
MLWorks

Windows Version 2.0 Installation Notes

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Europe:

Harlequin Limited
Barrington Hall
Barrington
Cambridge CB2 5RG
U.K.

telephone +44 1223 873 800
fax +44 1223 872 519

North America:

Harlequin Incorporated
One Cambridge Center
Cambridge, MA 02142
U.S.A.

telephone +1 617 374 2400
fax +1 617 252 6505

Electronic Access:

<http://www.harlequin.co.uk>
<http://www.harlequin.com>

Contents

1	MLWorks distribution format	5
2	Contacting Harlequin Support	5
3	Suggested minimum system configurations for MLWorks	7
4	Installation	7
5	Licenses	12
6	Environment variables and startup files	14
7	Contents of the installed MLWorks system	15
8	Organization of the installed MLWorks system	21
9	Setting up editor support	22

Installing MLWorks

1 MLWorks distribution format

MLWorks™ 2.0 is distributed on a CD-ROM and via FTP from Harlequin's World Wide Web site. The distributions are produced with InstallShield®.

2 Contacting Harlequin Support

2.1 Personal edition

Users of MLWorks Personal edition may find the newsgroups `comp.lang.ml` and `comp.lang.functional` useful. The product knowledgebase in the Support area of our website can also be accessed:

<http://www.harlequin.com/devtools/ml>

2.2 Professional edition

Registered users of MLWorks Professional edition can contact Harlequin Support via email at:

mlworks-support@harlequin.com

Please be certain to include the CD serial number in the subject line of your email message.

If you are not registered, please visit our registration page on our website:

<http://www.harlequin.com/devtools/mlworks>

You should have your serial number ready. The serial number is located on a sticker on the back of the CD envelope.

Please contact Harlequin Support in the following circumstances:

- You need assistance with installing or running MLWorks.
If you need a license name and code for MLWorks, please send mail to `mlworks-keys@harlequin.com` rather than the `mlworks-support` address.
- You encounter a bug in the MLWorks software or documentation and wish to submit a bug report.
- You have any comments or suggestions for improving the MLWorks software or documentation.

We prefer communication by electronic mail, particularly when you submit bug reports.

If you use electronic mail and wish to submit a bug report, please fill in the bug template distributed with MLWorks and then send it to us. You can find the template in the top-level installation folder in the file `bug-template.txt`.

When you report a bug, it is very important to include a stack backtrace when necessary. Backtraces are necessary when the bug you are reporting causes MLWorks to enter the debugger on an unhandled exception.

It is only possible to see a backtrace in the TTY (that is, non-windowing) debugger, so if you are running MLWorks in GUI mode you must:

1. Choose **Usage > General Preferences > General** from the MLWorks podium's menubar.
A dialog appears.
2. Turn off the "Always use window debugger" option and click **OK** or **Apply**.

Once you have done this, MLWorks will enter the TTY debugger when you next reproduce the error. At the “Debugger>” prompt, enter `b`. MLWorks will generate a backtrace suitable for submission in a bug report.

3 Suggested minimum system configurations for MLWorks

To run the Windows 95 version of MLWorks 1.1 we recommend at least 20 MB RAM. For running on Windows NT, we recommend at least 24 MB RAM.

The distribution folder for Windows 95 and Windows NT is 9 MB; the installed system takes up around 23 MB. Therefore, during installation you will need around 32 MB of free disk space.

See Section 10 on page 16 for details of how to tune settings in MLWorks and Windows to improve performance.

4 Installation

Please note that license registration for Professional edition users now takes place during installation. See “Licenses” on page 12 for details on how to enter your license information.

4.1 From the CD-ROM

1. Mount the CD-ROM on your CD-ROM drive.
2. Using Windows Explorer, go to the folder containing the MLWorks distribution.
3. Double-click on `setup.exe`.

The InstallShield application will now guide you through MLWorks installation.

MLWorks is now fully installed.

4.2 From the World Wide Web

After downloading your MLWorks distribution from the Harlequin web site, follow these instructions to install MLWorks.

4. Double-click on the **exe** file that you downloaded from the Harlequin web site. This is a self-extracting executable which runs the InstallShield setup automatically. Click on **Setup** to start the installation procedure.

The InstallShield application will now guide you through MLWorks installation.

MLWorks is now fully installed.

5 Licenses

MLWorks will only run in Personal edition mode *unless* you enter a valid license during the installation procedure. Licenses can be obtained from Harlequin for the Professional edition by sending electronic mail to one of the following addresses:

`mlworks-keys@harlequin.co.uk`

`mlworks-keys@harlequin.com`

Licenses can also be served from a copy of the Harlequin License Server daemon running on your internal network.

If you have difficulty with the license code system please contact MLWorks Support. See Section 2 on page 5 for support contact information.

5.1 The license code system

When you install MLWorks, it prompts you to input your license name and code. The following is example output from MLWorks:

Input your license name: **MLPRO-WNT-I7TKQ@%**

Input your license code: **C9F6@ @6@436HW8Z**

Note: Please reproduce the license name and code exactly as supplied. Preserve the case of alphabetical characters and do not introduce any extra whitespace (including leading and trailing space). To reduce the likelihood of error the license code does not use the digits 0 and 1, and all letter are upper-case.

Also note the following:

- If the system rejects your license, possibly because it was mistyped, clicking **Retry** gives you another chance to enter it.
- The standard **Cut**, **Copy**, and **Paste** keyboard accelerators (Ctrl+X, Ctrl+C and Ctrl+V) work in the license dialog box.
- If you wish to install MLWorks as a Personal edition, leave the license name and code fields blank and click on **OK**.

MLWorks stores valid license information in your home directory in the registry, under HKEY_LOCAL_MACHINE. MLWorks reads the license name and code from there in subsequent sessions, so you do not need to type them in again.

If you delete this stored license information, you will have to reinstall MLWorks in order to re-enter license information.

6 Registry entries and startup files

This section lists all the environment variables and startup files that MLWorks uses. They are all described in more detail elsewhere in the documentation, but are listed here for reference.

6.1 Registry entries

Note the case difference in these registry settings between **SOFTWARE** and **Software**.

Items in HKEY_CURRENT_USER\Software\Harlequin\MLWorks\

Source Path The compilation system source path.

Pervasive Path

The folder containing the pervasive library units.

Startup Directory

The folder containing the startup files **.mlworks** and **.mlworks-preferences**.

Items in HKEY_LOCAL_MACHINE\SOFTWARE\Harlequin\MLWorks\2.0\

License	Saved registration information.
User	Saved registration information.

6.2 Startup files

.mlworks	Startup file.
.mlworks_preferences	Saved preferences from the GUI.

7 Contents of the installed MLWorks system

In addition to the MLWorks compiler and interactive environment, the MLWorks system contains various scripts, manual pages, libraries and a run-time system executable.

Before we can discuss the contents of the installation in more detail, there are two concepts to explain: *object files* and *image files*.

MLWorks provides a separate compilation system which allows you to compile ML source files down to object files on disk. Object files have the suffix `.mo`. They are suitable for loading into the MLWorks interactive environment (`mlworks` or `mlworks-basis`) or runtime (via `mlpervasive.bat`, which includes the pervasive library code necessary for running all code compiled by MLWorks) for execution.

In addition, there are facilities in the Professional edition for turning ML applications you have developed under the MLWorks programming environment into free-standing files. This delivery process works in two ways; you can either compile an application down into an executable file packaged with the MLWorks runtime, or you can save your current session. In the former case, you can execute the application by running the executable file; in the latter, you do so by invoking the MLWorks session as saved.

The MLWorks installation provides libraries in the form of source and object files, and image files. The various MLWorks scripts work with either object files or image files or both.

7.1 Documentation

The *MLWorks Version 2.0 Release Notes* are important reading for all users. This document is available in the `documentation` folder as a PDF file:

```
documentation\release-notes\pdf\RN-2-0.pdf
```

You will need Adobe Acrobat Reader to read and print PDF files.

It is also available in HTML form under:

```
documentation\release-notes\html\INDEX.HTM
```

The MLWorks interactive environment is described in the *MLWorks User Guide*. This manual is available in the `documentation` folder as a PDF file:

```
documentation\guide\pdf\UG_2-0-W.pdf
```

It is also available in HTML form under:

```
documentation\guide\html\INDEX.HTM
```

The libraries distributed with MLWorks are described in the *MLWorks Reference Manual*. This manual is available in the `documentation` folder as a PDF file:

```
documentation\reference\pdf\RM_2-0.pdf
```

It is also available in HTML form under:

```
documentation\reference\html\INDEX.HTM
```

HTML documentation for the Standard ML Basis library can be found with the URL:

```
http://www.harlequin.com/products/ads/ml/basis/
```

7.2 Shortcuts

All the MLWorks shortcuts are located in the installation's `bin` subdirectory.

<code>mlworks</code>	A shortcut that invokes the MLWorks interactive environment with only the <code>General</code> structure of the Standard ML Basis Library.
----------------------	--------------------------------------------------------------------------------------------------------------------------------------------

mlworks-basis A shortcut that invokes a version of the MLWorks interactive environment containing a built-in copy of the full Standard ML Basis library.

main.exe An executable file that invokes the MLWorks runtime system on the MS-DOS command line, providing standard I/O. The runtime system provides support for running MLWorks object files (`.mo`) and image files (`.img`).

See the output of `main.exe -help` for more details.

main-windows.exe

An executable file that invokes the MLWorks runtime in the Windows context.

mlbatch.bat A script that invokes MLWorks on the command line as a batch compiler. It can be used to compile ML source files (`.sm1`) into MLWorks object files (`.mo`)

mlimage-windows.bat

A script that restarts saved MLWorks interactive environment sessions (that is, sessions started with `mlworks` or `mlworks-basis`). Interactive environment sessions can be saved to a `.img` file from the GUI environment podium window (**File > Save Session As ...**) or programmatically with the `shell.saveImage` function.

mlimage-console.bat

A script for running delivered images that run as console applications in an MS-DOS window, that is, images that use standard I/O.

mlpervasive.bat

Because `main.exe` cannot execute object files without a copy of the pervasive library to hand, it requires you to pass a copy of the pervasive library to it whenever you want to execute object files. For convenience, there is a

script `mlpervasive.bat`, which is like `main.exe` but which loads the pervasive library image, `images\pervasive.img`, automatically. (The various supplied image files are covered in Section 7.5 on page 20.)

7.3 Libraries

MLWorks comes with a set of libraries. The libraries are supplied in two ways:

1. As mixtures of source and object files
2. As image files

The libraries are:

- The Standard ML Basis library. This library is an implementation of the Standard ML Basis library developed by the SML community. It provides a basic SML toolkit for general programming tasks such as I/O; extensions to the SML type system; internationalization; and Posix support. The `General` structure of the Basis library is pre-loaded into the interactive system in MLWorks, and is therefore permanently available at the top level.

Object and source files for the Basis library are in the `basis` compound, an installation subdirectory. An image file of the Basis library is in `images\basis.img`. To use the Basis Library in your own code, you should make the project `basis.mlp` a subproject of your own project. This project file is found in the `basis` subfolder.

- The MLWorks pervasive library. This library is MLWorks' own general-purpose library containing facilities for I/O, creation of standalone applications, multiprocessing, profiling, and so on. There is some overlap between the facilities provided by the pervasive library and those provided by the Basis library.

The pervasive library literally pervades the MLWorks environment, as the permanently available structure `MLWorks`. Object and source files for the pervasive library are also available in the `pervasive` compound, an installation subdirectory. An image file can be found in `images\pervasive.img`.

- The MLWorks foreign interface library. This library is MLWorks' own library for interfacing to code written in languages other than Standard ML. C is the only foreign language supported at present.
Object and source files for the foreign interface library are in the `foreign` compound, an installation subdirectory. The image file is `images\foreign.img`.
- The MLWorks Windows interface library. This library is MLWorks' own library for GUI programming through Win32.
Object files for the Win32 interface library are in the `winsys` compound; the image file is `images\windows.img`.

Additionally, the MLWorks interactive environment provides the `shell` structure, a library relating to the interactive environment only. This interactive environment library cannot be used in user applications, and is therefore not distributed in separate files like the other libraries.

7.4 Image files

Under the `images` subfolder of your installation folder, you can find the following image files:

<code>basis.img</code>	The Standard ML Basis library.
<code>batch.img</code>	The MLWorks batch compiler. This is the image loaded into <code>main-window.exe</code> by the <code>mlbatch.bat</code> script.
<code>foreign.img</code>	The MLWorks foreign interface library.
<code>gui.img</code>	The interactive MLWorks image with the GUI interface. This is the image loaded into <code>main-windows.exe</code> by the <code>mlworks</code> shortcut.
<code>guib.img</code>	As <code>gui.img</code> , but with a copy of the Standard ML Basis library preloaded. This is the image loaded into <code>main-windows.exe</code> by the <code>mlworks-basis</code> shortcut.

`pervasive.img` The MLWorks pervasive library. This is the image loaded into `main.exe` by the `mlpervasive.bat` shortcut.

`windows.img` The MLWorks Windows interface library.

Note: `mlworks`, `mlworks-basis`, `mlbatch.bat`, and `mlpervasive.bat` were designed specifically for using `batch.img`, `gui.img` and `pervasive.img`, and you should use the scripts rather than invoke them directly with `main-windows.exe` or `main.exe`. This is particularly important in the case of `gui.img` and `guib.img`, where the corresponding shortcuts `mlworks` and `mlworks-basis` set up a number of environment variables derived from the installation process, and pass particular parameters to the images. Without these extra details MLWorks would run into difficulty.

8 Organization of the installed MLWorks system

The installation process creates a number of subdirectories of your installation directory in order to store the various files that make up the MLWorks system. It is worth knowing a little about what these subdirectories contain.

<code>basis</code>	The Standard ML Basis library.
<code>bin</code>	The various scripts (<code>mlworks</code> , <code>mlbatch.bat</code> , and so on) and the runtime (<code>main-windows.exe</code> and <code>main.exe</code> , for windowing and console applications respectively).
<code>documentation</code>	The online documentation for MLWorks 2.0, which consists of the <i>MLWorks User Guide</i> , <i>MLWorks Reference Manual</i> , the <i>Release Notes</i> and a copy of these <i>Installation Notes</i> .
<code>examples</code>	Example code.
<code>foreign</code>	The MLWorks Foreign Interface library.
<code>images</code>	The various image files.
<code>objects</code>	Compiled files for <code>basis</code> , and <code>utils</code> .

pervasive	The MLWorks pervasive library.
scripts	Contains information for constructing the correct scripts for your system during the installation of MLWorks.
utils	Signatures related to the Standard ML Basis library.
winsys	The MLWorks Windows interface library.

9 Setting up editor support

MLWorks supports a variety of external editors. The following sections of the main documentation describe how to set up editor support:

- In the *MLWorks Reference Manual*, read the sections on the `shell.Editor` structure and the `shell.Preferences` structure.
- In the *MLWorks User Guide*, read the section on “Editing ML Files” in Chapter 1.

10 Improving performance

The following notes present suitable system settings for running MLWorks on Windows.

Ensure a minimum amount of disk space. 64MB is plenty for most applications.

You can control the memory usage of MLWorks with the `-limit n` option to the MLWorks runtime itself, and also by setting the swap characteristics of Windows. The settings depend on the sort of work you are doing, for example student work, running a medium-sized application, or large-scale software development (all figures in MB):

Table 1 Recommended Windows memory settings (in Megabytes)

	Personal	Professional (medium)	Professional (large)
~live data	16	24	32
~max. heap size	32	48	48 (no <code>-limit</code>)
suitable <code>-limit</code> value	32	48	64
~max. heap size	24	32	40 (with <code>-limit</code>)
suitable RAM	16	24	32
reserved swap	64	64	128
minimum swap	23	32	32

The `-limit` in Table 1 refers to the `-limit n` option to the MLWorks runtime, which specifies an advisory arena extent size in MB. The default is 100. If you have problems with memory usage, try this setting first, using the suggested *n* from the table above. To change it, edit the `mlworks` shortcut by choosing **Start > Settings > Taskbar**, then in the Taskbar properties dialog, choose **Start Menu Programs** and click on the **Advanced ...** button. This explores the start menu programs. Find and select the `mlworks` shortcut and choose **File > Properties**. Then choose **Shortcut**. The shortcut is presented in the Target text box, and can be edited there.

Reserved swap is how much disk space you should have available to your virtual memory system. This is what determines whether MLWorks will die from lack of memory.

Minimum swap is the smallest size you should allow your swap file to become. You can set this in the Control Panel under **System**. The operations necessary differ between Windows 95 and Windows NT.

On Windows 95, select the Performance page, then click on the **Virtual Memory...** button in the Advanced Settings pane. Then select the **Let me specify** radio button and fill out the fields appropriately.

On Windows NT, select the Performance page, then click on **Change...** in the Virtual Memory pane. Then fill out the fields appropriately.

If you still have trouble, we suggest using the Windows 95 System Monitor or Windows NT Performance Monitor.

In the Windows 95 System Monitor (**Start > Programs > Accessories > System Tools > System Monitor**), select **Edit > Add Item**. In the Category list, select Memory Manager, then from Items choose “Swapfile in use” and “Swapfile size”. Click **OK**.

In the Windows NT Performance Monitor (**Start > Programs > Administrative Tools [Common] > Performance Monitor**), select **Edit > Add to Chart**. Choose “Paging File” from the Object drop-down list and “%Usage” from the Counter drop-down list. Click **Add**.

The next thing to do is to monitor the chart while you are performing typical tasks in MLWorks. There is a danger that readings will disappear from the chart too quickly for you to interpret them. To avoid this, slow down the display by selecting **Options > Chart** and changing the “Update interval” slider setting (Windows 95) or Update Time interval setting (Windows NT).

Diagnosis again differs between Windows 95 and Windows NT. On Windows 95, if the swapfile size goes up and down a lot, the minimum swapfile size should be increased. If the swapfile size does not go up and down at all, the minimum swapfile size could be reduced. A suggested number in either case is 4/3 of the peak value of “Swapfile in use”.

On Windows NT, if the paging file usage stays very low, your PC is not paging very much and you need not make changes. If the usage gets very high, you need to reduce the value of `-limit` used by the MLWorks runtime, or reduce the maximum paging file size, or do fewer tasks at once.

Also of interest for monitoring on Windows NT is the “Memory” object and its “Page Faults/sec” counter. If this remains high (over 100, say; though the exact number depends on your PC) for a prolonged period, you are thrashing and need to reduce your `-limit`, get more physical memory, or do fewer tasks

at once. Note that the Performance Monitor graphs are scaled independently of each other.

