$\Delta \nabla$ *E M A*   *E l e c t r o   M a g n e t i c   A p p l i c a t i o n s ,   I n c .*

7 6 5 5   W e s t   M i s s i s s i p p i   A v e n u e ,   S u i t e   3 0 0 ,   L a k e w o o d ,   C O   8 0 2 2 6 - 4 3 3 2   (3 0 3)   9 8 0 - 0 0 7 0 ,   F a x :   (3 0 3)   9 8 0 - 0 8 3 6

MHarness

version 3.2

Software Installation Guide

for UNIX

and Linux

MHarness version 3.2.2 01-May-2006

MHarness version 3.2 Software Installation Guide for UNIX and Linux

C O N T E N T S

```
--------------------------------------------------------------------------------
MHarness Installation Documentation
--------------------------------------------------------------------------------
```

        A copy of this document is also on the MHarness CD, in the subfolder
"unix/installdocs".

```
--------------------------------------------------------------------------------
EMA and Software Information on the CD-ROM
--------------------------------------------------------------------------------
```

        In addition to the MHarness software, the MHarness CDROM also contains a
number of documents, in several electronic formats, containing a variety of
information about EMA, its various software products, software features and prices,
consulting and other activities, and other information.   Look in the
"EMAandSoftwareInformation" folder on the CD-ROM.

```
--------------------------------------------------------------------------------
Overall Procedure
--------------------------------------------------------------------------------
```

        The overall procedure for installing MHarness is:

1) install the software   - see section "Installing MHarness"
2) install a license   - see section "Setting Up Licensing"
3) source the setup scripts   - see section "Running MHarness"
4) test run the program   - see section "MHarness Examples"
5) locate the documentation   - see section "MHarness Documentation"
5) Additional Information: - see section "gnuplot" for more information about
     gnuplot, a free third-party plotting program included with EMA software.
                                - see section "Adobe Acrobat Reader" for
     instructions on obtaining and installing Adobe Acrobat Reader
     if you do not already have Acrobat Reader on your system.

```
--------------------------------------------------------------------------------
Installing MHarness
--------------------------------------------------------------------------------
```

        Perform the following steps to install MHarness on a UNIX or Linux system:

1) Load the MHarness CD into the CD-ROM drive

2) Navigate to the "unix" subdirectory of the CDROM, e.g.,

        % cd /cdrom/cdrom0/unix

3) Run the setup script "install.sh", e.g.

        % ./install.sh

4) The setup program will prompt you for some choices, including choice of platform
(depending on what is on the CDROM), installation directory, and installation type.
The installation type "MHarness License Manager Only" should be used if you have a
machine on which you want to run the license manager but do not want to install
MHarness.   Otherwise choose the "MHarness" setup type which includes the license
manager.

Running MHarness

Installing a License

     Before running MHarness you must either install a standalone license, or set-
up the license server with a floating network license. See the section "Setting Up
Licensing" for more information.

Running MHarness

     Before attempting to run MHarness, you should source the set-up script
"mharness_setups_csh" (for C-shell (csh)) or "mharness_setups_sh" (for Korn or
Bourne shells (ksh or sh)).

example:

```
# (sh or ksh)
% . mharness_setups_sh
```

```
# (csh)
% source mharness_setups_csh
```

     These scripts add the full pathname of the MHarness "bin" subdirectory to the
PATH environment variable so that Mharness may be run from the command-line.
     These scripts are placed in the top-level installation directory by the
installation program. The command to source the appropriate script can be placed in
a system login script or in individual users' login scripts. See your system
documentation for instructions on how to do this.
     Once the script has been sourced to include the MHarness "bin" path in the
PATH environment variable, Mharness can be executed at the command line:

```
% mharness
```

     MHarness will prompt you for the name of an input file and proceed with the
computation. You can also give the name of the input file as a command-line
argument:

```
% mharness testmodel.inp
```

MHarness version

     The exact version of MHarness that is installed can be determined with the
following command:

```
% mhver
```

It is a simple shell script that echoes the MHarness version and date release.

MHarness Examples

    The subdirectoy /examples of the installation contains input and output files
for the examples described in the MHarness manual, as well as modifications of those
examples for use in MHarness training sessions. These files can also be used to

4

test an installation of MHarness to see if everything is working correctly. Running
MHarness on any of the example input files will produce output files that will over-
write any existing output files in the same directory. So, if you wish to compare
your outputs with the pre-existing output files, make a copy of the input files in a
separate test directory first so as not to over-write the pre-existing output files.
For example,

```
% mkdir ./test
% cp ./*.inp ./test
% cd ./test
% mharness ex2.inp
% gnuplot
gnuplot> plot "./ex2voltout", "../ex2voltout"
gnuplot> exit
%
```

MHarness Documentation

     The following user manuals and documentation are part of the MHarness software
installation:

Installation Documentation
----
     docs/install_mharness.pdf
          - MHarness Installation Guide for UNIX and Linux (this document)
     docs/install_mharness.txt
          -text file version of install_mharness.pdf

MHarness User Manual
----
     docs/MHv3.2_User_Manual.pdf
          - MHarness User Manual

MHarness command-line tools/utilities documentation
----

        docs/mharness_utilities_ref.pdf

                - MHarness Utilities Reference Manual (PDF format)
                for the set of command-line utilities included
                with MHarness

        docs/mharness_utilities.README

                - list and overview of the command-line utilities
                included with Mharness

        docs/addfiles.README
        docs/derivfile.README
        docs/fft.README
        docs/filter.README
        docs/makesource.README
        docs/multisource.README
        docs/shiftsource.README
        docs/source.README
        docs/source2.README
        docs/sumfile.README
        docs/tfunc.README

                - individual read-me files for each of the command-line
                utilities included with Mharness (same information as
                in the MHarness Utiliites Reference Manual)

        docs/man/man1

                - this directory contains man page versions of all
                the above README files for the individual utilities

        docs/writewcur_readme.pdf
                - README file to accompany the tool "writewcur",
                an additional utility tool included in the MHarness
                installation

MHarness examples problem assignments
----
        examples/ProblemAssignments.pdf
                - description of problems to be worked with the MHarness example files.
                Used primarily for MHarness training.

        examples/ProblemAssignments.txt
                - text file version of ProblemAssignments.pdf

gnuplot documentation
----
        gnuplot4.0.0/man/man1/gnuplot.1
              - man page for gnuplot
        gnuplot4.0.0/docs/gnuplot.pdf
              - gnuplot manual
        gnuplot4.0.0/docs/gpcard.pdf
              - gnuplot reference card
        gnuplot4.0.0/docs/tutorial/tutorial.pdf
              - gnuplot tutorial

        There are other miscellaneous gnuplot documents in the "gnuplot4.0.0/docs" directory which you may also find useful; the abovementioned ones are the primary reference manuals.

        Documentation for gnuplot is also available in the form of the help system within gnuplot, after you start gnuplot.

              NOTE on gnuplot documentation: With the exception of the man page, the documentation mentioned above (i.e. the PDF files and all other documents in the "docs" directory), came from the Windows distribution of gnuplot 4.0.0. However, these documents are generally applicable and deemed to be useful to users of gnuplot on any platform. But you may occasionally find reference to features that are Windows-specific.

Rainbow SLM license manager software (for system administrators)
----
        docs/SLM71sys.pdf
              - Rainbow Sentinel License Manager System Administrator's Guide
              (for use by system administrators)

        docs/man/man1/lsdecode.1
              - man page for lsdecode, a Rainbow SLM utility
              (for system administrators)

        docs/man/man1/lsmon.1
              - man page for lsmon, a Rainbow SLM utility
              (for system administrators)

        lic/README - quick-start instructions for setting-up a license server

Viewing Documentation

        Files with a name like "README", "*.readme", "*.README" or "*.txt" are text
files that may be viewed with any text file viewer.
        Files in PDF format ("*.pdf") are Adobe Portable Document Format files. They
require Adobe Acrobat Reader to view them. To view these files, first launch Adobe
Acrobat Reader:

% acroread

        Then click the "File" menu, choose "Open...", and navigate to the location of
the desired document listed above. Check the installation location or consult your
system administrator if you are not sure where to find the documents listed above.
        If you do not have Adobe Acrobat Reader on your system, see the section "Adobe
Acrobat Reader", below, or consult your system administrator.

MHarness Utilities
----

running utilities

    A suite of command-line utilities useful in working with column-formatted ASCII
data files, such as those used by Mharness, is included. These programs are in the
same folder as the other executable files: the subdirectory /bin of the
installation. If the MHarness setups script has been sourced as described in
"Running MHarness", you should be able to run any of the utilities at a command
prompt, similar to the way you run MHarness. For example,

% tfunc

        The file "mharness_utilities.README", in the /docs subdirectory of the
installation, contains a full list and brief description of the utilities. Each
utility also has its own README file and/or man page and is also described in the
MHarness Utilities Reference Manual (see section "Mharness Documentation").

utilities man pages

        The MHarness installation contains man pages for the command-line utilities.
If the MHarness setups script has been sourced, which adds the man page directory to
the system MANPATH, you should be able to invoke the man pages from a command
prompt. Invoking the following man page:

% man mharness_utilities

        gives a man page listing and providing an overview of the utilities. You can
invoke the man page for a specific utility by entering "man utility_name" at a
command prompt.

```
--------------------------------------------------------------------------------
gnuplot
--------------------------------------------------------------------------------
```

gnuplot installed automatically

        MHarness result waveforms may be viewed with any available third-party
plotting package. The freely-available "gnuplot" is fit for this purpose, and is
included with the MHarness software distribution. gnuplot is installed
automatically by the installation script along with the MHarness software.
        The MHarness setup scripts "mharness_setups_sh" and "mharness_setups_csh" (see
the section "Running MHarness") add the directory path containing the gnuplot
executables to the PATH environment variable. They also add the path containing a
gnuplot man page to the MANPATH environment variable. If the setup script has been
sourced, you should be able to run gnuplot from a command prompt:

% gnuplot

        NOTE: some systems (particulary Linux) may already have a version of gnuplot
installed. In this case, you might get the pre-existing installation when you enter
"gnuplot" at a command prompt, because the EMA3D setup scripts put the EMA-installed
gnuplot directory at the end of PATH. If you wish to use the EMA-installed version
instead (for example, if the EMA-installed version is a more recent version), you
can edit the setup scripts to put the EMA-installed gnuplot location at the
beginning of PATH. The setup scripts already contain a line to do this, which is
commented-out by default. Just comment-out the line that puts the directory at the
end of PATH, and un-comment the line that puts the directory at the beginning of
PATH. There are comments in the setup scripts that tell you how and where to do
this.

        You should also be able to read the gnuplot man page*:

% man gnuplot

                *NOTE: you may need to run "windex" first; see your
                system documentation.

source code to compile for alternate platforms or terminal types
----
        The installation script installs a copy of gnuplot that has been pre-compiled
by EMA, from the gnuplot source code distribution, for the appropriate platform and
using the default set of terminal drivers. A copy of the raw gnuplot source code
distribution is included on the MHarness CD but is not installed by the installation
script. This may be used, if you wish, to compile a version of gnuplot for some
other platform, or to add or remove terminal drivers for particular terminal types.
The source code is set-up to compile more or less automatically on a variety of
systems. For more information, look on the MHarness CD in the following directory:

unix/gnuplot-4.0.0

and read the file "gnuplot-4.0.0.readme".

```
--------------------------------------------------------------------------------
Adobe Acrobat Reader
--------------------------------------------------------------------------------
```

Most of the manuals included with the MHarness distribution are in Adobe Portable Document Format (PDF). Viewing them requires Adobe Acrobat Reader, which is available for free.

get Acrobat Reader from Adobe

Acrobat Reader can be obtained from the Adobe web site at:

http://www.adobe.com

get Acrobat Reader from the MHarness CD

Acrobat Reader is included on the MHarness CD for convenience. It is not installed by the installation script, but it can be installed separately if you do not have Adobe Acrobat Reader on your system. Look in the subdirectory "unix/acrobat" of the the CD-ROM. Look for a directory corresponding to your platform, for example "unix/acrobat/solaris8" or "unix/acrobat/irix6.5". The Acrobat distribution is in the form of a gzipped tar file. Uncompress and untar the file, then look for a file called "README" in the top level of the resulting directory structure for further instructions.

```
--------------------------------------------------------------------------------
Setting Up Licensing
--------------------------------------------------------------------------------


Licensing Overview
------------------
        Software licensing for EMA software is managed by the Sentinel License Manager
product, version 7.2, from Rainbow Technologies.
        End-users of EMA software may choose between two basic types of licensing: a
floating network license (also called a server license), or a standalone license.
The type of licensing you wish to use will determine the type of license key you
will request EMA, Inc. to issue.  It also will determine whether you need to run the
license server.
        With a floating network license, the license server software is installed on
one machine along with a floating network license key for the product(s) purchased.
Users may use the EMA software product(s) on any machine on the same subnetwork as
the license server machine; the application checks out a license key from the server
when it is run.  Several machines can share the same license(s) up to the concurrent
usage limit (number of licenses purchased).
        With a standalone license, the license server is not used.  A license key for
the software product(s) purchased is installed on each individual machine, and the
software application reads the license key directly.  Each machine requires its own
individual license.
        After you have decided which type of licensing you wish to use, follow the
instructions below.  If you decide to use standalone licensing, you may skip the
sections "License Server Installation" and "License Server Startup".

Obtaining and Installing a License - Overall Procedure
------------------------------------------------------
        Use the following overall procedure to obtain and install a license for
MHarness.

        1) install the license server if you are using floating network licensing
        2) generate locking information for the license server machine (for network
        licensing) or for the individual machine(s) (for standalone licensing)
        3) transmit the locking information to EMA
        4) receive one or more license key files (usually by e-mail)
        5) install the key file(s) in the correct location(s)

Follow the instructions below to perform each step of the procedure:
```

Step 1) License Server Installation and Startup (floating network license only)

```
License Server Installation (floating network license only)
-----------------------------------------------------------
        If you wish to use a floating network type of license, you must install the
license server on one machine of your choice.  This is accomplished by running the
MHarness setup as described in "Installing MHarness".  The setup option "MHarness
License Manager Only" can be used to install just the license server on a machine
where you do not want to install MHarness.
        The setup option "MHarness" includes all the licensing software files --
running the "License Server Only" setup is not necessary if you have already run
setup and chosen the "MHarness" installation option.
```

```
License Server Startup (floating network license only)
------------------------------------------------------
        Once the licensing software has been installed on a machine, the license
server can be started by changing dir to the "lic" subdirectory of the MHarness
installation and using the following command:

% ./lserv -s ./lservrc

where, lservrc is the license file which has been installed in the "lic"
subdirectory.
        A command similar to the above may be put in a system startup script to start
the license server every time the machine boots.  See your system documentation for
instructions on how to do this.  For starting the server from such a startup script,
you will want to use the command in the form:

<license_dir_path>/lserv -s <license_dir_path>/lservrc

I.e., use full pathnames in a startup script.

License Server Control Script (floating network license only)
-------------------------------------------------------------
        A shell script is provided which may be used to control the license server
(start and stop it).  This script is located at

<installation_dir>/mharness322/lic/slm_ema_daemon

        DISCLAIMER:  This script is meant as an example or framework to be used by the
        system administrator as a time-saver compared to creating their own
        startup/control script from scratch.  However, daemon startup scripts can vary
        widely between different implementations of UNIX, and are sometimes used
        differently even on different instances of the same system from the same
        vendor.  Therefore, EMA cannot guarantee that this script will work on your
        system, or that the script will not cause some undesirable effect on your
        system.  The script should be studied carefully and understood before it is
        used, and it should be edited to customize it for your site (to set certain
        directory pathnames to the license server software; and to adjust the system
        commands or syntax to fit your system).

        The script was developed on a Solaris 8 machine, so it may require significant
modifications before it can be used on a system with startup semantics or startup
script organization that are different from Solaris-style.
        Note that the script launches the license server daemon process as user "slm".
So you will either want to create such a user for running the daemon, or change the
daemon startup line in the script to launch the daemon as a different user (running
application daemons as user "root" is not recommended as a standard precaution).
```

Step 2 & 3) Obtain machine locking codes and transmit them to EMA

```
Machine Locking Codes
---------------------
        In order to obtain a license or licenses for the software you have purchased,
you will need to obtain some machine locking codes for the machine on which the
license server will run (in the case of network licensing), or the machine(s) on
which the EMA software will run (in the case of standalone licensing).  This is done
with the utility "echoid", which is part of the Rainbow licensing software.  To run
the utility, change directory to the "lic" subdirectory and run it by name at a
command prompt as in the example below.  The output from "echoid" in the example
```

below is only a sample, your lock codes depend on your machine hardware configuration and will be different from those shown in the example.

example:

```
% cd <install_dir>/mharness322/lic
% ./echoid

        SentinelLM 7.2.0 Host Locking Code Information Utility
  Copyright (C) 2002 Rainbow Technologies, Inc.


                Locking Code 1 :   1-2524D
                Locking Code 2 :   8-352C5

%
```

Locking codes can be generated for a machine on which MHarness or the licensing software has not been installed, by running "echoid" directly from the MHarness CD. The licensing tools are available for use directly from the CD, in the directory "<cdrom>/unix/lic/<platform>", where "<platform>" is a directory whose name indicates the platform for which the tools it contains are intended.

example:

```
% cd <cdrom>/unix/lic/solaris8
% ./echoid
%
```

> NOTE1: Do not confuse "echoid" with any native UNIX or Linux command. "echoid" is a utility included with the Rainbow Technologies licensing software used by EMA.

> NOTE2: When running "echoid", the file "echoid.dat" MUST be in the current working directory in order to generate the correct locking codes! Running "echoid" without first making the licensing subdirectory your current working directory will result in incorrect locking codes. Always change dir to this directory first. (As an alternative, the file "echoid.dat" can be copied to the current working directory before the command "echoid" is run.)

Return the resulting locking code(s) to EMA and EMA will generate and issue appropriate licenses based on those locking codes.

Step 4 & 5) Receive and install license key file(s)

```
License Key File Installation
-----------------------------
```
You will be issued one or more license codes to activate the EMA software you have purchased. Each license code is an alphanumeric string, usually e-mailed as an ASCII text license key file. When you receive a license key file, save it as (or save a copy of it as) a text file named "lservrc". Where you place the key file depends on whether you are using network or standalone licensing.

For standalone licensing:

Place the key file "lservrc" in the "bin" subdirectory of the MHarness installation. This directory will be "<install_dir>/mharness322/bin", the same directory containing the mharness executable program files. Do this on each machine on which Mharness is installed and for which you have been issued a license.

License File Environment Variable "LSERVRC" (standalone key file only):

For a standalone license on a UNIX or Linux system, you should also set the environment variable "LSERVRC" to the full path name of the license key file as in the following example:

example of setting LSERVRC to the license key file path name:

(Korn or Bourne shell):

```
% set LSERVRC=<install_dir>/mharness322/bin/lservrc
% export LSERVRC
```

(or, more compactly):

```
% export LSERVRC=<install_dir>/mharness322/bin/lservrc
```

(C shell)

```
% setenv LSERVRC <install_dir>/mharness322/bin/lservrc
```

Note that LSERVRC should be set to the full path name of the file "lservrc", including the file name, not just the directory containing the file. Also note that LSERVRC should be exported (Korn or Bourne shell), or should be set as an environment variable rather than a shell variable (C shell), so that it will be visible in subshells. You might wish to put the command to set LSERVRC in users' login or shell-initialization scripts or a system login or initialization script.

For network licensing:

Place the key file "lservrc" in the "lic" subdirectory of the MHarness installation. This directory will be "<install_dir>/mharness322/lic", the same directory containing the license server executable program and other license manager files. If you are installing a new license file, you will have to stop the license server (which can be done with the tool "lsrvdown" in the "lic" directory) and re-start it to pick up the new license keys.

If you already have a network license key file named "lservrc" containing licenses for other EMA products, or for products from other vendors using the Sentinel License Manager license server, append the contents of the new key file to the existing file instead of replacing it.

It is not necessary to set the environment variable LSERVRC for a network license key if the key file is placed in the same directory as the license server or if the key file is specified in the license server command as described in "License Server Startup".

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```
License Key File Format:
------------------------
        The format of the license key file is important in order for the EMA software
or license server to successfully read it.  License keys issued by EMA will be in
the correct format when they are sent.  However, if the format becomes altered or if
you experience trouble, the following are the important points to observe:
```

- Every line in a license file consists of a license code string, optionally followed by a comment. A '#' denotes the beginning of a comment.
- There should be exactly one license code string in each line of the file.
- Every line in the file must begin with a license code string and not some other text, not even a comment.
- The permissions of the file must be set so that the users (in the case of standalone licensing) or the license server (in the case of network licensing) have permission to read it.

```
Documentation:
-------------
        For more detailed information about the Sentinel License Manager, refer to the
"Sentinel License Manager System Administrator's Guide".  A copy of the guide is
installed with Mharness in the following location:

        <install_dir>/mharness322/docs/SLM71sys.pdf

        The file is named "SLM71sys.pdf".  It is in Adobe Portable Document Format.
```

```
--------------------------------------------------------------------------------
Appendix A: Environment Variables Used by MHarness
--------------------------------------------------------------------------------
       When you source the setup script "mharness_setups_csh" or "mharness_setups_sh"
(see section "Running MHarness"), some environment variables are set, that assist in
running the program.  Here is a list of the environment variables set by the shell
setups scripts and their meaning.

Environment Variable           Usage/Meaning
---------------------------------------------------------------------------
PATH                           Enables the system to locate programs
                               whose names are typed at a command prompt.
                               The setup scripts add the path names of
                               the MHarness "bin" directory and the
                               gnuplot "bin" directory to this
                               environment variable.  This enables
                               mharness, the mharness command-line
                               utilities, and gnuplot, to be run by
                               typing their names at a shell command
                               prompt.

       values added by setups scripts:

       <install_dir>/mharness322/bin
       <install_dir>/mharness322/gnuplot4.0.0/bin

MANPATH                        Specifies the location of man pages.  Man
                               pages that are located in a directory that
                               is included in MANPATH, may be viewed by
                               typing "man <command_name>" at a shell prompt
                               (you may need to run "windex" first -- see
                               your system documentation).  The setup scripts
                               add to this environment variable, a directory
                               containing man pages for the MHarness command-line
                               utilities, a man page for gnuplot, and man pages
                               for a couple of Rainbow Sentinel License Manager
                               license utilities.

       value added by setups scripts:

       <install_dir>/mharness322/docs/man

Environment variables used by Gnuplot:

GNUHELP                        Specifies the location of the gnuplot
                               help file "gnuplot.gih", so that interactive
                               help is available while running gnuplot.

       value set by setups scripts:

       <install_dir>/mharness322/gnuplot4.0.0/share/gnuplot/4.0/gnuplot.gih
```

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```
GNUPLOT_DRIVER_DIR              Specifies the location of the directory
                                containing the gnuplot X11 driver file.

        value set by setups scripts:

        <install_dir>/mharness322/gnuplot4.0.0/libexec/gnuplot/4.0

Environment variables used by the Sentinel License Manager licensing system:

LSERVRC                         Specifies the location of the license key
                                file "lservrc".  This environment variable
                                should only be necessary for a standalone
                                license key.  For a standalone key, it may
                                be necessary to set this variable to enable
                                the licensing in the application to locate
                                the key file, which is normally placed in
                                the MHarness "bin" directory.  The setup
                                scripts contain a line to set this variable
                                to the appropriate location for a standalone
                                key file, but it is commented-out.  It can be
                                un-commented in the setup script if it is
                                necessary for a standalone key file.  For a
                                floating network key file, it should remain
                                commented-out.

        value set by setups scripts:

        <install_dir>/mharness322/bin/lservrc
```

```
--------------------------------------------------------------------------
Appendix B: Platform Compatibility & System Requirements
--------------------------------------------------------------------------
```

The following are the system requirements for MHarness version 3.2 for UNIX and Linux. Some system requirements are platform-specific, others are common to all variants of UNIX.

```
SUN Solaris
-----------
```

The SUN Solaris version of MHarness in this distribution was prepared on a SUN Ultra60 running Solaris 8. Here are the SUN Solaris-specific system requirements for MHarness version 3.2:

Hardware Platform:
processor: SPARC family processor.

Software Platform:
operating system: Solaris 8 or compatible.

```
SGI IRIX
--------
```

The SGI IRIX version of MHarness in this distribution was prepared on an SGI Octane running IRIX 6.5.20. Here are the SGI IRIX-specific system requirements for MHarness version 3.2.

Hardware Platform:
processor: SGI MIPS processor.

Software Platform:
operating system: SGI IRIX 6.5.x.

```
Linux
-----------
```

The Linux version of MHarness in this distribution was prepared on a 32-bit Intel platform running Red Hat Enterprise Linux 3.0. Here are the Linux-specific system requirements:

Hardware Platform:
processor: Intel x86-family 32-bit processor.

Software Platform:
operating system: RedHat Enterprise Linux 3.0 (kernel 2.4)
                                    or compatible.

```
UNIX (and Linux) (all)
----------------------
      Here are the MHarness version 3.2 system requirements common to all variants
of UNIX.


Hardware Platform:
hard disk space (installation):    45 MB
hard disk space (user)*:           1 GB or more recommended
system memory**:                   64MB minimum, 128MB - 256MB recommended
swap file size:                    appropriately proportional to system memory (for
                                   example, 100% to 150% of system memory size is
                                   one commonly used rule of thumb)
graphics card/display:             no graphics card or display requirement


Software Platform:
graphics system***:                no graphics requirement
```

*User disk space requirements vary significantly. Most MHarness problems require relatively little user disk space for the problem files. 1 GB is probably more than enough; however, this is very little disk space by today's standards and since disk space is rather cheap, a good rule of thumb is "the more, the better".

**System memory requirements vary significantly depending on the MHarness problem you are solving. Most MHarness problems will take much less space in memory than the minimum mentioned. However, you may want to have enough memory for multiple MHarness jobs, very large jobs, etc.

***There is no particular graphics requirement for running MHarness itself. MHarness results are typically viewed with any data-plotting program of the user's choice (such as the free "gnuplot" that is included). The graphics requirements for "gnuplot" are very basic. If some other third-party plotting package is being used to plot/visualize result waveforms, the graphics requirements for that package should be considered.

```
--------------------------------------------------------------------------------
Appendix C: Gnuplot Copyright
--------------------------------------------------------------------------------
      Gnuplot  is  distributed  with  EMA  software  in  accordance  with  the  Gnuplot
Copyright, quoted here:


GNUPLOT v4.0.0 COPYRIGHT

/*[
 * Copyright 1986 - 1993, 1998, 2004   Thomas Williams, Colin Kelley
 *
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 * in supporting documentation.
 *
 * Permission to modify the software is granted, but not the right to
 * distribute the complete modified source code.  Modifications are to
 * be distributed as patches to the released version.  Permission to
 * distribute binaries produced by compiling modified sources is granted,
 * provided you
 *   1. distribute the corresponding source modifications from the
 *    released version in the form of a patch file along with the binaries,
 *   2. add special version identification to distinguish your version
 *    in addition to the base release version number,
 *   3. provide your name and address as the primary contact for the
 *    support of your modified version, and
 *   4. retain our contact information in regard to use of the base
 *    software.
 * Permission to distribute the released version of the source code along
 * with corresponding source modifications in the form of a patch file is
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 * This software is provided "as is" without express or implied warranty
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]*/
```