



PO Box 20,  
Dallas Victoria 3027  
Australia

<http://www.nightwing.com.au/FileMaker>  
vox +613 9309 1434  
fax +613 9309 8273

INTRODUCING

# KeyCodeMaker<sup>®</sup>

For FileMaker Pro<sup>™</sup> Developers

## Product Overview and Specifications

June 2003

Prepared by R J Cologon, PhD  
Director of Development,  
NightWing Enterprises

NB Filemaker Pro is a Trademark of FileMaker Inc

**NightWing Enterprises, Melbourne, Australia**

[CobaltSky@nightwing.com.au](mailto:CobaltSky@nightwing.com.au)

<http://www.nightwing.com.au/FileMaker/>

## PRODUCT DESCRIPTION:

The NightWing Enterprises KeyCodeMaker is a stand-alone application which enables developers of FileMaker Pro database applications (including runtimes) to create user-specific product registration codes for their software products, and to generate the matching FileMaker Pro calculation formulae required to validate the codes and extract the information that the user registration codes contain.

### Product Scope

The KeyCodeMaker is structured around the requirements of commercial or proprietary database applications created with FileMaker Pro, insofar as it automates the process of compiling compound formulae in FileMaker calculation syntax, for multiple product (and product version) registration systems.

The user registration codes which KeyCodeMaker generates are particular to a specific (FileMaker based) end-product and version, as well as to a specific registered user. The codes use a custom-designed layered cryptographic process to incorporate:

- internal registration code authentication checksums
- verification protocol to tie the code to a specific registered user name
- encrypted data packets which can include up to three information elements, including:
  - an access level indicator for the specific user-product registration.
  - an expiry data for time limited access.
  - a numeric value from 1 to 800 for counter-based access.

Thus purchasers of software licenses for products which utilise the KeyCodeMaker system can be provided with a username and matched access code which, when entered into the software will enable the product in accordance with the terms of the license they have purchased.

### Practical Applications

By way of example, a developer who uses FileMaker Pro™ to create a calendar and scheduling application may wish to sell user licenses which are renewable annually (eg on payment of an annual fee).

The KeyCodeMaker system will generate authentication formulae which are specific to the product/version, which the developer can embed in the FileMaker Pro script calculations at the time the product is created.

When a user purchases an annual license, the developer can then use KeyCodeMaker to create a user registration code which matches the username assigned to that licensee, and in which the expiry date for the licenses purchased by that user is embedded.

On entering the username and matching activation code, the user will be granted access - to the appropriate version of the calendar product – and the user's access will expire on the date which the developer specified and which was embedded into that user's activation code.

The same product can be configured to provide other types or levels of access to users. So for instance, a user who has paid for a higher level of license/access might be given an activation code which enables additional features or provides ongoing (not time limited) access. Yet other users might be given access codes which the software recognises as demonstration-only activation codes, which provide limited or demo-mode functionality.

All the above capabilities are simultaneously supported by KeyCodeMaker, which can register and manage the multiple encryption algorithms required for different FileMaker Pro products, as well as managing user registrations and the creation of multiple activation codes per user, each embedded with the information packets regarding user access levels which are specified by the developer at the time the codes are created.

### Operational Parameters

KeyCodeMaker allows creation of unlimited product/version validation cryptosystems each of which use the same general framework, but which are differentiated by their dependence upon unique and randomly generated cypher keys. The keys are not binary, but rather, are

rendered in ascii format suitable for inclusion in and interpretation by the FileMaker Pro calculation engine.

KeyCodeMaker supports usernames for licensed users which are from five to sixty characters in length and which are comprised of alphanumeric characters (case sensitive), spaces, apostrophes and/or hyphens.

KeyCodeMaker generates and utilises product-specific user registration/activation codes which conform to a standardised format of four-times-four-alphanumeric, eg:

Z2P9-FFQ7-AMDX-U8SL

All KeyCodeMaker registration/activation codes are composed of partially random combinations of thirty-two alphanumeric characters – specifically, uppercase letters (with the exception of ‘O’ and ‘I’ and numerals (with the exception of ‘0’ and ‘1’). The omission of O, 0, I and 1 eliminate scope for confusion of these characters, and the user frustration and additional product support which stems from such confusion.

### **General functionality**

A significant feature of the KeyCodeMaker application is its role as a development tool. Specifically, it calculates and renders as text, the complex/compound FileMaker Pro formula expressions which are required within end-user products to decode and interpret the activation codes. These calculations are generated instantly and offered up as text – ready to be cut and pasted directly into FileMaker Pro ScriptMaker calculation dialogs.

In addition, KeyCodeMaker offers a relational database designed to store product, user and registration details, and to facilitate the addition of new products (creating a unique cryptosystem for each) and the addition of users and/or generation of additional activation codes for existing users.

KeyCodeMaker offers an intuitive graphical user interface which is clean, modern and original, and is designed in line with ergonomic principles. It carries the NightWing Enterprises hallmarks of efficiency and elegance in design and operation. Automation and point-and-click functionality are offered to high levels throughout the application interface.

### **Technical Background**

KeyCodeMaker is written with the FileMaker Pro Developer Edition, and is bound as a stand-alone runtime application for Windows, MacOS 9 and MacOS X.

As such, the cryptographic tools implemented in KeyCodeMaker do not reside in source code, but in high level quasi object code supported by FileMaker. For this reason, the cyphers do not conform to any existing encryption standards, but utilise a custom encryption framework developed for the purpose by NightWing Enterprises.

This has the advantage of making the codes generated by KeyCodeMaker less susceptible to hacking techniques developed for other more generally available encryption standards. As a custom and proprietary system, it operates within an independent framework and exploits the particular strengths and operational parameters of the FileMaker Pro development environment.

The generation of keys and initialisation vectors for the cryptographic procedures harness the existing FileMaker Pro ‘Random’ function, yet are applied in proprietary ways which filter seeding effects to provide a robust encryption architecture.

Given the nature of the environment, the encryption procedure is not rendered in binary form, but is instead conducted at a high level within the FileMaker calculation engine, dealing directly with ascii data rather than binary data. For this reason encryption key lengths are not directly comparable to binary keys, but can be regarded as at least equivalent.

The cryptographic process is multi-stage using two independent keys to render interpolated data strings, with initialisation vectors (single base 9) used to engender random spin and offset. The encryption process incorporates interleaving, packeting and independent hash-based checksum authentication.

# KeyCodeMaker®

## PRODUCT SPECIFICATIONS:

Purpose of product	Commercial software licensing and copy protection
Scope of end use/application	FileMaker Pro databases and runtimes
Development Environment	FileMaker Developer v6.0.4 (plus third party extensions)
Operating systems supported	Windows 98 Windows Me Windows NT 4.0 Windows 2000 Windows XP MacOS Classic MacOS X
Hardware requirements	Intel Pentium 90 or higher, 64Mb RAM or greater, 20Mb or more free hard disk space, or  Macintosh G3 or higher, 128Mb RAM or greater, 20Mb or more of free hard disk space
No of end-products supported	Unlimited *
No of end-product versions	Unlimited *
No of users per product	Unlimited *
No of product reg'ns per user	Unlimited *
Cryptographic process	Multi-process custom/proprietary format encryption rendered in high level ascii manipulations
Cryptographic efficiency	Generation of codes is hardware dependent, but typically 1.4k/sec. **
Software architecture	FileMaker Pro runtime
Encryption strength***	Phase 1 key 39bit (ascii, not binary) Phase 2 key 32bit (ascii, not binary) Combined strength in ascii-base equivalent to approx 59bits

\* except as regards limits imposed by available file storage space.

\*\* the estimated encoding speed is an approximation and is based on mid-range PC performance levels (ie 1.5Ghz or less).

\*\*\* cipher keys are rendered directly into ascii and are therefore not directly comparable to binary keys of equal length. However in base conversion, the equivalent strength of ascii keys will always be equal to or greater than that of binary keys of the same length.

*Document prepared by:*  
R J Cologon PhD  
NightWing Enterprises  
June 2003