

## FOREWORD

The information contained in:

- the "Refrigeration Family products": **REFRIBASE**, **REFREPAIR**, **REFRIDIAG**, **REFRILEC** 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**.

**All rights reserved. All reproduction of all or any parts of these products in any way or by any method whatsoever is explicitly forbidden. Any unauthorised reproduction or distribution is punishable under the legislation safeguarding the rights of authors.**

**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.**

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.

*If you require any further information, please contact:*

**KOTZA INTERNATIONAL – Le Chêne – 05130 TALLARD (France)**  
Tel.: **+33 (0) 492 540 733** - Fax: **+33 (0) 492 540 730**  
E-mail: **kotza@kotza.com** Internet: **www.kotza.com**

Revision March 2010

**Translation from french by Gareth J. Rees & Ann Auzet**

Windows 2000 / XP / Vista & Seven are all trademarks of the MICROSOFT CORPORATION

USER'S MANUAL FOR REFRILEC4

## 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 the following:

- A Window air-conditioning unit in the “single-phase current” part
- 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 refrigeration and 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

Other more “specialist” electrical problems, particularly those pertaining to liquid chillers, will be covered in another software package that we will be marketing at the end of 2004.

- 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 plant room.**

## REFRILEC: THE SEQUENCE OF STEPS

Every time REFRILEC is run, 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). 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.***



***KOTZA International - Distribution Centre***  
Le Chêne F- 05130 Tallard (France)

Tel: +33 492 540 733 Fax: +33 492 540 730  
E-mail: [kotza@kotza.com](mailto:kotza@kotza.com)