on the small arrow (marker 1) to bring up a listing of the available drives, and choose the desired unit (**there must be sufficient space available on the chosen drive**).

If your Hard-disk is partitioned (marker 2), don't use C: in order to avoid any access authorization.



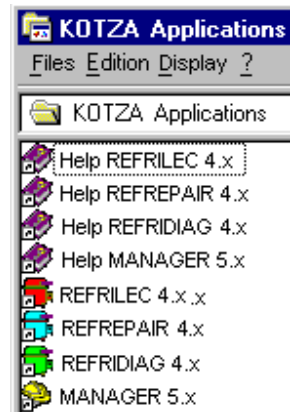
at different times, always install them on the same drive to allow access to the features of the MANAGER utility.

To start the proper installation process, you should now click on the **[OK]**. After all programs has been loaded and extracted, the screen opposite install the software utilities (**wait for the closing, sometimes near of a minute**).



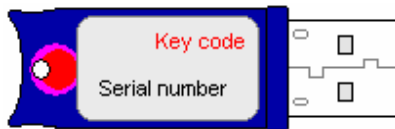
A message will inform you whether the installation has been successful. Click **[OK]** when this appears.

The **KOTZA Applications folder** has been created and appears on the screen (note that the help available is a condensed version of this manual).



The time taken for installation of the Software will depend on the performance of your equipment, but it should never be more than two or three minutes for each program.

Finally, when the program will install the MANAGER (this should only take a short time) **the installation procedure will then be complete.**



At that time only, insert the security key in an USB port. Windows then install automatically the driver. When the USB key is recognized, then a red light switch on.

Below are the new icons that will appear on your desktop, depending on which Software has been installed.

The **REFRIBASE, REFREPAIR, REFRIDIAG, REFRILEC, CHILREPAIR** and **HYDRAUREPAIR** icons provide rapid access to the User Menu. The **MANAGER** icon provides rapid access to the Supervisor menu.



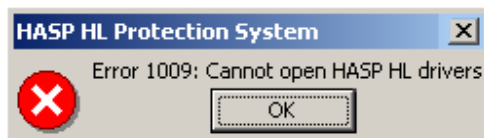
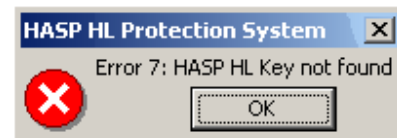
EVERY TIME you wish to start a program, you should click on the corresponding icon on the desktop.



With VISTA or SEVEN, if an error message like opposite is

displayed when you click on any of the program icons, right-click on the icon of the program and then click on "Run as administrator", then allow the program to run.

Opposite, the security key is not properly installed in the USB port of your PC.



The error 1009 message indicates that the USB key driver is not correctly installed.

See question 6 page 53

Meaning of the key codes:

Chil Repair	Refri Lec	Refri Diag	Ref Repair	Refri Base	Key Code
				X	01
			X		02
			X	X	03
		X			04
		X		X	05
		X	X		06
		X	X	X	07
	X				08
	X			X	09
	X		X		10
	X		X	X	11
	X	X			12
	X	X		X	13
	X	X	X		14
	X	X	X	X	15
X					16
X				X	17
X			X		18
X			X	X	19
X		X			20
X		X		X	21
X		X	X		22
X		X	X	X	23
X	X				24
X	X			X	25
X	X		X		26
X	X		X	X	27
X	X	X			28
X	X	X		X	29
X	X	X	X		30
X	X	X	X	X	31

Hydrau Repair	Chil Repair	Refri Lec	Refri Diag	Ref Repair	Refri Base	Key Code
X						32
X					X	33
X				X		34
X				X	X	35
X			X			36
X			X		X	37
X			X	X		38
X			X	X	X	39
X		X				40
X		X			X	41
X		X		X		42
X		X		X	X	43
X		X	X			44
X		X	X		X	45
X		X	X	X		46
X		X	X	X	X	47
X	X					48
X	X				X	49
X	X			X		50
X	X			X	X	51
X	X		X			52
X	X		X		X	53
X	X		X	X		54
X	X		X	X	X	55
X	X	X				56
X	X	X			X	57
X	X	X		X		58
X	X	X		X	X	59
X	X	X	X			60
X	X	X	X		X	61
X	X	X	X	X		62
X	X	X	X	X	X	63

MANAGER: THE TRAINING MANAGEMENT SOFTWARE

GENERAL

As its name suggests, the MANAGER allows the supervision of the 450 users that can be using **each of** the REFRIBASE, REFREPAIR, REFRIDIAG, REFRILEC, CHILREPAIR and HYDRAUREPAIR programs.

The MANAGER can only be accessed by means of a password, and allows the Supervisor to view quantitative and qualitative information about the performance of every user of each program. **Specifically, the MANAGER will enable you to:**

- Add, remove, rename or copy Groups of Users.
- Configure a group of users.
- Add, change, remove or allocate a password to a User.
- Consult the results obtained (globally or individually) for each Group or each User. There can be up to 15 groups each of 30 Users (i.e. 450 Users) for each program installed!



The latest MANAGER now provides unified control for all the programs installed (Air or Water Technology), and incorporates numerous improvements over previous versions.

At the same time as you install REFRIBASE, REFREPAIR, REFRIDIAG, REFRILEC, CHILREPAIR and/or HYDRAUREPAIR, you should always install the MANAGER to take advantage of the features it offers.

THE MANAGER: PASSWORD FOR FILE ACCESS

Whether you are starting from the Desktop or from the [Kotza Application] menu (*access to this is described on page 26*), click on the icon called **MANAGER**.

If the icon is not present on the desktop, refer to question 12 on page 57.

The welcome screen then requests the password. Enter the password, and press [Enter] or click [OK].

The initial password that is used for each program is: see paper manual

To maintain confidentiality, as you enter your password, the # sign is substituted for each letter you type. If a typing error is made, press the backspace key to correct it. As soon as the password has been recognised, you have access to the MANAGER and all its features described below.

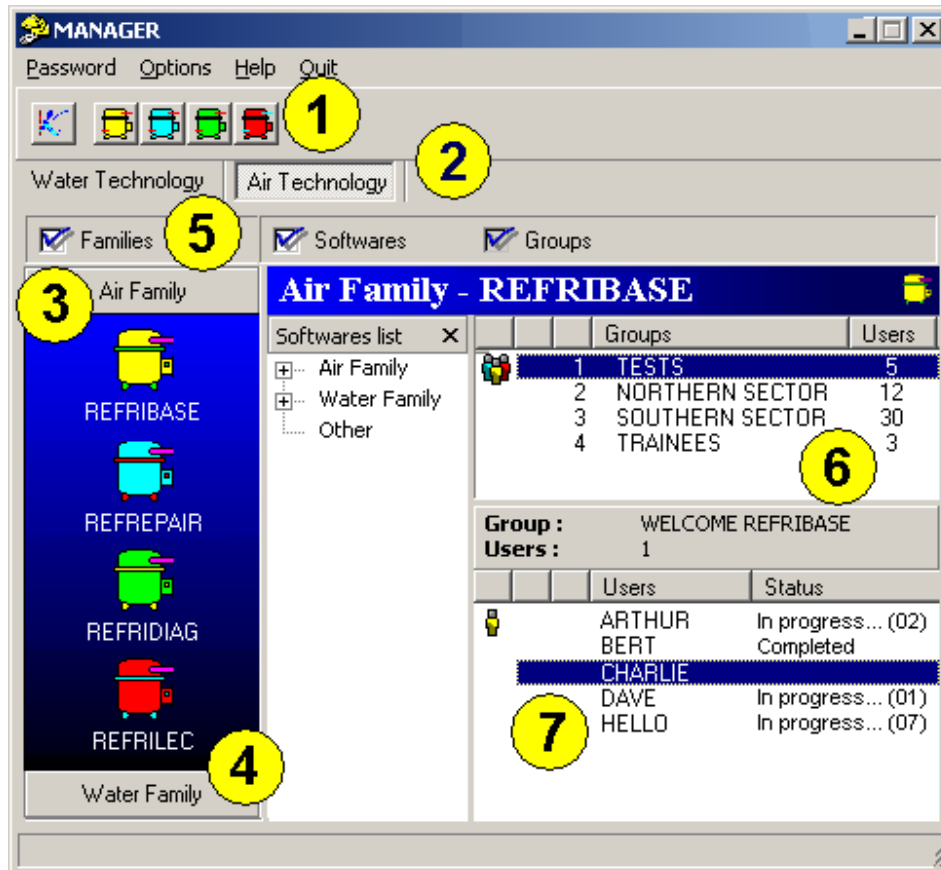
If you have forgotten your password, refer to question 9 on page 56.

THE MANAGER: ACCESSING GROUPS

When you click on the "MANAGER" icon and correctly enter the password, a new screen is displayed.



The MANAGER will be displayed only if at least one dongle key is plugged in your PC.



When program is properly installed and the corresponding key is plugged in, its icon is displayed (marker 1).

When several programs are installed, click on the appropriate tabs (markers 2 and 3) for the program whose Groups you wish to examine.

In the MANAGER you can choose from:

- **The Air Technology (marker 2) / Air Family (marker 3) for REFRIBASE, REFREPAIR, REFRIDIAG and REFRILEC.**
- **The Air Technology (marker 2) / Water Family (marker 4) for CHILREPAIR**
- **The Water Technology (marker 5) for HYDRAUREPAIR.**

The 15 possible groups for the selected Software will then appear (marker 6) with the number of users belonging to each group appears opposite the name of the group.

In this example, Group number 1, called "TESTS" has been clicked, and is highlighted. This Group has 5 users, whose names are shown underneath (marker 7).

Group 2 is called "Northern Sector" and contains 12 Users. If you click on this group, a list of the 12 Users in the group will appear, and so on.

THE MANAGER: ADD A GROUP

To do this, click in the upper window and then click the **right button** of the mouse and then click on **[Adding a Group]**.

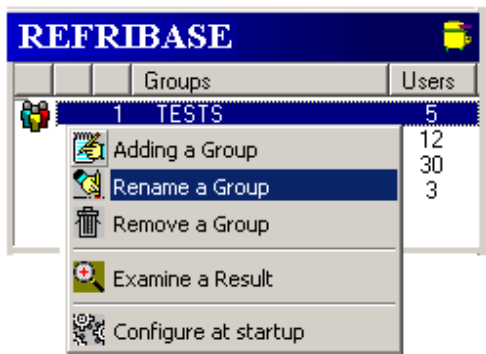
The input box "Adding a Group" then appears. Enter the name of the Group, using up to 20 alphabetic characters.



IF YOU WISH TO ADD A GROUP AND ENTER A LIST OF USER NAMES FOR MORE THAN ONE PROGRAM, YOU SHOULD ONLY DO THIS ONCE AND THEN USE THE "COPY A GROUP" OPTION (described on page 14).



THE MANAGER: RENAME A GROUP



You need to select an existing Group and then right-click on the mouse. Then you should click on **[Rename a Group]** in the window that appears.

In the example opposite, you want to change the name of the Group called "TESTS".

A dialog box then appears. Enter the new name of the Group, using up to 20 alphabetic characters.

THE MANAGER: REMOVE A GROUP



WARNING: this option PERMANENTLY REMOVES ALL THE NAMES AND ALL THE RESULTS OF ALL THE USERS IN THIS GROUP.

You should select an existing Group and then right-click on the mouse. Then you should click on **[Remove a Group]** in the window that appears.

In the example opposite, you want to remove the Group called "TESTS".

If you decide not to remove the Group, click on the **[No]** button when asked to confirm its removal.



THE MANAGER: COPY A GROUP

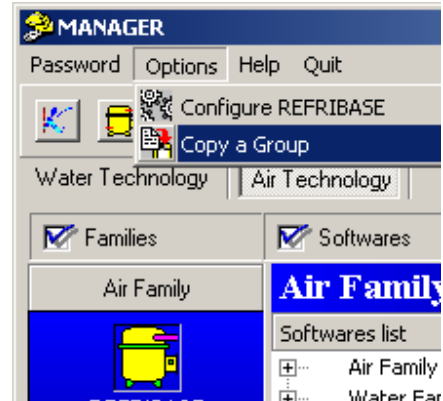
You can copy a complete group from one program to another without having to re-type all the names of the Users in the Group for every program.



IT'S NOT POSSIBLE TO COPY A GROUP FROM AIR TECHNOLOGY TO WATER TECHNOLOGY AND VICE VERSA.

For example, to copy in REFRIBASE all the names from the existing group called "WELCOME" in REFREPAIR, you should proceed as follows:

First of all, click on "Air Technology / Air Family" and then click on the "REFRIBASE" icon (this identifies it as the *target* program). Then click on [Options] in the menu bar, and then on [Copy a Group]. The screen shown below will appear:



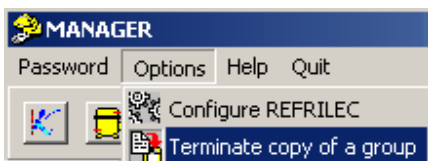
REFRIBASE will be in the upper right window (the *target* program) and in the left hand window will be the available *source* programs.

Note that if other programs from the same technology are installed, their icons and groups will also appear in the left-hand window. At this point, in order to copy the Group "WELCOME" from REFREPAIR, **click on this Group, and whilst keeping the mouse button depressed**, move the mouse

cursor into the right upper window before releasing the button.

A new Window suggests you to copy configuration and password for every User in that group are copied (*for further information regarding specific cases, see "allocate a password to a User", on page 17 and "Configuring the Software" on page 24*).

"WELCOME", a copy of the REFREPAIR Group now appears in the list of Groups in REFRIBASE (to rename it, see on page 13).



Finish the copy by clicking on [Options] in the menu bar, and then on [Terminate Copy of a Group].

THE MANAGER: ACCESSING USER NAMES

After clicking on the "MANAGER" icon, and correctly entering the password, this option enables you to rapidly review the steps and repairs that have been completed by the various Users belonging to each of the 15 possible Groups.



The MANAGER will be able to start only if at least one USB Key is plugged into the parallel/USB port of the PC.

By clicking on the name of a Group, the Group is highlighted and the names of the Users belonging to that Group are displayed in the lower window.

The status of each User from this Group who has started the program is displayed opposite the User's name. "**Completed**" if they have finished all the repairs or "**In progress (xxx)**", where xxx represents the number of the step (in REFRIBASE, REFREPAIR, REFRILEC, CHILREPAIR or HYDRAUREPAIR) or the level (in REFRIDIAG) that the User is currently working in.

Groups		Users
1	TESTS	5
2	NORTHERN SECTOR	12
3	SOUTHERN SECTOR	30
4	TRAINEES	3

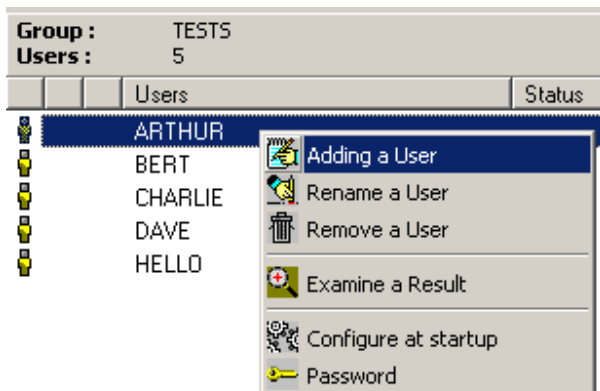
Group :	WELCOME REFRIBASE
Users :	1

Users	Status
ARTHUR	In progress... (02)
BERT	Completed
CHARLIE	
DAVE	In progress... (02)
HELLO	In progress... (07)

Group 1 (called TESTS) contains 5 Users, named Arthur, Bert, Charlie, Dave and Hello: Bert has completed the program. Arthur and Dave are at level 2 (REFRIDIAG) or at step 2 (REFRIBASE, REFREPAIR, REFRILEC, CHILREPAIR or HYDRAUREPAIR), Hello is at level 7 whilst Charlie hasn't started yet.

THE MANAGER: ADD A USER

This option will enable you to add Users to a group. *You can only add a User name to a Group if that Group already exists (see: Add a Group, page 13).*



Since the MANAGER will only allow a maximum of 30 Users in a Group, it is not possible to add a User to a Group that is already full.

In the "Users" window, right-click the mouse. Then click on **[adding a User]** in the window that is displayed.

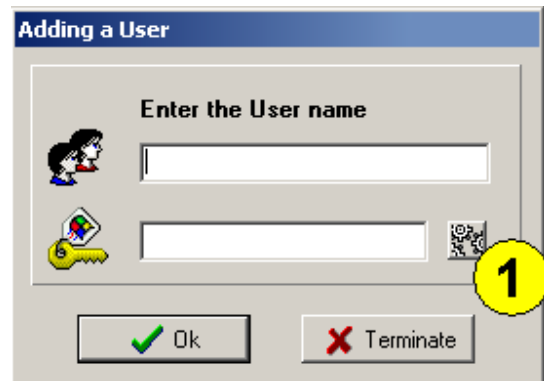
A dialog box then appears.

Enter the name of the new User, using up to 20 alphabetic characters. If you make a typing error, use the **[Backspace]** button to delete the error.

Confirm the name by pressing **[Enter]** or by clicking on **[OK]**. Complete the input of new names by clicking on the **[Terminate]** button.



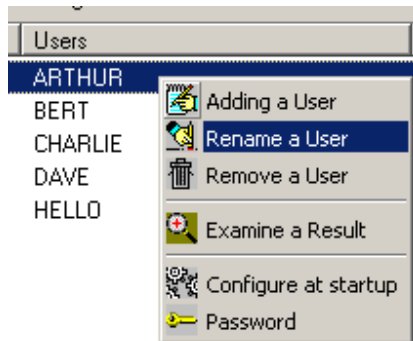
Should the Supervisor wish to allocate a personalised password to a User, or allow the User to configure his own evaluation, this can be done using the lower window, marker 1 (see: “Allocate a password to a User”, page 17 and “configure at start-up”, page 18).



The MANAGER automatically changes small letters to capitals, and arranges all the names in alphabetical order. In addition, the MANAGER prevents the entry of duplicate names (no 2 names can be identical).

THE MANAGER: RENAME A USER

After clicking on the "MANAGER" icon, and correctly entering the password, this option allows User names to be changed e.g. if there has been an error in spelling. In the "Users" window, select the User name that needs to be changed so that it is highlighted, and then right-click the mouse and click on **[Rename a User]** in the window that is then displayed.



Enter the new name for the User, using up to 20 alphabetic characters. If you make a typing error, use the **[Backspace]** button to delete the error.

Complete the input of the name by pressing **[Enter]** or by clicking on **[OK]**.

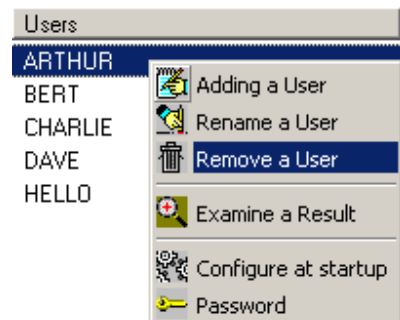
THE MANAGER: REMOVE A USER



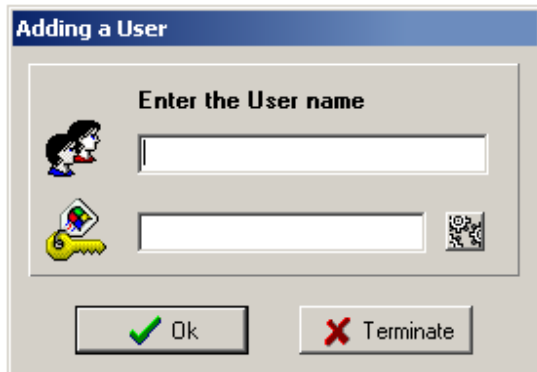
WARNING: THIS OPTION PERMANENTLY REMOVES THE NAME AND ALL THE RESULTS FOR THE USER INVOLVED.

In the "Users" window, select the name that you wish to remove so that it is highlighted, then right-click the mouse and click on **[remove a User]** in the window displayed.

If you decide not to remove the User, click on **[No]** when asked for confirmation.



THE MANAGER: ALLOCATE A PASSWORD TO A USER



If a Supervisor so wishes, he can allocate a personalised password to each User, in each Group, that allows them access to one or several installed programs.

The password can be entered in the lower box when the name is added (see on page 15).

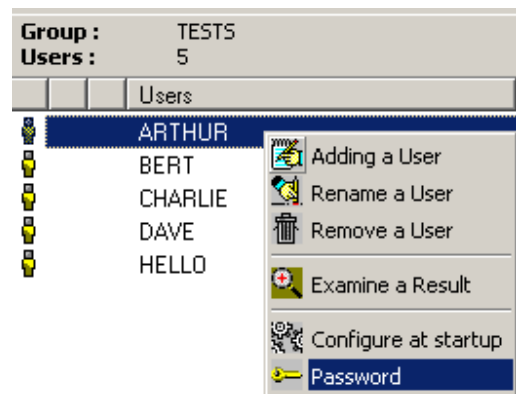
The password can also be entered or changed as follows.

In the MANAGER, simply right-click on the appropriate name and then click on [**Password**].

This gives access to the input box shown below.

This enables you to:

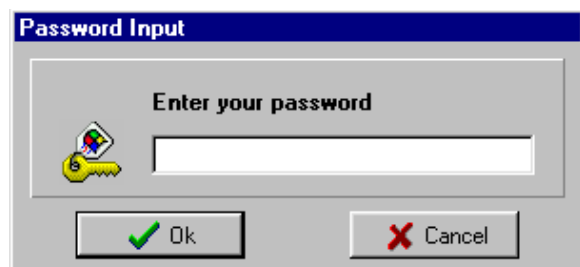
- **Read the password** (MIKE in this example),
- **Change the password** (by entering the new password in the relevant box).
- **Delete the existing password** (simply by pressing [Enter]).



For example, from the Group "TESTS", if you allocate the password "DAD" to a User called "DAVE", this password will not be required from a user called "DAVE" who belongs to another Group or who is a User in another program.

From then on, every time that the User wishes to access the program concerned, the following dialogue box appears.

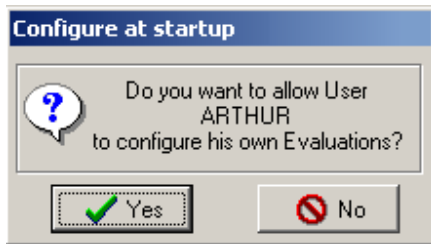
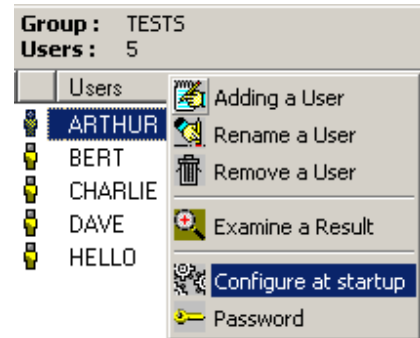
The User must then correctly enter his password, or he will be refused access to the program.



THE MANAGER: CONFIGURE AT START-UP

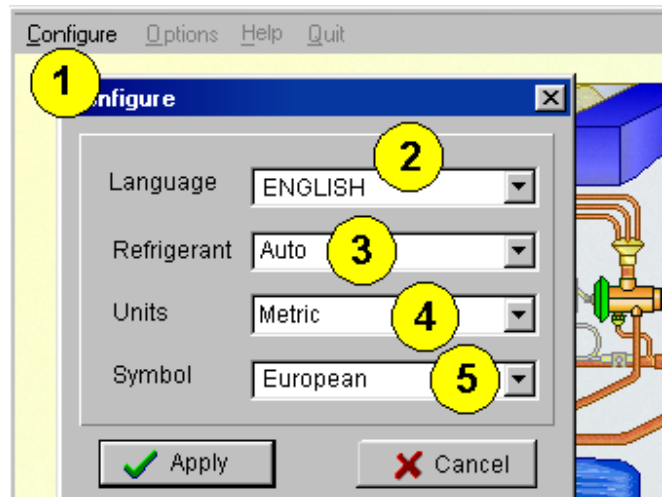
After clicking on the "MANAGER" icon and correctly entering the password, this option will authorize a User to configure the Software in Use during a session.

RIGHT-Clicking the mouse on a User's name and then on [Configure at Start-up] gives access to the confirmation box alongside.



If [Yes] is clicked, then when the User involved (in this instance, the user named "Arthur") uses the Software, he will have access to the [Configure] option (marker 1).

Depending on the program concerned, the User can select the language (marker 2), the refrigerant (marker 3), the units of measurement (marker 4) or the electrical symbols (marker 5).



For more detail see "Configuring the Software, pages 24 to 26.

THE MANAGER: EXAMINE THE RESULTS

After clicking on the "MANAGER" icon and correctly entering the password, this option will enable the Supervisor to review the results obtained by each Groups of Users of each program (overall or individually).



The MANAGER will be able to start only if at least one security Key is plugged into the parallel/USB port of the PC.

For example, let's look once more at the group "TESTS" that we saw earlier:

	Groups	Users
1	TESTS	5
2	NORTHERN SECTOR	12
3	SOUTHERN SECTOR	30
4	TRAINEES	3

Group :	WELCOME REFRIBASE	
Users :	1	

	Users	Status
	ARTHUR	In progress... (02)
	BERT	Completed
	CHARLIE	
	DAVE	In progress... (02)
	HELLO	In progress... (07)

"Double-click" on the name of this group to access the results.

THE MANAGER: RESULTS IN REFRIBASE, REFREPAIR, REFRILEC, CHILREPAIR or HYDRAUREPAIR

To consult the “Results in REFRIDIAG”, see *page 21*.

To access this screen, see the procedure given in the “Examine the Results” chapter above. A table as shown below will then appear on the screen:

Steps																		
User	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	Pro.	Summing	
ARTHUR	56	60	50	70	58	62	75	82	64	78	75	84	62	77	58	24250	67.4%	
BERT	43	59														2150	51.0%	
CHARLIE	--															0	0%	
DAVE	75	82														3350	78.5%	
HELLO	61	59	61	58	88	58	82									8250	66.7%	

This table will allow the *Supervisor* to see at a glance the situation of any of the 15 Groups of 30 Users for the program in use. Let's now examine the results of Group 1, called "TESTS". This Group contains 5 Users called Arthur, Bert, Charlie, Dave and Hello. By consulting the table, the *Supervisor* can immediately see that only Charlie has not yet started the program. He sees that Bert & Dave are on Step 2, whilst Hello is on Step 7.

Note: Only 15 steps can fit into the results screen. In the Software containing more than 15 steps, the results are displayed on several screens.

In REFREPAIR for example, since Arthur has passed Step 15, the Supervisor needs to click on the [Next>>] button to view the rest of the table and review what has happened in Steps 16 to 28. He should click on the [<<Previous] button to return to Steps 1 to 15.

Steps																		
User	16	17	18	19	20	21	22	23	24	25	26	27	28	Pro.	Summing			
ARTHUR	58	82	59	88	61	67	58	82	61	77	75	84	82	24250	67.4%			
BERT														2150	51.0%			
CHARLIE														0	0%			
DAVE														3350	78.5%			
HELLO														8250	66.7%			

The Supervisor can therefore see the individual scores for each User for each Step, as well as the cumulative score for the total number of Steps completed.

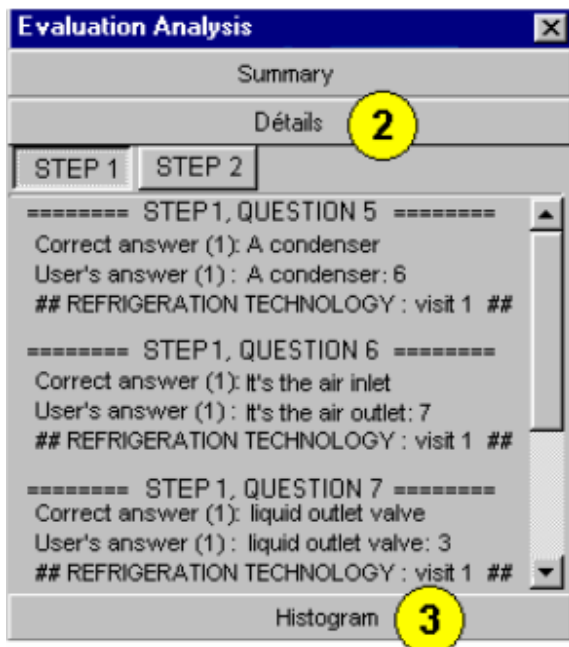
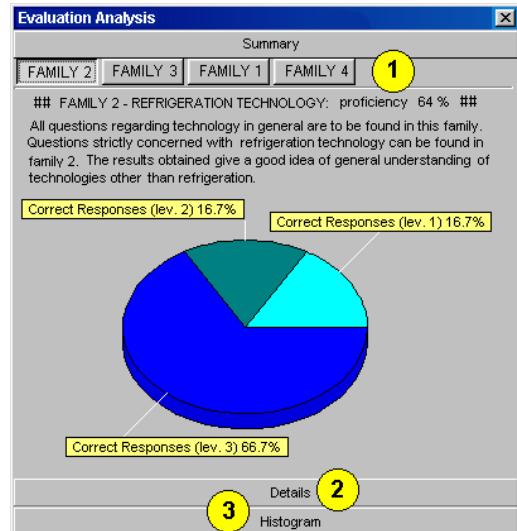


By clicking on the [Print] button, you can produce a paper record of the results (check that there is paper in the printer and that it is switched on!).

In addition, if the *Supervisor* double-clicks on the name of a User, a new results table appears. In REFRIBASE, REFREPAIR, REFRILEC, CHILREPAIR and HYDRAUREPAIR, the results table looks like that opposite. (For REFRIDIAG, see page 21).

On the "Summary" screen, all four families of faults can be accessed using their tabs (marker 1). Additional information about the faults is given in each family.

Using this table, the Supervisor can see the results obtained by each User for each family of faults.



Clicking on "Details" (marker 2) gives the Supervisor access to much more detailed information. He then has access to *precise* information about the User's answer to *every* question, including the correct answer, the Family of fault involved and the number of times a User has looked at this question (for example, whether he has quit the program without answering the question).

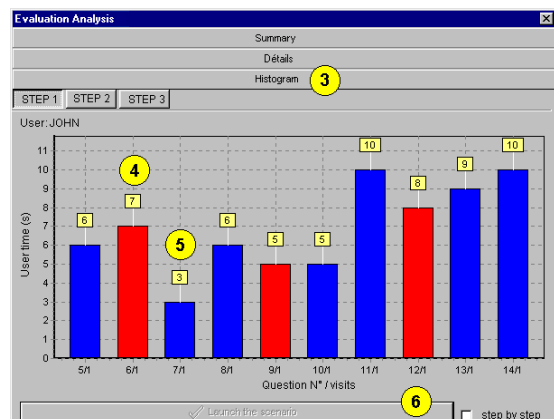
By clicking on "Histogram" (marker 3), the Supervisor can access another type of analysis.

The Supervisor can, if he wishes, obtain a precise idea of the skills and knowledge of each User.

He will be able to see how much time (in seconds) has been spent on a question, and the number of times a User has looked at a question.

The Scenario option (marker 6) is not currently available.

He can examine the correct answers (in blue, marker 5) or wrong answers (in red, marker 4) given for every question in every step.



In summary, then, the Supervisor can exert full control over the progress being made by each of the Users. If, say, he sees that a large number of Users have obtained a poor score in any particular Step, he can decide on the course of action that he should take. For example, he could run a special class on those elements considered in that particular step.

THE MANAGER: RESULTS IN REFRIDIAG

To access this screen, see the procedure given on page 18 (Examine the Results). The table that appears on the screen looks like that below:

Results TESTS																	
Steps																	
User	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	Pro.	Time
ARTHUR	C	A	D	Z	E	--	G	*	--	--	--	--	--	--	--	36.9 %	1H07'
BERT	B	A	A	D	B	D	C	A	B	A	A	A	A	A	D	78.0 %	3H39'
CHARLIE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0 %	0H00'
DAVE	H	A	F	H	Z	--	--	--	--	C	--	--	--	--	--	0.0 %	0H56'

Let's now look at the results in REFRIDIAG for the Group "TESTS" that contains four Users called Arthur, Bert, Charlie and Dave. The supervisor can see that Bert has completed the first 15 steps and that only Charlie has not yet started the program. He also sees that Arthur has performed 7 repairs whilst Dave has done 6.

Meaning of the codes used in REFRIDIAG:

- **If a User identifies the correct fault at the first attempt:** he obtains **A** if he has 'bet' maximum points, **B** if he has bet 3/4 of the maximum, **C** for 1/2 maximum and **D** if he has bet the minimum points.
- **If the User is wrong at the first attempt, but correctly identifies a fault at the second attempt:** he obtains **E** if he bets maximum points, then **F**, then **G**, and finally **H** if he bets the minimum.
- **If the User is still wrong at the second attempt:** the fault has not been identified and he obtains a score of **Z**.
- **If the User decides to leave the Plant Room without completing the repair:** he obtains *

Therefore, Arthur has left the Plant Room at fault 08 (*), has failed to find fault 04 (Z), but he has found fault 02 at the first attempt with a maximum wager (A). He has also found fault 01 at the first attempt when he has made a wager of 1/2 the maximum (C) and fault 03, when he has bet the minimum (D). Finally, he has (*at the second attempt*) found fault 05, when he has bet the maximum (E) and fault 07 when he has made a wager of 1/2 the maximum (G).

Since Bert has passed repair 15, the Supervisor should click on the [Next>>] button to see the rest of the table and view the results obtained in the remainder of the repairs. He should click on the [<<Previous] button to return to repairs 1 to 15, or on [Next>>] to view faults 31 to 45, and so on.

- **"Pro." Column:** The Supervisor can view each User's score (which is updated after every wager) relative to the maximum possible score of 100%.
- **"Time" column:** during a repair, every inspection, measurement or test performed causes a virtual time counter to increase. For example, a temperature measurement results in a counter increase of 30 seconds, and dismantling an expansion valve increases the counter by five minutes. *In order to help the User progress, the 'real' time taken during a repair (time used to think the problem over, to use the reference Manuals, or if the User is disturbed) is not counted.* This column therefore displays the total amount of "virtual" time used in working on repairs that have been completed.

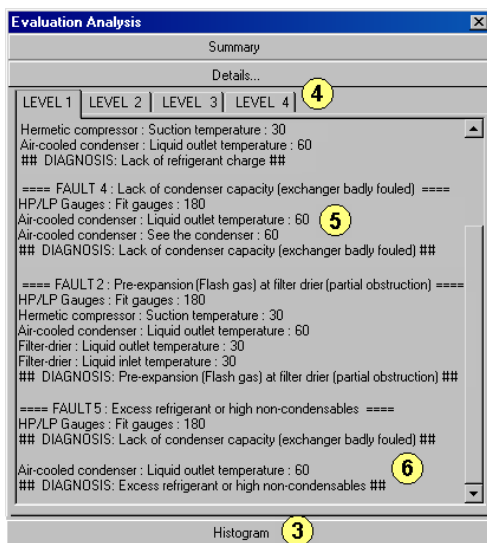
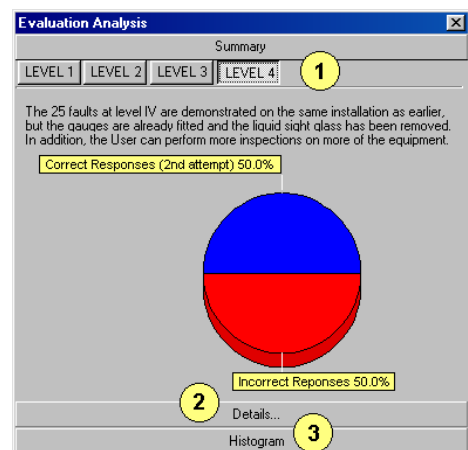


Clicking on the [Print] button allows you to produce a paper record of the results (check that there is paper in the printer and that it is switched on!).

In addition, if the Supervisor double-clicks on the name of any User, a new Results table appears, like the one opposite below (for REFRIBASE, REF-REPAIR, REFRILEC, CHILREPAIR and HYDRAU-REPAIR see page 19).

On the "Summary" screen, all four levels of faults can be accessed using their tabs (marker 1). All useful information is given for each level.

Clicking on "Details" (marker 2) or "Histogram" (marker 3) gives the Supervisor access to other information (which will be explained later).



The "Details" give the Supervisor access to this very precise analysis:

Marker ④: To follow the procedure used by the User, the Supervisor should click on the appropriate tab for the corresponding level.

Marker ⑤: In the example opposite, at fault 4 at level 1 (lack of condenser capacity, exchanger badly fouled) the User has started by fitting a set of gauges (this takes a virtual time of 180").

Then he has measured the liquid outlet temperature (60") and finally he examined the condenser (60") before giving the correct diagnosis. *This was a very good attempt.*

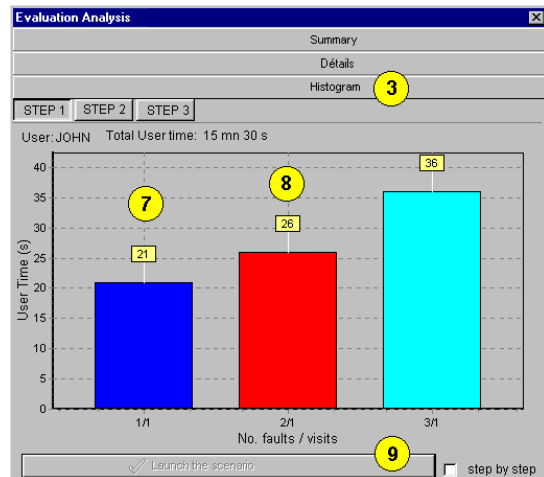
Marker 6: At fault 5 on level 1 (excess refrigerant charge or high non-condensable) the User fitted the set of gauges (180") and quickly diagnosed (*much too quickly!*) a fouled condenser. *This diagnosis was entirely wrong!* At the second attempt, he measured the liquid outlet temperature (60") which at last enabled him to produce the correct diagnosis.

Using this table, the Supervisor can see **precisely** what progress each User has made **in each fault situation at each level...**

By clicking on "Histogram", (marker 3 on each diagram), the Supervisor can access another type of analysis:

He can examine the correct answers (in blue, marker 7) or wrong answers (in red, marker 8) given for every question in every step. He will be able to see how much time (in seconds) has been spent on a question, and the number of times a User has looked at a question.

The Scenario option (marker 9) is not currently available.



The Supervisor can check in detail the procedure used and the effectiveness of each User for every one of the 46 faults.

To summarise, then, the Supervisor has full control over the activities of the Users. If he observes that a number of Users have produced poor scores on a particular fault, he can decide what actions he needs to take. For example, he could run a special class dealing with the subject matter (theme) of the repair in question.

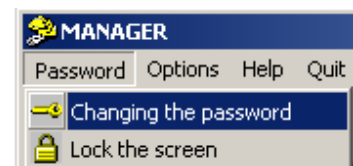
At this point, you could read the answer to question 20 on page 60 "What sort of score should be obtained with REFRIDIAG?" and the list of faults on page 40.

THE MANAGER: CHANGING PASSWORD

THE INITIAL PASSWORD IS: see paper manual

After clicking on the "MANAGER" icon, and then correctly entering the existing password, this option allows you to change the password. The MANAGER automatically converts small characters to capitals. Do not be concerned by this.

Click on [Password / Changing the password] in the menu bar.



In the dialog box that appears, enter the new password using up to 20 alphabetic characters.

If you make a typing error, use the [**Backspace**] to correct it. Confirm the entry by pressing [**Enter**] or by clicking the [**OK**] button. If you decide not to change the password, click on [**Cancel**].



WARNING: DO NOT FORGET YOUR NEW PASSWORD AFTER CHANGING IT IF YOU WANT TO KEEP ON USING THE MANAGER.

If you do forget your password, refer to question 9 on page 56.

THE MANAGER: CONFIGURING THE SOFTWARE

By **Right-clicking** on the name of a Group, you can configure the Group (**and all the Users it contains**) as you wish. *You can actually configure different Groups with different options.*

Thus one group can be configured with R22, Imperial units, to remain at level two, and to start at step 5, whilst **another** group can use R134a, metric units (International System), automatically choose a level, and start at step 1.



WARNING: IF YOU CHANGE THE CONFIGURATION OF A GROUP, YOU WILL CHANGE THE CONFIGURATION FOR ALL THE USERS IN THAT GROUP. TAKE GREAT CARE AT EVERY STEP OF THIS PROCEDURE IF YOU WANT TO AVOID MAKING MISTAKES.

Using the previous example once more, call the first group "R22 IU LEV2 STP5" and the second "R134 IS NORMAL" (you can use up to 20 characters).



The different configuration options can vary from Software to another, but the used screens are similar.

You may change the default configuration of the Software selecting its tab and then click on [**Options**] and [**Configure**] in the menu bar.



Warning: All Groups that you add or copy afterwards will have this new default configuration.

Language, marker 1: The choice of language cannot be changed, but at the present time, some Software is available in several languages. *If you are interested in the foreign language versions of the Software, please contact us.*

Refrigerant, marker 2: The choice of the refrigerant is only available in REFRIBASE (R22 or R134a). In REFREPAIR and CHILREPAIR, the refrigerant is chosen automatically (R407C, R410A, etc.) REFRIDIAG uses R22 only. REFRILEC and HYDRAUREPAIR are not concerned as it deals only with the electric or hydraulic repairs.

Units, marker 3: The Supervisor can choose the system of units that is to be used (except in REFRIDIAG):

- **IS** (International System): pressures are expressed in bar and temperatures in °C. These are the units now used by most refrigeration engineers outside the USA.
- **IU** (Imperial Units): pressures are given in psi, temperatures in °F, lengths in feet and inches etc.

Symbols, marker 4: This option is used with REFRILEC only. The *Supervisor* can choose the type of electrical symbols he wishes to use in the diagrams: European or American.



For these 4 first options, see also “Configure at start-up”, page 18.

Confirm Identity, marker 5: The Supervisor can tick this box to ensure that every REFRIBASE User (in the example) must confirm his name using a keystroke.

Evaluation Mode, marker 6: This option is not available. It is included for use with a future version of the Software.

Level, marker 7: This option is used with REFRIBASE only. If this value is set to 0, REFRIBASE will automatically adjust the level of difficulty (1, 2 or 3) according to the responses given by the User.

If this value is set to something other than 0, REFRIBASE will stay at this level, irrespective of the quality of the User's answers.

Starting Step (or level), marker 8: The *Supervisor* can choose to start or re-start the program at a given step (for REFRIBASE, REFREPAIR, REFRILEC, CHILREPAIR or HYDRAUREPAIR) or level (for REFRIDIAG). The default starting step or level is 1.

...And terminate, marker 9: This option allows **ONLY** the step (or the level) indicated by the "Starting Step" to be performed. If this is not ticked, and the Supervisor wants to re-start the Software at a given step or level, the results from steps above the starting step are deleted.

Server, marker 10: This option is not available. This option is for use in a future version of the Software, which will be capable of use in a Network.



Initially, each Software is configured as shown in the screen above. All Groups that you create from this will have this default configuration.

It may be useful to read: "Configure at Start-up" page 18, "Add a Group" page 13, and "Copy a Group" page 14.

LEAVING THE MANAGER

This option allows you to quit the MANAGER. Click on [Quit] in the menu bar to close the MANAGER. If you decide not to quit, respond to the request for confirmation by clicking on the [No] button.



If you have run a program by clicking on its icon from the MANAGER, then when you quit this program, you will be returned to the MANAGER and asked once again for the password. This is to prevent unauthorised users from accidentally changing or removing information.

ACCESSING THE USER MENU

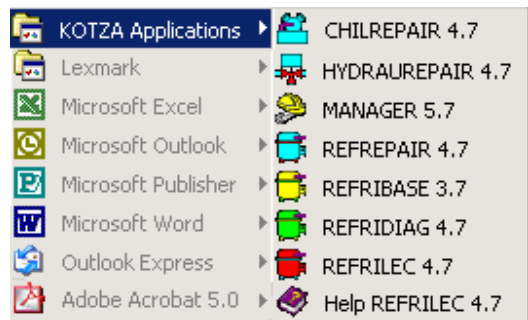
No typing skills are required for any of the Software. All a User needs are basic mouse control skills and the ability to open and close windows in the Software. You must remember to inform a User of the name of the Group to which he belongs (there can be up to 15 Groups).

From the Desktop, you can double-click directly on the appropriate icon to run a program.



With Windows 2000/XP you could also click on [Start] then [Programs] then [Kotza Applications], and finally on the appropriate icon for the program you wish to run.

With Vista or Seven, click on Windows icon at the bottom left of the screen, then on [All Programs], then on [KOTZA Applications].



The welcome screen then displays the various Groups, and the list of names of all the Users belonging to the chosen Group in alphabetical order.



With Vista or Seven if an error message like opposite is displayed when

you click on any of the program icons, right-click on the icon of the program and then click on "Run as administrator", then allow the program to run.

The User must then click on his Group, then on his name, and then confirm this choice.



WARNING: Confirmation can be performed in three different ways...



In the "Option" menu of the MANAGER, if the Supervisor has ticked the "Confirm Identity" box (see marker 5 page 25), the window opposite will appear.

The User should then type in his name as it is entered in the Group and then click on [OK]. If this is not done, the program will not allow him access.

If the "Confirm Identity" box is not ticked, the User can confirm his name by means of a simple click of the mouse.

After confirming his name, if the Supervisor has allocated a password to the User (see page 17), the dialog box shown opposite appears.



The User should then correctly enter his password and then click on [OK]. If this is not done, the User will not be able to access the program.

The program will then display a welcome message and take the User to the appropriate repair.

REFRIBASE: DETAILED DESCRIPTION

REFRIBASE is at a "beginner" level of difficulty.

REFRIBASE (Refrigeration and A/C for the beginner) is a training system that provides refrigeration 'novices' (students, heating engineers, electricians etc.) with the necessary knowledge to allow them to make effective repairs on unitary air-conditioning units.

REFRIBASE is an auto-adaptive program that poses real-life problems according to the quality of responses to earlier questions. Therefore, every time the Software is used, the situations presented to the User will be different. You respond to each problem by using a simple mouse click. REFRIBASE immediately updates your score and displays an appropriate correction on the screen.

REFRIBASE allows you to interrupt your session at any point you wish. The next time that you access it, it will return you to the exact same point in the program that you would have found yourself.

The progressive increase in level of difficulty and the wide range of problems soon means that you can make accurate and rapid diagnosis of faults. The self-correction capability of the program enables the User to train entirely alone, whilst still making progress that is as rapid as it is spectacular.

In addition, the integrated MANAGER, which is only accessible using a password, analyses the results obtained by each User at every Step (up to 450 different Users can be recognised by the Software at any one time). The MANAGER allows the Supervisor full control over the Groups of users, and allows him to review the progress of each User as he pleases.

The Supervisor can also choose the refrigerant (R22 or R134a) to be used, the units (bar and °C or psi and °F), and many other options (*see page 25*).

Thanks to its animated graphics, its ease of use, its interactive operation, its progressive training system and its self-adapting properties, REFRIBASE is truly the ideal tool for gaining competence in working with unitary A/C systems.

REFRIBASE: USING AND DURATION OF TRAINING

Refrigeration and Air-conditioning skills are not easy to acquire. In the same way, the refrigeration topics dealt with in the REFRIBASE Software might seem difficult.

This is why, to avoid de-motivating novice engineers, it is strongly recommended that preliminary study is undertaken using the REFRIBASE Manual.

Then you can proceed as follows:

- 1) **Make a first attempt using the PC**, perhaps with the assistance of the REFRIBASE Manual (an average time for this would be from 4 to 10 hours to complete the 10 steps in several sessions).


If, after the first five steps the resulting score were too low, it would perhaps be better not to continue immediately. It would then be advisable to carefully re-read the REFRIBASE Manual and then perhaps start the REFRIBASE Software from the beginning.

2) Re-Read the REFRIBASE Manual.

- 3) **A second run through the program on the PC** (an average time for this would be from 2 to 6 hours, in several sessions).

A User who wishes to do so could start the REFRIBASE program completely, as often as necessary, until an excellent score is achieved.

Note: These times are, of course, simply indications of what might be expected. The time taken varies enormously according to the User's initial knowledge.

 **REFRIBASE has been designed for the BEGINNER. If, after working through all the steps entirely alone, a User obtains a high score using it, he should then take a course in practical refrigeration skills. There is no doubt that he will then be able to work alone and effectively on most types of stand-alone A/C units.**

He could then continue to improve his knowledge using REFREPAIR (which continues where REFRIBASE leaves off) and the 626 pages REFREPAIR Manual, which is dedicated to refrigeration and A/C repairs.

REFRIBASE: THE SEQUENCE OF STEPS

Every time REFRIBASE is run (*see: accessing the User menu, page 26*), a welcome message appears and the User is automatically taken to the appropriate step where his last score (in points and as a percentage score) is displayed.

Pro. : 4500 pts (30.2%)

In this example, the User has a total of 4500 points, which is a percentage score of 30.2% relative to the maximum possible score.



REFRIBASE RECORDS THE RESULT OF EVERY QUESTION IN EVERY STEP FOR EVERY USER. IT IS THEREFORE POSSIBLE TO COMPLETE ALL THE STEPS IN SEVERAL DOZEN SEPARATE SESSIONS.

After every response, REFRIBASE provides the User with a commentary advising him which page of the Manual he should consult to obtain additional information. REFRIBASE simultaneously updates the User's score, archives it on the hard drive and then suggests that the User either continues or breaks off the session.



THE LEVEL OF DIFFICULTY OF THE QUESTIONS (LEVEL 1, 2, OR 3) IS AUTOMATICALLY ADJUSTED ACCORDING TO THE LEVEL OF THE USER'S KNOWLEDGE (*Unless the configuration has been changed, see page 25 marker 7*)

For every question in each step, there are three different levels of difficulty:

- **Level 1:** the questions are at beginner's level.
- **Level 2:** the questions are more difficult, or there are a greater number of possible answers (intermediate level).
- **Level 3:** the questions are even more difficult (highest level).

**For every correct answer, you rise by one level.
For every incorrect answer, you drop down one level.
If, therefore, the program is restarted from the beginning,
the questions posed (or the possible answers) will be different.**

STEP 08/1

Question 16/17

In the case opposite, the User is currently at Step 8 and at level 1. He is at the 16th question of a total of 17 possible questions.

Thus, every time the program is run, the auto-adaptive nature of REFRIBASE means that the User encounters different situations at a different level of difficulty.

REFRIBASE: THE THEME OF EACH STEP

Steps 1 to 5: the Window A/C unit.

- **Step 1:** the name and function of the various A/C unit components.
- **Step 2:** commissioning. Understanding the refrigeration system.
- **Step 3:** normal operating parameters.
- **Step 4:** The identification plate and control panel. Consequences of small anomalies in operation.
- **Step 5:** introduction to minor repairs, possible (and impossible!) faults.

Steps 6 to 10: the split-system A/C unit.

- **Step 6:** installation and commissioning using the remote control.
- **Step 7:** fitting a set of gauges. Normal operating parameters.
- **Step 8:** diagnosis of faults from a table of trends.
- **Step 9:** diagnosis of faults using pressure and temperature readings.
- **Step 10:** looking for errors in a table of trends.

REFREPAIR: DETAILED DESCRIPTION

REFREPAIR (which carries on where REFRIBASE ends) is at an "intermediate" level.

REFREPAIR is a training Software for refrigeration repairs that uses examples of several direct expansion systems with air-cooled condensers, and which are running on several different refrigerants.



If a User has little or no knowledge of refrigeration systems, it is recommended that they start by using REFRIBASE before trying to get to grips with REFREPAIR.

REFREPAIR: USING AND DURATION OF TRAINING

Refrigeration and A/C skills are not easily acquired. In the same way, the refrigeration topics dealt with in the REFREPAIR Software might seem difficult. This is why **we would recommend that you proceed as follows:**

- 1) **Study the REFREPAIR Manual** (average time required: from 10 to 20 hours, in several sessions).
- 2) **Make a first attempt using the PC**, making corrections with the help of the REFREPAIR Manual (average time required: from 4 to 16 hours, in several sessions).
- 3) **Make a second study of the Manual** (average time required: from 5 to 10 hours, in several sessions).
- 4) **Make a second attempt using the PC**, alone, without using the REFREPAIR Manual, making final corrections by using the on-line help (average time required: from 4 to 12 hours, in several sessions).

A User who wishes to do so could run the REFREPAIR Software as often as is needed until he achieves an 'excellent' score.

Note: These times are, of course, simply indications of what might be expected. The time taken varies enormously according to the User's initial knowledge.



When a User obtains a good score using REFREPAIR, *and completes every step entirely on his own*, he should be able to diagnose most of the usual refrigeration problems that he is likely to come across in the plant room.

He could then continue to improve his skills and knowledge using the REFRIDIAG Software, which is a refrigeration fault simulator.

REFREPAIR: THE SEQUENCE OF STEPS

Every time REFREPAIR is run (*see: accessing the User menu, page 26*), the User is taken automatically to the appropriate step and his last score (as points and percentage) is displayed.

REFREPAIR RECORDS THE RESULT OF *EVERY QUESTION IN EVERY STEP FOR EVERY USER. IT IS THEREFORE PERFECTLY OK TO QUIT A STEP WHENEVER YOU LIKE.*

After every answer, REFREPAIR updates the score, archives it on the hard disk and provides the User with the choice of continuing or of ending the session.

Each Step considers a principal refrigeration theme or a particular equipment configuration. The progressive nature of the problems posed and the different methods used to formulate questions encourage the acquisition of knowledge, which can quickly be put to use in the plant room. The value of the program has been proven repeatedly since the first version appeared in 1990.

REFREPAIR: THE THEME OF EACH STEP

- **Step 1:** Installing an hermetic compressor.
- **Step 2:** Installing an hermetic compressor (further features).
- **Step 3:** Installing an air-cooled condenser (with level differences).
- **Step 4:** Installation of a complete condensing set.
- **Step 5:** $\Delta\theta$ for air-cooled condensers.
- **Step 6:** Malfunctions in condensing sets.
- **Step 7:** Installation of the liquid line and a capillary expansion device.
- **Step 8:** Selection of (and faults associated with) capillaries.
- **Step 9:** Installing the evaporator.
- **Step 10:** Problems associated with fans.
- **Step 11:** Replacing a hermetic compressor with a semi-hermetic.
- **Step 12:** Problems with semi-hermetic compressors.
- **Step 13:** Installing a condensing set. Problems with lubricants.
- **Step 14:** Installing the liquid line and a thermostatic expansion valve.
- **Step 15:** Installation and adjustment of thermostatic expansion valves.
- **Step 16:** MOP expansion devices, $\Delta\theta$, and thermostats.
- **Step 17:** Solenoid valves. Control by pump-down.
- **Step 18:** Installation of a capacity regulator.
- **Step 19:** Installation of a HP regulator valve.
- **Step 20:** Testing for leaks, evacuation and charging a system.
- **Step 21:** Fitting a set of gauges. Using a contact thermometer. Sub-cooling and superheat with single component refrigerants and refrigerants with large temperature glides.

- **Step 22:** Using a trend table: Diagnosis of a fault from its symptoms. Some LP faults.
- **Step 23:** Finding a number of errors in a trend table. Some HP faults.
- **Step 24:** Measuring air temperatures. Diagnosis of a fault from measurements made.
- **Step 25:** The test for non-condensables.
- **Step 26:** Measurement of air-flows. Air-flow problems.
- **Step 27:** Finding the only impossible fault from measurements displayed, with single component refrigerants and refrigerants with a large temperature glide.
- **Step 28:** Measuring current. Installation of a 4-way cycle inversion valve.

After every answer, the cumulative score (in points and as a percentage score) is updated. REFREPAIR comments briefly on the answer given by the User and indicates the page of the Manual where additional information can be found. This ensures that effective auto-correction takes place.

Unfortunately you've fallen into the trap! If you want an explanation [click here](#)

Explanations: manual page 316

Clicking on the commentary accesses on-line help, which allows the User to consult (on screen) the appropriate pages of the REFREPAIR Manual.

In total, REFREPAIR 4 poses 435 different questions throughout its 28 steps (unless the configuration has been changed - see page 25). At the end of every question, REFREPAIR archives the results on the hard disk and gives the User the choice of continuing or ending the session.

When a User chooses to end the session, then at the start of the next session, REFREPAIR will bring him back to exactly the same point at which he left the program.

REFRIDIAG: DETAILED DESCRIPTION

REFRIDIAG (which follows on from REFREPAIR) is at a "qualified" User level.

REFRIDIAG is a refrigeration fault simulator, which uses as examples several R22 direct expansion A/C systems using air-cooled condensers. It is recommended that the repair techniques of REFREPAIR are fully understood before getting to grips with REFRIDIAG.

REFRIDIAG: USING AND DURATION OF TRAINING

Refrigeration and A/C skills are not easy to acquire. Similarly, the refrigeration aspects of REFRIDIAG may at times appear to be difficult.



This is why, to avoid de-motivating a novice User we would strongly recommend that a high score is first obtained in REFREPAIR before REFRIDIAG is attempted.

Then you should proceed as follows:

1) Make a first attempt on the PC, perhaps with the help of the REFREPAIR Manual (average time required: from 4 to 10 hours to complete all 46 faults in several sessions). *If the score is too low at level 1 and then at level 2, it would perhaps be better not to continue the repairs. It would probably be more beneficial to carefully re-read the REFREPAIR Manual and perhaps repeat the REFREPAIR program.*

2) Re-read the REFREPAIR Manual.

3) Second attempt using the PC (average time required: from 2 to 6 hours for all the repairs, in several sessions).

The User could, if he wished, repeat REFRIDIAG as often as necessary until a high enough score is obtained.

Note: These times are, of course, only indications, since they can vary enormously depending on the initial knowledge of the User.



REFRIDIAG has been designed for QUALIFIED technicians. When a User obtains a high score in REFRIDIAG, *having worked through the steps alone*, he should be capable of successfully solving most of the usual refrigeration problems that he might encounter on his own.

REFRIDIAG: THE SEQUENCE OF REPAIRS

Every time REFRIDIAG is run (*see: accessing the User Menu, page 26*), after a welcome message, the User is automatically taken to the relevant repair where his last score (in points and percentages) is displayed.

REFRIDIAG SAVES THE RESULT OF EVERY REPAIR CARRIED OUT BY EVERY USER. IT IS THEREFORE ENTIRELY POSSIBLE TO CARRY OUT THE 46 DIFFERENT REPAIRS IN 46 SEPARATE SESSIONS.

After each diagnosis, REFRIDIAG updates the User's score, archives it on the hard disk and offers the User the choice of continuing or of ending the session.

THE FAULTS ARE ALWAYS PRESENTED IN A RANDOM SEQUENCE.

This random order means that if a User who has completed the 46 repairs wants to re-start REFRIDIAG, then the order in which the faults appear in each level will be different each time.

The 46 faults are split into four levels of increasing difficulty:

Level 1: 5 faults

Level 2: 5 faults

Level 3: 11 faults

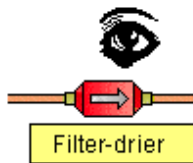
Level 4: 25 faults



Unless the configuration has been changed (*see page 25*), the User must complete all the level 1 faults before he moves on to level 2, and so on.

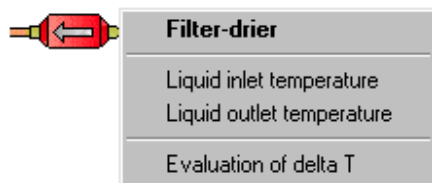
This allows the User to quickly become accustomed to using REFRIDIAG and to fall in with the aim of the program, that is: *to improve his effectiveness in performing repairs without the risk of any damage being done to equipment!* The User's progress will soon be apparent in the plant room. The success of REFRIDIAG since the appearance of the first version in 1993 is proof of this.

Note: For every repair situation presented, the program will act as if a client has called to say that the ambient temperature is too high. *At each level, the User arrives at the plant room and has to decide for himself what measurements to make or which inspections he needs to carry out.*



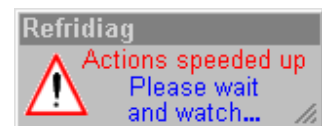
To make a measurement, or to make an inspection, the User should bring the mouse over the relevant equipment. When the cursor changes into an "eye", the name of the equipment will appear. **For example, bringing the mouse cursor onto the filter-drier will cause the image opposite to appear.**

The User should then Right-click the mouse to access the available menu (which depends on the level) and then click on the action that he wishes to perform



For example, in the first three levels, the User is presented with the choices shown opposite after clicking the right button of the mouse. All that is then needed is a simple click of the mouse.

When this box is displayed, it indicates that a lengthy procedure is underway (searching for a leak, dismantling of equipment, etc.). These activities are deliberately speeded-up. Be patient and carefully observe what is happening.

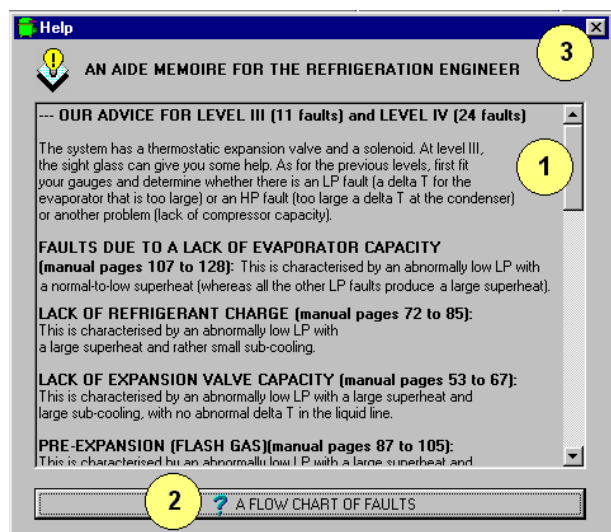



If the User has problems, he can click on the "Help" button.

A window like that shown opposite will then appear. The User may then consult the advice on what action to take. This advice is always appropriate for the level of difficulty involved.

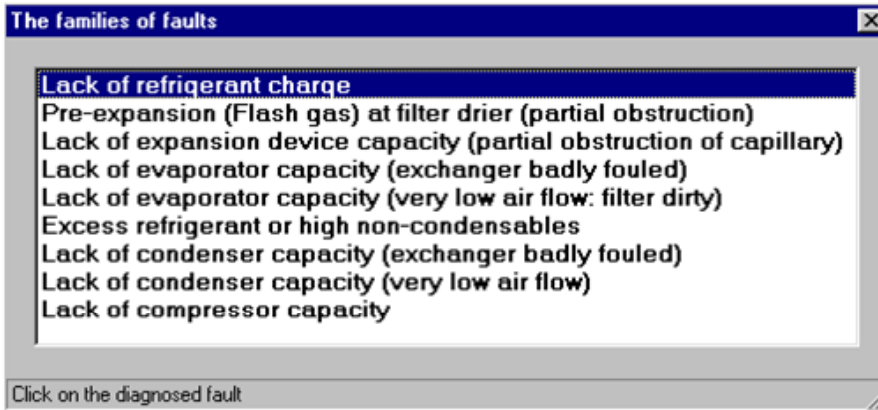
The slide bar can be used (marker 1) to scroll the text.

The User can also click on the bottom bar (marker 2) to display a fault flowchart relevant to the current level of difficulty. This is a helpful at-a-glance reminder.



Remember to always click on  (marker 3, previous page) to close a window and to return to an earlier screen.

When a User thinks that they have identified the fault as precisely as they can, they should click on the "**Diagnostic**" button.

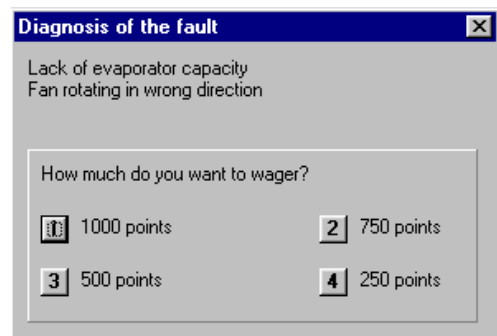


A window then appears with a list of faults appropriate to the current level of difficulty (Opposite is a window from level 1).

The User then clicks on the fault he has diagnosed.

FROM LEVEL II ON, THINGS GET A BIT MORE COMPLICATED: When you click on a family of faults, a second window appears with a choice of sub-families.

For example, at level II, when you click on "Lack of evaporator capacity", another window offers the choice between "Badly fouled exchanger", "Dirty air filter" and "another reason". If he is not sure, then the User can re-think his diagnosis by closing the window. Otherwise, the User chooses by clicking on the appropriate fault.



Now REFRIDIAG asks the User to place a 'bet' on his diagnosis (*the maximum amount he can wager will depend on the level of difficulty and the points he has already gathered*).

Note: Each User that starts REFRIDIAG receives 'capital' of 10,000 points and his percentage score is set at 99.9%.

Once the User has made his wager, REFRIDIAG responds using a personalised message.

- **If his diagnosis is correct**, REFRIDIAG displays a confirmation message and the User wins the points he has wagered.

He can then, if he wishes, continue to make measurements and inspections to explore the effects of the fault he has found on the operating parameters of the system.

- **If his first diagnosis is incorrect**, REFRIDIAG displays an explanation and the User loses the points he has wagered. REFRIDIAG offers the User a second chance to find the fault. When the first attempt is wrong, the User should start his line of reasoning over again, and should only put forward his second diagnosis when he is absolutely sure.
- **If the second diagnosis is still incorrect**, REFRIDIAG displays an explanation and the User again loses the points he has wagered.



Just as an unhappy client would look for another engineer, REFRIDIAG does not give the User a third chance to find the fault! On the other hand, a User who does not want to admit defeat can continue to take measurements and make inspections in an attempt to find the fault. This User, however, can no longer place bets.

In all of these cases, a User's score and percentage success score are updated after every wager.



The User can then click on the [**Continue**] button to move onto the next fault.



He can also click on the [**Quit**] button at any time to end the current session. After confirmation, REFRIDIAG then returns to the User menu. The fault currently displayed is not counted.





If he clicks on the [**Exit**] button, Refridiag also asks for confirmation before it returns to the User Menu. ***This action can be considered equivalent to "leaving the Plant Room".***

REFRIDIAG: REPAIRS at LEVELS I and II

The faults at level I (5 faults) and level II (5 faults) are demonstrated using a small installation equipped with a hermetic compressor and a capillary expansion device. To diagnose these first 10 faults, the User can carry out various inspections by bringing the mouse on to the equipment below and then right-clicking the mouse (see page 35).

- **HP-LP Gauges**
 - Fitting the gauges
 - Removing the gauges
- **Hermetic compressor:**
 - Measuring the suction side temperature
 - Measuring the discharge temperature
 - Touching the top of the compressor
 - Touching the bottom of the compressor
- **Air-cooled condenser:**
 - Measuring the liquid outlet temperature
 - Measuring the air inlet temperature
 - Measuring the air outlet temperature
 - Examining the condenser









-  **Filter-Drier:**
 - Measuring the liquid inlet temperature
 - Measuring the liquid outlet temperature
 - Measuring delta T
-  **Evaporator:**
 - Measuring the air inlet temperature
 - Measuring the air outlet temperature
 - Examine the evaporator
 - Examine the air filter

REFRIDIAG: REPAIRS AT LEVEL III

The repairs at level three (11 faults) are demonstrated using an installation fitted with a semi-hermetic compressor and a thermostatic expansion valve.

Depending on the fault, the liquid sight-glass "bubbles" just as it would in real life.










At this level, the User can carry out various inspections by bringing the mouse onto the following equipment:

-  **HP-LP Gauges**
 - Fitting the gauges
 - Removing the gauges
-  **Compressor:**
 - Measuring the suction side temperature
 - Measuring the discharge temperature
-  **Air-cooled condenser:**
 - Measuring the liquid outlet temperature
 - Measuring the air inlet temperature
 - Measuring the air outlet temperature
 - Examine the condenser
-  **Filter-Drier:**
 - Measuring the liquid inlet temperature
-  Measuring the liquid outlet temperature
-  Measuring delta T
-  **Solenoid Valve:**
 - Measuring the liquid inlet temperature
 - Measuring the liquid outlet temperature
 - Measuring delta T
-  **Evaporator:**
 - Measuring the air inlet temperature
 - Measuring the air outlet temperature
 - Measuring the expansion valve bulb temperature
 - Examine the evaporator
 - Examine the air filter

You can see a complete list of faults on page 40 onwards.

REFRIDIAG: REPAIRS AT LEVEL IV

The 25 faults at level IV are demonstrated on the same installation as earlier, but in addition, the User can perform more inspections on more of the equipment.

-  **Compressor:**
 - Measuring the suction side temperature
 - Measuring the discharge temperature
 - Examining the Identification Plate
 - Examine the motor terminal block
 - Measuring the current passing
 - Perform a mechanical check on the valves
-  **Condenser fan:**
 - Examining the Identification Plate
 - Examine the motor terminal block
 - Measuring the current passing
-  **Liquid receiver:**
 - Measuring the liquid inlet temperature
 - Measuring the liquid outlet temperature
 - Performing a pump-down test
 - Performing a non-condensable test
 - Check for leaks
-  **Filter-drier:**
 - Measuring the liquid inlet temperature
 - Measuring the liquid outlet temperature
 - Estimating the delta T
 - Check for leaks
-  **Solenoid Valve:**
 - Measuring the liquid inlet temperature
 - Measuring the liquid outlet temperature
 - Estimating the delta T
 - Examining the Identification Plate
 - Measuring the current passing
-  **Air cooled-condenser:**
 - Check for leaks
 - Measuring the temperature of the liquid outlet
 - Measuring the air inlet temperature
 - Measuring the air outlet temperature
 - Examining the condenser
 - Measuring the air flow
 - Check for leaks
-  **Expansion Valve:**
 - Making a full mechanical inspection
 - Check for leaks
-  **Evaporator fan:**
 - Measuring the bulb temperature
 - Examining the thermostatic line
 - Examining the capacity table
 - Checking the valve adjustment stem
 - Making a full mechanical inspection
 - Check for leaks
-  **Evaporator:**
 - Measuring the air inlet temperature
 - Measuring the air outlet temperature
 - Examining the evaporator
 - Examining the air filter
 - Measuring the air flow
 - Check for leaks
-  **Evaporator fan:**
 - Examining the Identification Plate
 - Examine the motor terminal block
 - Measuring the current passing
 - Full mechanical inspection

REFRIDIAG: A LIST OF THE 46 FAULTS

You will find below a listing of the 46 faults that correspond to the numbers displayed during a review of the results.

REFRIDIAG - Faults at Level 1:

1. Lack of refrigerant charge
2. Pre-expansion (Flash-gas) at the filter drier (partial obstruction)
3. Lack of evaporator capacity (air flow too small: dirty filter)
4. Excess refrigerant charge or high non-condensables
5. Lack of condenser capacity (condenser fouled)

REFRIDIAG - Faults at Level 2:

6. Lack of expansion valve capacity (partial obstruction)
7. Lack of evaporator capacity (evaporator fouled)
8. Lack of evaporator capacity (other reason)
9. Lack of condenser capacity - lack of air flow
10. Lack of compressor capacity

REFRIDIAG - Faults at Level 3:

11. Lack of refrigerant charge
12. Pre expansion (flash-gas) in the liquid line - blocked filter-drier
13. Pre-expansion in the liquid line - Liquid outlet valve partially closed
14. Pre-expansion in the liquid line - solenoid not opening fully
15. Lack of evaporator capacity - lack of airflow (dirty filter)
16. Lack of evaporator capacity - lack of airflow (other reason)
17. Lack of evaporator capacity - evaporator fouled
18. Lack of compressor capacity
19. Excess refrigerant charge or high non-condensable
20. Lack of condenser capacity - condenser fouled
21. Lack of condenser capacity - lack of air flow

REFRIDIAG - Faults at Level 4:

22. Lack of refrigerant charge / leak at compressor
23. Lack of refrigerant charge / leak at condenser
24. Lack of refrigerant charge / leak at evaporator
25. Pre-expansion (flash-gas) - obstruction between condenser and liquid receiver
26. Pre-expansion (flash-gas) between filter drier and solenoid valve
27. Pre-expansion - solenoid valve spindle bent
28. Lack of expansion valve capacity / badly adjusted expansion valve, closed too much
29. Lack of expansion valve capacity / valve orifice too small
30. Lack of expansion valve capacity / blocked expansion valve filter
31. Lack of expansion valve capacity / thermostatic line designed for use with R12

32. Lack of expansion valve capacity / MOP point of the thermostatic line too low
33. Lack of evaporator capacity / fan rotating in wrong direction
34. Lack of evaporator capacity / drive belt needs tightening
35. Lack of evaporator capacity / drive belt needs replacing
36. Lack of evaporator capacity / variable pulley of motor open too much
37. Lack of evaporator capacity / 60Hz motor on 50 Hz supply
38. Excess refrigerant or non-condensable / excess refrigerant
39. Excess refrigerant or non-condensable / very high non-condensable
40. Lack of condenser capacity / fan rotating in wrong direction
41. Lack of condenser capacity / motor star connected instead of triangle
42. Lack of condenser capacity / 60Hz motor on 50 Hz supply
43. Lack of compressor capacity / damaged LP valves
44. Lack of compressor capacity / damaged HP valves
45. Lack of compressor capacity / cylinder head gasket leaking between LP and HP
46. Lack of compressor capacity / internal safety valve leaking

REFRILEC: DETAILED DESCRIPTION

REFRILEC is at a level of difficulty situated between “beginners” and “intermediate”. REFRILEC is a training Software for electrical repairs, supported by a Window air-conditioning unit in the “single-phase current” part and an air conditioner with water-cooled condenser in the “three phase current” part.



Prior knowledge of refrigerating systems is not absolutely necessary, but we would highly recommend acquiring some basic notions (with REFRIBASE, for example).

REFRILEC: USING AND DURATION OF TRAINING

The professions of air-conditioning engineers are not easy ones.

Similarly, the REFRILEC software package can sometimes appear difficult *from an electrical point of view*. This is why **we would recommend that you proceed as follows:**

- 1) Study the REFREPAIR Manual** (average time required: from 10 to 20 hours, in several sessions). And study very carefully:
 - Single-phase motors, pages 339 to 358
 - Electric maintenance - initiation, pages 359 to 376
 - Miscellaneous electric problems, pages 377 to 383
 - Three phase motors - general, pages 442 to 448
- 2) Make a first attempt using the PC,** making corrections with the help of the REFREPAIR Manual (average time required: from 2 to 10 hours, in several sessions).

3) Make a second study of the Manual (average time required: from 5 to 10 hours, in several sessions).

4) Make a second attempt using the PC, alone, without using the REFREPAIR Manual, making final corrections by using the on-line help (average time required: from 2 to 6 hours, in several sessions).

A User who wishes to do so could run the REFRILEC Software as often as is needed until he achieves an 'excellent' score (more than 80%).

Note: These times are, of course, simply indications of what might be expected. The time taken varies enormously according to the User's initial knowledge.



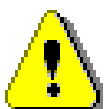
When a User obtains a good score using REFRILEC, and completes every step entirely on his own, he should be able to diagnose most of the usual electric repairs that he is likely to come across in the small plant room.

REFRILEC: THE SEQUENCE OF STEPS

Every time REFRILEC is run (see: *accessing the User menu, page 28*), the User is taken automatically to the appropriate step and his last score (as points and percentage) is displayed.

REFRILEC RECORDS THE RESULT OF EVERY QUESTION IN EVERY STEP FOR EVERY USER. **IT IS THEREFORE PERFECTLY OK TO QUIT A STEP WHENEVER YOU LIKE.**

After every answer, REFRILEC updates the score, archives it on the hard disk and provides the User with the choice of continuing or of ending the session.



Each Step considers a principal theme or a particular equipment configuration. The progressive nature of the problems posed and the different methods used to formulate questions encourage the acquisition of knowledge, which can quickly be put to use in the plant room.

This is a tried and tested self-teaching approach, used since the first version of REFREPAIR appeared in 1990.

REFRILEC: THE THEME OF EACH STEP

SINGLE-PHASED equipment (Window air-conditioning unit)

Step 1: Single-phase, single-speed motors.

How to spot windings with an Ohmmeter?

How to measure insulation resistance? Breakdown diagnostics.

- Step 2:** Run and start capacitors.
How to differentiate between them and test them?
Breakdown diagnostics.
- Step 3:** Wiring capacitors on single-phase motors. Choice of capacitors.
- Step 4:** Current relays. How to recognize, test and install them?
Breakdown diagnostics.
- Step 5:** Voltage relays. How to recognize, test and install them?
Breakdown diagnostics.
- Step 6:** Multi-speed Single-phase motors. How to spot windings with an Ohmmeter?
- Step 7:** Air-conditioning unit control panel. How to spot and test the switches, speed selectors and thermostats?
- Step 8:** Drawing up the electrical diagram and wiring the air-conditioning unit.
Measuring the voltage with the unit switched off. Interpreting the results.
- Step 9:** Starting up the fan. Measuring the voltage and amperage for different ventilation speeds. Interpreting the results.
- Step 10:** Starting up the compressor. Breakdown diagnostics. Modifying the wiring.

THREE-PHASE equipment (support: small air-conditioning unit)

- Step 11:** Three-phase motors with single and dual voltage. How to spot windings with an Ohmmeter? Breakdown diagnostics.
- Step 12:** Wiring the fan contactor and starting it up. Voltage at the different points. Interpreting the results. Breakdown diagnostics.
- Step 13:** Wiring the compressor contactor and starting it up. Voltage at the different points. Interpreting the results. Breakdown diagnostics.

After every answer, the cumulative score (in points and as a percentage score) is updated. REFRILEC comments briefly on the answer given by the User and indicates the page of the Manual where additional information can be found. This ensures that effective auto-correction takes place.

Unfortunately you've fallen into the trap! If you want an explanation [click here](#)

Explanations: manual page 316

Clicking on the commentary accesses on-line help, which allows the User to consult (on screen) the appropriate pages of the REFREPAIR Manual.

In total, REFRILEC 4 poses 200 different questions throughout its 13 steps (unless the configuration has been changed - see page 25).

At the end of every question, REFRILEC archives the results on the hard disk and gives the User the choice of continuing or ending the session.

When a User chooses to end the session, then at the start of the next session, REFRILEC will bring him back to exactly the same point at which he left the program.

DETAILED DESCRIPTION OF CHILREPAIR

CHILREPAIR, the first program of the "Water Family", is at an "intermediate" level.

CHILREPAIR is training Software for refrigeration repairs that uses examples of air conditioning systems involving the use of water and which may be using several various refrigerants.



If a User has little or no knowledge of refrigeration systems, it is strongly recommended that they start by using REFRIBASE and then REFREPAIR, and fully master these programs before trying to get to grips with CHILREPAIR.

CHILREPAIR: USING AND DURATION OF TRAINING

Refrigeration and A/C skills are not easy to acquire. Similarly, the refrigeration and/or hydraulic aspects of CHILREPAIR may at times appear to be difficult.

This is why ***we would recommend that you proceed as follows:***

- 1) Study the REFREPAIR Manual** (average time required: from 10 to 20 hours, in several sessions).
- 2) Make a first attempt using the PC**, making corrections with the help of the on-line HELP and REFREPAIR Manual (average time required: from 4 to 12 hours, in several sessions).
- 3) Make a second study of the Manual** (average time required: from 5 to 10 hours, in several sessions).
- 4) Make a second attempt using the PC**, alone, without using the REFREPAIR MANUAL, making final corrections by using the on-line help (average time required: from 4 to 10 hours, in several sessions).

A User who wishes to do so could run the CHILREPAIR Software as often as is needed until he achieves an 'excellent' score.

Note: These times are, of course, only indications, since they can vary enormously, depending on the initial knowledge of the User.

When a User obtains a good score using CHILREPAIR, and completes every step entirely on his own, he should be able to diagnose most of the usual problems that he is likely to come across in the plant room.

CHILREPAIR: THE SEQUENCE OF STEPS

Every time that the program is run, the User is taken automatically to the appropriate step and his last score (as points and percentage points) is displayed.



CHILREPAIR records the results of *every question in every step for every User*. **It is therefore perfectly OK to quit a step whenever you like.**

After every answer, CHILREPAIR updates the score, archives it on the hard disk and provides the User with the choice of continuing or ending the session. Each Step considers a particular refrigeration theme or a particular equipment configuration.

The progressive nature of the problems encountered, and the different methods used to present the questions result in a genuine improvement in knowledge, which is immediately of use on site or in the plant room.

This is a tried and tested self-teaching approach, used since the first version of REFREPAIR appeared in 1990.

Computer room air-conditioning units with water-cooled condensers.

- **Step 1:** Getting to know the installation.
- **Step 2:** Starting up. Fitting gauges, interpretation of the measurements obtained using different refrigerants (with and without temperature glides).
- **Step 3:** Fitting and adjusting a constant pressure valve.
- **Step 4:** Analysis of some refrigeration faults.
- **Step 5:** Faults specific to water-cooled condensers.

Chilled water plants with air-cooled condensers feeding several fan-coil units.

- **Step 6:** Getting to know the installation.
- **Step 7:** Starting up the installation and analysis of some faults specific to this type of equipment.
- **Step 8:** Basic repairs on the water system.
- **Step 9:** Various repairs on the installation.
- **Step 10:** Detailed analysis of various refrigeration faults.
- **Step 11:** Detailed analysis of various hydraulic faults.

Chilled water plant using a water-cooled condenser with multi-tubular heat exchangers.

- **Step 12:** Getting to know the installation.
- **Step 13:** Electrical problems associated with this type of equipment.

Air handling plant equipped with a chilled water cold unit.

- **Step 14:** Getting to know the installation.

Air handling plant supplied by a chilled water plant.

- **Step 15:** Problems associated with the control of the chilled water plant/air handling plant arrangement. Specific equipment.

Chilled water plant using a water-cooled condenser with multi-tubular heat exchangers.

- **Step 16:** Connection of the condenser and repairs specific to this type of equipment.

Chilled water plants with condensation using well water.

- **Step 17:** Various problems associated with this type of installation.

Chilled water plant using an air-cooled condenser

- **Step 18:** Various refrigeration problems.

Chilled water plant using a water-cooled condenser with an open cooling tower.

- **Step 19:** Operation of the tower and basic psychometry.
- **Step 20:** Control of the tower, and problems specific to this type of equipment.

Chilled water plant using a water-cooled condenser with a closed cooling tower.

- **Step 21:** Various problems associated with this type of installation.

Eff. : 4500 pts (30.2%)

After every answer, the cumulative score (in points and as a percentage score) is updated.

CHILREPAIR makes brief comments on the User's answer and offers him the chance (by clicking on the area shown) to access extracts from the REFREPAIR Manual on the screen.

Unfortunately you've fallen into the trap! If you want an explanation [click here](#)

Explanations: manual page 316

These provide additional information on the problem in question, and the result is an effective self-correction facility.

In total, CHILREPAIR poses 330 different questions, spread out over 21 Steps (unless the configuration has been changed – see page 25). At the end of every question, CHILREPAIR archives the results on the hard disk and gives the User the choice of continuing or ending the session.

When a User chooses to end the session, then at the start of the next session, CHILREPAIR will bring him back to exactly the same point at which he left the program.

HYDRAUREPAIR: USING AND DURATION OF TRAINING

HYDRAUREPAIR is at a level of difficulty situated between “intermediate” and “confirmed”.



Prior knowledge of refrigerating systems is not absolutely necessary, but we would highly recommend acquiring some basic notions (with CHIL-REPAIR, for example).

The professions of refrigeration and air-conditioning engineers are not easy ones. Similarly, the HYDRAUREPAIR software package can sometimes appear difficult from an electrical point of view. This is why we would recommend that you proceed as follows:

- 1) **Study the REFREPAIR Manual** (average time required: from 10 to 20 hours, in several sessions).
- 2) **Make a first attempt using the PC**, making corrections with the help of the REFREPAIR Manual (average time required: from 2 to 10 hours, in several sessions).
- 3) **Make a second study of the Manual** (average time required: from 5 to 10 hours, in several sessions).
- 4) **Make a second attempt using the PC**, alone, without using the REFREPAIR Manual, making final corrections by using the on-line help (average time required: from 2 to 6 hours, in several sessions).

A User who wishes to do so could run the HYDRAUREPAIR Software as often as is needed until he achieves an 'excellent' score (more than 80%).

Note: These times are, of course, simply indications of what might be expected. The time taken varies enormously according to the User's initial knowledge.



When a User obtains a good score using HYDRAUREPAIR, *and completes every step entirely on his own*, he should be able to diagnose most of the usual hydraulic repairs that he is likely to come across in the plant room.

HYDRAUREPAIR: THE SEQUENCE OF STEPS

Every time HYDRAUREPAIR is run, the User is taken automatically to the appropriate step and his last score (as points and percentage) is displayed.

HYDRAUREPAIR RECORDS THE RESULT OF EVERY QUESTION IN EVERY STEP FOR EVERY USER. IT IS THEREFORE PERFECTLY OK TO QUIT A STEP WHENEVER YOU LIKE.

After every answer, HYDRAUREPAIR updates the score, archives it on the hard disk and provides the User with the choice of continuing or of ending the session.



Each Step considers a principal theme or a particular equipment configuration. The progressive nature of the problems posed and the different methods used to formulate questions encourage the acquisition of knowledge, which can quickly be put to use in the plant room.

This is a tried and tested self-teaching approach, used since the first version of REFREPAIR appeared in 1990.

HYDRAUREPAIR: THE THEME OF EACH STEP

- Step 1** Installation of a small liquid chiller with a series of terminal units. Where should the pump be installed?
- Step 2** Installation of the expansion chamber. Safety valve. Operating pressure. Filling operation and system purging procedure,
- Step 3** Start running the chilled water pump. Pressure heads in a closed circuit. Pressure drop across the evaporator. Relationship between flow and pressure. Pump curves.
- Step 4** Total Head of a pump. The total pressure drop across the system. Differential pressure-switch. $\Delta\theta$ for the water between the inlet and outlet of the evaporator.
- Step 5** Using a trend table: Diagnosis of a fault from its symptoms. Finding the only impossible fault from measurements displayed. From the operating conditions shown, what is the most likely fault?
- Step 6** Plant room with an Air Handling Unit. Connect the chiller unit to the chilled water system. Installation of a 3-way valve
- Step 7** Installation of the circulator and expansion chamber. Control thermostat, Flow switch, differential pressure switch and anti frost control.
- Step 8** Flow of water. Pressure drop between the inlet and outlet of the evaporator. Total pressure drop across the system. Circulator graph, network graph and adjustment of the circulator speed.
- Step 9** Twin circulators. Compressor control. Readings with the system running normally. Diagnosis of a fault from measurements made.
- Step 10** Adjustable flow circulators. Primary circuit with 2 secondary circuits. Flow through the circulators. Pressure-break cylinder. Various repairs.
- Step 11** Condenser connected to a potable water supply. Annual water consumption. Various repairs. Recovery unit.
- Step 12** Supply the water-cooled condenser using a supply of well-water. NPSH of a pump. Cavitation in pumps. Multistage pump.
- Step 13** Installing a dry-cooler. Glycol solution. Installation of the circulator and expansion chamber. HP repairs.
- Step 14** Condenser connected to an open cooling tower. Measurement of the various pressures (pump off).
- Step 15** Open cooling tower. Measurement of the various pressures (pump on). Pressure drops.
- Step 16** Pressure drop of a filter. The filter becomes blocked. Total Head of the pump. Pump graph.
- Step 17** Hydraulic breakdown training session.
- Step 18** Repairs with cooling towers (de-concentration, float valve, scaling, filter blocked, tower nozzles, tower pump, valves, tower fan, etc).
- Step 19** Repairing various breakdowns. Cavitation of the pump.

- Step 20** Indirect cooling towers. Expansion chamber under or over-inflated. Add glycol solution. Purge of the hydraulic system. Various repairs.
- Step 21** Check the nitrogen pressure in the expansion chamber. Expansion chamber located at the pump inlet / outlet.
- Step 22** Breakdown training session (liquid chiller + cooling tower + Air Handling Unit)
- Step 23** Finding the only impossible fault from measurements displayed.

After every answer, the cumulative score (in points and as a percentage score) is updated. HYDRAUREPAIR comments briefly on the answer given by the User and indicates the page of the Manual where additional information can be found. This ensures that effective auto-correction takes place.

Unfortunately you've fallen into the trap! If you want an explanation [click here](#)

Explanations: manual page 316

Clicking on the commentary accesses on-line help, which allows the User to consult (on screen) the appropriate pages of the REFREPAIR Manual.

In total, HYDRAUREPAIR poses 330 different questions throughout its 23 steps (unless the configuration has been changed - see page 25). At the end of every question, HYDRAUREPAIR archives the results on the hard disk and gives the User the choice of continuing or ending the session. When a User chooses to end the session, then at the start of the next session, HYDRAUREPAIR will bring him back to exactly the same point at which he left the program.

QUESTIONS / ANSWERS / FAQ

This chapter contains some of the answers to questions that may be asked about REFRIBASE, REFREPAIR, REFRIDIAG, REFRILEC, CHILREPAIR, HYDRAUREPAIR and the MANAGER.

1) I've just bought the Software. Can I use it on more than one PC?

The development of each piece of Software (and their corresponding technical Manuals) represents thousands of hours of work. It has involved an enormous effort in terms of ingenuity, research and production.

For these reasons, all our Software is supplied on a licence basis. It is protected against copying, and registered with the Software Protection Agency. This body has the power to act against counterfeiters and Software pirates. Furthermore, the law provides protection for authors against pirating of Software and Manuals. The penalty for pirating these goods can be up to Euros 150,000 and from 3 months to two years prison.

The installation of the Software involves copying all the files needed to run the programs onto your hard disk. It also involves installation of the appropriate USB Protection key.

YOU CAN INSTALL A PROGRAM ON SEVERAL PCS, BUT THE SOFTWARE WILL ONLY RUN ON A PC IF THE APPROPRIATE SECURITY KEY IS INSTALLED IN THE USB PORT OF THE PC.

If you have a particular requirement for several keys, then contact your supplier for details of the significant price reductions to be made with the purchase of multiple copies of the Software!

2) How do I uninstall a program?

The same program is used to install and uninstall all Software. To uninstall (or install) any other Software you MUST have administrator access rights. It is highly recommended that you close all other applications beforehand and return to the Windows desktop.

1) Place the installation CD-ROM into the drive of your PC and close the drive. With most PCs, the drive will run automatically after a few seconds, and will load the installation program. ***If this does not happen, see page 6 the way to proceed.***

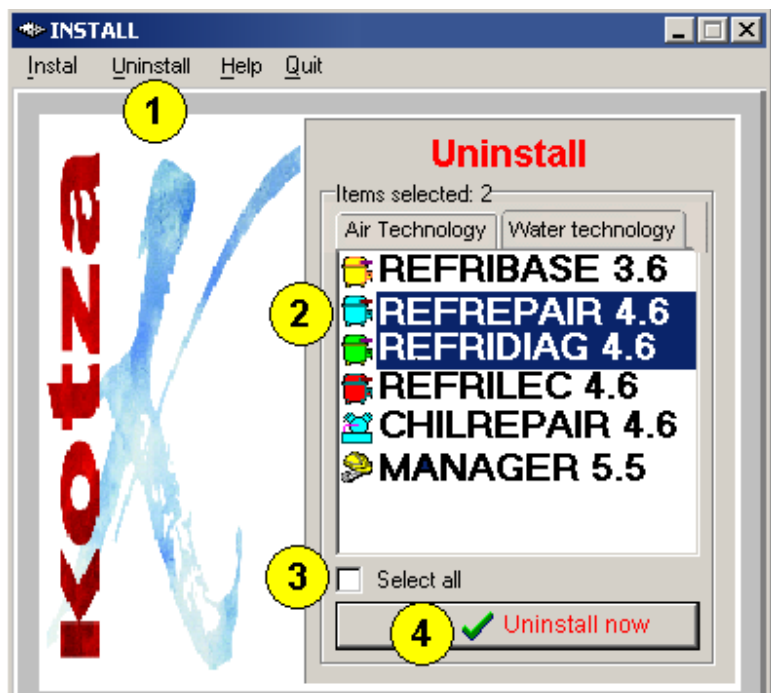
The time the program takes to install will depend on the speed of your CD-ROM drive, but should be less than a minute or so.

2) When the installation screen appears, click on "Install commercial programs"

A warning message is then displayed, asking you to confirm that you have the security key (dongle). Respond by clicking on [Yes] - **the key is not actually needed to install or uninstall programs.**

A new screen will then be displayed (If a program has not been installed, then it will not appear on the list.)

3) Click on [Uninstall] on the installation program menu bar (marker 1) then on the [Air technology] or [Water technology] tab according to the Software you wish to uninstall.



Then **select the program(s) that you wish to uninstall from the list** (marker 2).

You can also click on [**Select All**] (marker 3) directly to select all the programs.

When you have selected the program(s) to uninstall, click on [**Uninstall Now**] (marker 4).



Unless you are not uninstalling all of the programs, DO NOT UNINSTALL the MANAGER utility. This will still enable you to use the MANAGER features for use with the programs that are still installed on your PC.

If you have followed the instructions correctly, then towards the end of the uninstall sequence for each program, a message will appear telling you that the uninstallation has been successfully accomplished. *Otherwise, after a short period, the uninstallation will continue automatically. The total time taken to uninstall the Software will depend on the performance of your PC, but it should not take more than about 1 or 2 minutes per program.*



Above all, always remember to retrieve the security key from the USB port of your PC. You will need it if you want to use the Software on another PC!

3) How do I reinstall a Software on another PC?

You can only install Software on a PC if it is not already installed on that PC. If it is not installed, then simply use the installation procedure *described on page 6*. To uninstall Software, *read the previous question*.

22

4) The screen colours are wrong and /or change suddenly.

The various parts of a refrigeration system appear randomly on the screen.

This is actually a graphics problem. What do I do?

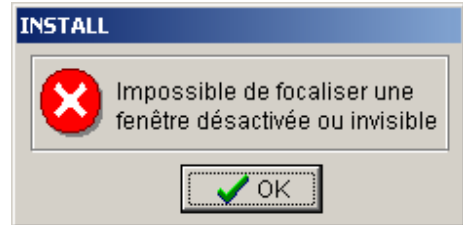


Remember that in order to operate correctly, all our Software needs a minimum of an 800 x 600 points in 65536 colours graphics card.

- **If the colours are wrong and tend to change suddenly, your system is configured for less than 65536 colours (e.g. it could be in 256-colour mode).**

- If the refrigeration system components seem to appear randomly on your screen, your system is configured for a graphics resolution of less than 800 x 600 points (you are perhaps using a 640 x 480 points resolution), or you are configured for "large fonts" instead of "small fonts".
- If this error message in French appears, the PC is set to large Fonts. **Set it to Small Font (or 96 dpi) and it may working OK.**

If your screen is configured for 1024 x 768 points, then the Software will run quite normally in a slightly smaller window.



This is usually not a problem if you are using a 19" or larger screen.

Whatever configuration you are using, you should have experienced exactly the same graphics problems on your PC with the free demonstration version of the Software.

High quality graphics will be produced on most screens in 800 x 600 or 1024 x 768 points mode with small fonts and 65536 colours.

You can **check** your graphics configuration easily by right-clicking on the Desktop background (on any area where there is no icon).

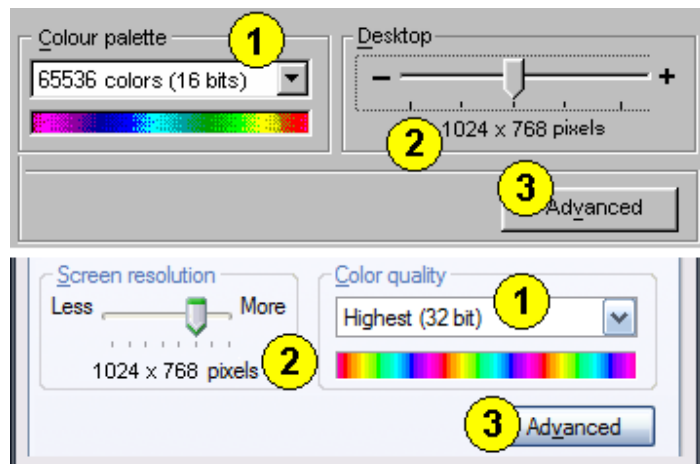
- **With W2000 or XP**, click on [**Properties**] and then on [**Configuration**] or [**Settings**]
- **With Vista or Seven**, click on [**Graphics Properties**] and then on [**Display settings**].

Note: Depending on the operating system of your PC, you might have slightly different terminology, but the general meaning will be the same. For example, you might see "Settings" instead of "Configuration", "Colours" instead of "Colour Palette", "Screen Area" or "Screen resolution" instead of "Desktop". You might then see:

Marker 1: "Colour palette" or "Color quality" 65536 colours or 16 bit, which is the *minimum required*.

Marker 2: "Desktop" or "screen resolution" 800 x 600, which is the *minimum required*.

Marker 3: **W2000 or XP** the font size is accessed by clicking [**Advanced**] and then on [**General**]. Then click on "small fonts" or "96 dpi"



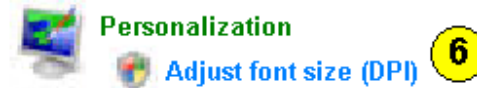
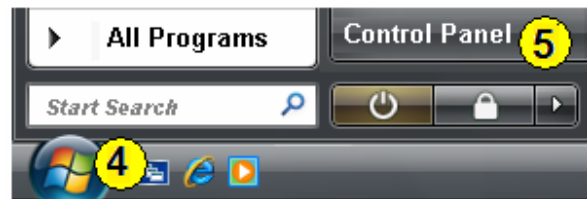
With Vista or Seven, Click on Windows icon (marker 4) then on [Control Panel] (marker 5).

Now type **Adjust font size** (marker 6) in the search box.

It will take you directly to the link for the **DPI Scaling Utility**, then Click on **96 DPI**



If you have limited experience in using a PC then do NOT change your configuration, as under some circumstances this could cause your PC to "crash".



In this case you should consult the supplier of your PC about a new graphics card (these are now relatively cheap) or install your Software on a newer PC.

5) The bottom of the screen is hidden, and I can't see my score.

With some PCs in 800 x 600 mode, the Taskbar (usually found at the bottom of the screen) can sometimes obscure the score.

To remedy this, right-click on the right bottom of the screen, then click on [**Properties**] and then on [**Auto Hide**].

The same problem can also occur with the tool bar (often found at the right of the screen). Click on the background of the toolbar and then click on [**Auto Hide**].

6) When I try to run a program, an error message is displayed. What should I do?

You should be able to avoid this problem if you have the minimum required configuration and have **precisely** followed the installation, operation and uninstall procedures described in this Manual.



If you obtain an error message whilst using any of the Software, you should first make a careful note of the complete message displayed and perhaps print a copy of the screen.

An error message could originate in several ways:

- **Windows** error messages are generally obvious to see and are usually self-explanatory.
- **The error messages for our Software are also usually fairly explicit.**

For example, the **MANAGER** may display the messages below:

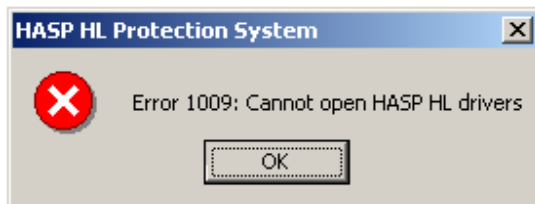
- On the left, you are trying to review the results obtained by a User who hasn't started the program, and so this is impossible.
- Opposite you are trying to run an application when the appropriate USB security key is not present in the USB port of the PC.



Remember that without the USB key, the program will not run.



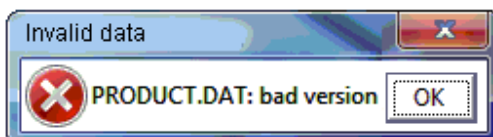
A "REFRIBASE" KEY (FOR EXAMPLE) WILL ALLOW YOU TO RUN REFRI-BASE AND THE MANAGER ONLY, BUT WILL NOT ALLOW REFREPAIR, REFRIDIAG, REFRILEC, CHILREPAIR OR HYDRAUREPAIR TO RUN.



This error 1009 message indicates that the USB key driver is not correctly installed.

Try to take the USB key off and put it back in another USB port.

If necessary, uninstall and then reinstall the manager (in order to reinstall the key driver).

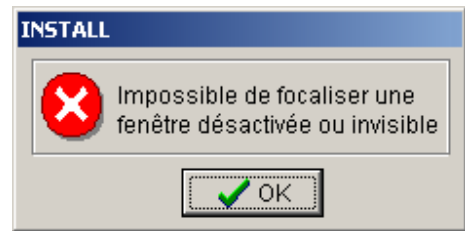


With VISTA or SEVEN, if an error message like opposite is

displayed when you click on any of the program icons, right-click on the icon of the program and then click on "Run as administrator", then allow the program to run.

On the right, **the error message in French** indicates the PC is set to large Fonts.

Set it to Small Font (or 96 dpi) and it may working OK (refer to question 4 on page 51).



A program will only run if the appropriate key is in the USB port of the PC and if all the files for the program concerned are present on your hard disk.

If your PC "crashes" when you try to run a program, check that the correct dongle is properly connected to the USB port. **If you have Anti-virus Software installed on your PC**, try deactivating it in order to check that the Software is operating correctly (naturally all our Software is guaranteed to be virus-free). **You should ensure that the PC is not carrying a virus.**

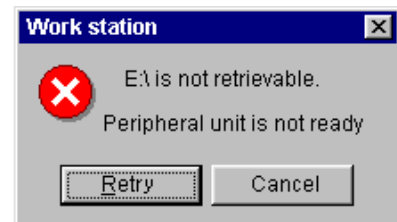


This is not an exhaustive list. Always make a careful note of any error messages and send it to Kotza@kotza.com. Without this being done, we may not be able to help you.

Other error messages may be displayed by other utilities running on your PC (e.g. anti-virus Software). These messages are frequently due to incorrect configuration of these utilities (consult the appropriate user Manual) or sometimes user error. Note that some messages can also be produced when Windows "crashes".

Some Examples of Error Messages:

You have inserted the CD in the wrong drive, or it is badly inserted (or upside down!) or you have made an error typing in a command (e.g. you have typed [E:demo] Instead of [D:demo]). Check that everything is correct and repeat the operation.



In most instances, you will be able to remedy the problems yourself by following the instructions given by the error message or by consulting you PC operating Manuals.

You will naturally appreciate that we can only help you with a problem if we have all the necessary information.



So if the fault persists, you should make a careful note of any messages that are displayed, of what programs were running at the time any faults occurred, the make and specification of your PC, the processor type, amount of memory available etc.

You should only contact your supplier when you have done all this.

7) An Error message freezes the PC. What should I do?

This type of message can occur after a user error or when Windows "crashes". *To make sure that this is the cause, re-start your PC and then run the Software once more.* If the fault persists, **make a careful note of the message displayed as well as the precise circumstances in which the problem occurred.** You should then consult your supplier (*see also the response to the previous question on page 53*).

8) What happens if I get a virus in my system?

Unfortunately for everyone, computer viruses are becoming increasingly widespread. Some are relatively harmless, but others can have an effect on your data that is **as destructive** as the effect of the AIDS virus on human life. Every time you insert a disk or CD of dubious origin (especially a "pirated" disk) into your PC **you may be responsible** for introducing such a virus onto your system. The same risk exists when you download Software from the Internet.

It is therefore strongly recommended that you equip your system with recent anti-virus Software, and that it is regularly updated - new viruses make their appearance every day.

Our CD-ROMS are naturally guaranteed to be virus free from the outset. In addition, to avoid producing any false alarms, the installation procedure does not involve any modification of system files.

9) I've forgotten my password. What should I do?

See paper manual



If you leave the paper Manual "lying around", then unauthorised persons might be able to use this procedure to change your password or gain access to the MANAGER. BE WARNED!

10) A User has forgotten his password; another User wants to change his password and yet another wishes to remove it. How can I do all this?

Turn to the chapter "Allocating a password to a User" on page 17 to learn how to carry out all these procedures.

11) A User's password isn't requested by all the programs that are installed on the PC. What has happened?

To begin with, you should read the chapter "Allocating a password to a User", page 17. **Note:** for the Group "TESTS" in REFRIBASE (for example), if you allocate a password "DAD" to a User called "JACK", this password will not be requested for a user "JACK" who belongs to another group in REFRIBASE or another program.

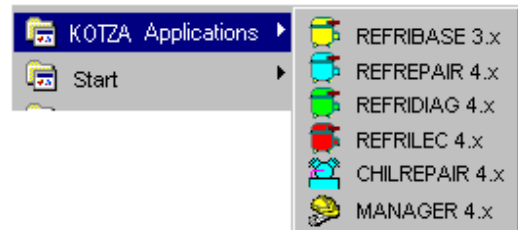
When you wish to add the users in a Group to another program, always use the option "Copy a Group" as described on page 14. In this way, you will not only avoid having to re-type all the names, but all existing password for each User will be copied into the new Group that this options creates.

12) The MANAGER icon is not displayed on my Desktop. What should I do?

First, check that the MANAGER has actually been installed.

With NT/W2000/XP, click on [Start] at the bottom left of the screen, then on [Programs], then on [KOTZA Applications].

With Vista or Seven, click on click on Windows icon at the bottom left of the screen, then on [All Programs], then on [KOTZA Applications].

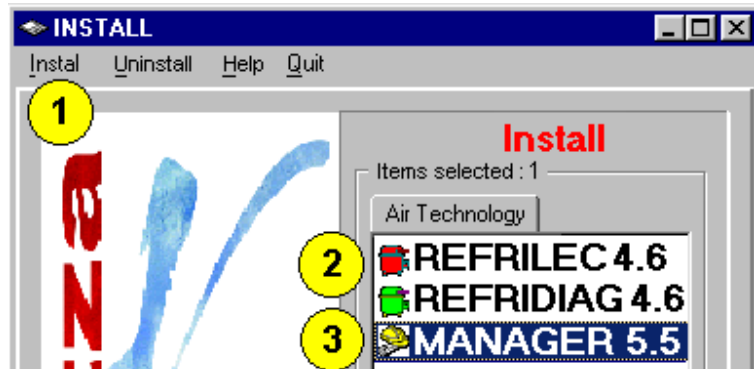


The programs that are installed will be listed in the window that this displays. If the MANAGER is listed there, then the icon that was on the Desktop has somehow been deleted. You can still run the MANAGER by clicking on the icon in the window that has just been displayed.

If the MANAGER is not found in the window, then the instructions in the "Installing the Software" chapter on page 6 have not been correctly followed. For example, the MANAGER may not have been installed at all, or some of the Software may have been installed on different hard disks.

Follow the installation instructions carefully on page 6 to 7 again. You should obtain a screen that is very similar to that shown opposite.

Click on "Install" (marker 1). The list of Software that is not installed is displayed on the right (marker 2) including the MANAGER. Select the MANAGER (marker 3) and then click on "Install now".



Then follow the program instructions. If you are unsure of the procedure, *it is explained more fully page 8 onwards.*

13) The Software runs on a PC under Windows 2000/XP/Vista/Seven but will it run on a Mac or under Linux?

Our Software will not run on Mac hardware, even using PC emulator utilities. The Software protection system used will not allow this.

All our Software is written using C++ and if use of Linux continues to grow, and if there is sufficient demand, we will develop a Linux version.

14) I have deleted a group in error. Can I retrieve it?

Unfortunately, any Groups that you have deleted can never be recovered.

The MANAGER provides a number of precautions against this situation arising: it requests a password, allows Escape options at all stages, and displays warning messages, all to prevent this very situation happening.

15) How is Training undertaken using the Software?

At the MANAGER, add your name (or an alias) to an existing Group, or add a group containing only your name.

You will be able to work through the entire program using this name (see pages 13 and 15).

16) What happens if there is a power-cut during a session?

Since every program updates its files after every Repair, everything would be just as if the User hadn't started the question being worked on at the time of the cut.

17) Does the time taken for Repairs affect the score?

- In **REFRIBASE, REFREPAIR, REFRILEC, CHILREPAIR and HYDRAUREPAIR**, time is not taken into account. Only the quality of the answers matters. This is worth pointing out to those Users who obtain poor scores because they are trying to rush through the program!
- With **REFRIDIAG**, during the period when a User is searching for a fault, every measurement and inspection will be "timed" using a virtual counter.

For example, a temperature measurement will cause the "time" the User spends to increase by 30 seconds.

When the supervisor then reviews the timer in the **MANAGER**, he can see the number of measurements and inspections that a User has performed. This value is simply a reflection on the quality of the User's fault-finding skills.

In reality, the *actual* time that has elapsed (including time to think the problem over, to refer to Manuals, or due to any other distraction, etc.) is not taken into account.

The problem solving process itself is considered the most important factor, not the time taken. ***For more detail see: "Results in REFRIDIAG", page 21.***



As a rough guide, a highly skilled repair engineer should diagnose all the faults in REFRIDIAG and obtain a score more than 80% in a "virtual" time of less than four hours.

18) A User enters his name incorrectly, and then inadvertently confirms it. What should he do?

All the programs have precautions to prevent such a mistake being made. In this instance, the User should immediately click on [**terminate**] to quit the program. If he has made a wager, the score will have been altered, and it will not be possible to reverse this.

The User's name and the number of his Group are continually displayed at the bottom left of the display window of each program. This will allow the Supervisor to quickly be made aware of this sort of error.



In addition, the **MANAGER** allows the Supervisor to configure each program so that Users must input their name and/or a password before they start a session.

To allocate a password to a User, see page 17.

To learn how to configure the Software, see page 24.

19) A User wants to start a program over again. What does he need to do?

From the **MANAGER**, use the [**Add a User**] option (see page 15) to include him once more under another name, or use different spelling e.g. you could use SMITH - J instead of SMITH.

The User could then work through the program a second time, thus allowing the supervisor to assess the progress made by the User between the two attempts.

20) What sort of score should be obtained using the programs?

Just as a reminder:

- In the "**Air Technology / Air Family**" REFRI~~BASE~~ is at a "beginner" level of difficulty, REFREPAIR is at an "intermediate" level, REFRIDIAG is at "qualified" level, And REFRI~~LEC~~ is at a level between "beginner" and "intermediate".
- In the "**Air Technology / Water Family**", CHILREPAIR is at an "intermediate" level.

In the "**Water Technology / Water Family**", HYDRAUREPAIR is at an "intermediate" level.



It is recommended that REFRI~~BASE~~ be fully understood before you try to get to grips with REFREPAIR, and that you should, in turn, have mastered REFREPAIR before trying to get to grips with REFRIDIAG, REFRI~~LEC~~ or CHILREPAIR.

In all our Software, the actual points scored are really of little interest.

- For **REFRI~~BASE~~**, the maximum score at the end of the 10 Steps is 99.9%. This implies that the User has made no errors, and that REFRI~~BASE~~ has stayed at level three throughout all that User's sessions.

At the first attempt, "poor" Users can finish with a score of about 35 to 50%. The best Users can exceed 60%. However, to exceed 80% (which can be regarded as an excellent score), most Users need several attempts at the full programs.

- For **REFREPAIR (28 steps) or REFRILEC (13 steps)**, the maximum score at the end of the steps can be 99.9%. At the first attempt, "poor" Users can finish all the steps with a score of about 50 to 60%. The best Users can exceed 70%. However, to exceed 80% (which can be regarded as an excellent score), most Users need several attempts at the full programs.
- For **REFRIDIAG**, the maximum score at the end of 46 repairs can be 99.9%. At the first attempt, "poor" Users can finish all the repairs with a score of about 40 to 50%. The best Users can exceed 60%. However, to exceed 80% (which can be regarded as an excellent score), with a reasonable time score, most Users need several attempts at the full programs.

*As a rough guide, **a highly skilled repair engineer should be able to diagnose all 46 faults in REFRIDIAG and obtain a score of more than 80% in a "virtual" time of less than four hours.***

- For **CHILREPAIR**, the maximum score at the end of the 21 steps can be 99.9%. At the first attempt, "poor" Users can finish all the steps with a score of about 40 to 50%. The best Users can exceed 60%.

However, to exceed 80% (which can be regarded as an excellent score), most Users need several attempts at the full programs.

- For **HYDRAUREPAIR**, the maximum score at the end of the 23 steps can be 99.9%. At the first attempt, "poor" Users can finish all the steps with a score of about 30 to 40%. The best Users can exceed 50%. However, to exceed 80% (which can be regarded as an excellent score), most Users need several attempts at the full programs.

21) What is the meaning of the icons in the Groups and Users Windows?

In the Groups Window:

- Icon 1: the Supervisor has reconfigured the selected software (see page 26)
- Icon 2 appears when the Supervisor copy a group from one software to another one (see page 14).

In the User Window:

- Icon 3: the Supervisor has authorized the User to configure the software at start-up (see page 18)
- Icon 4: the Supervisor has allocated a password to the User (see page 17).



**22) Is there any other similar Software available?
How can I get information about it?**

We will be pleased to keep you informed of any additions to our range of products.

Just Email us, if you wish, with your correct (and full) name and address, or any change of address, at: kotza@kotza.com

We will then send all our clients demonstration versions of new products as soon as they appear on the market.

Since our foundation in 1990, we have always taken our client's remarks and suggestions into account when making improvements to our products.

For this reason, we will continue to welcome your comments.

Thank You.



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