

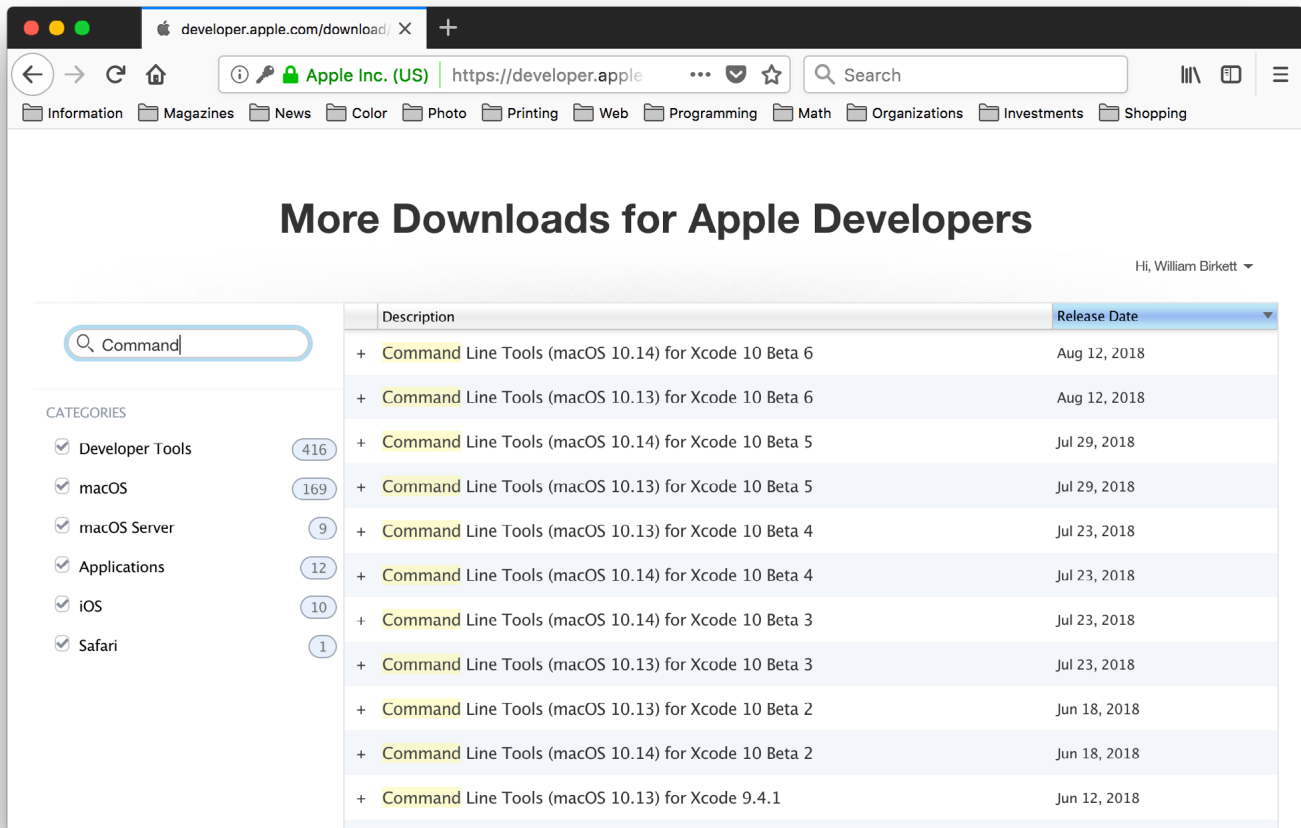
Installing the Color Tool Kit – Mac OS

The **Color Tool Kit** is a set of **Perl modules** based on the **ICC profile** standard. It can be used to read, write and create ICC profiles. It also includes a number of support modules for handling measurements, colorimetry, images, matrix operations, and optimization. The tool kit is free, open source software, available at **CPAN**, <https://metacpan.org/release/ICC-Profile>.

The software is written in the [Perl programming language](http://www.perl.org/books/library.html), which is built into all versions of Mac OS. You don't need to be a programmer to use the tool kit, but you should learn some basics of the Perl language. There are many good Perl books available, some are free <http://www.perl.org/books/library.html>.

Command Line Tools

You will need to install the **Command Line Tools** for your version of Mac OS. This is free software provided by Apple. You can download it from <https://developer.apple.com/download/more/>. After logging into this web site, type **Command** in the search window, and locate the appropriate version of Command Line Tools for your Mac OS. Download the package and install it.



The Command Line Tools are available for Mac OS 10.7.3 and later. While it is possible to use the color tool kit on Mac OS 10.6, you will need to install the Xcode application to get the required software tools. There is no need for Xcode on later versions of Mac OS.

Terminal App

Once the Command Line Tools are installed, launch the **Terminal** app, which is located in the **Utilities folder**, within the **Applications folder**. This app provides the user interface to the Command Line Tools. From this point on, you will control the installation by entering commands in the **Terminal** window. Start by verifying that the Command Line Tools are installed. One of these tools is the **make** program.

In the **Terminal** window, type **make -v** followed by return.

A screenshot of a macOS Terminal window. The title bar shows the user 'wbirkett' and the window size '80x12'. The terminal output shows the last login time, the command 'make -v', and the GNU Make 3.81 version information, including copyright and warranty details. The prompt 'WBBirkett-M:~ wbirke...' is visible at the end of the output.

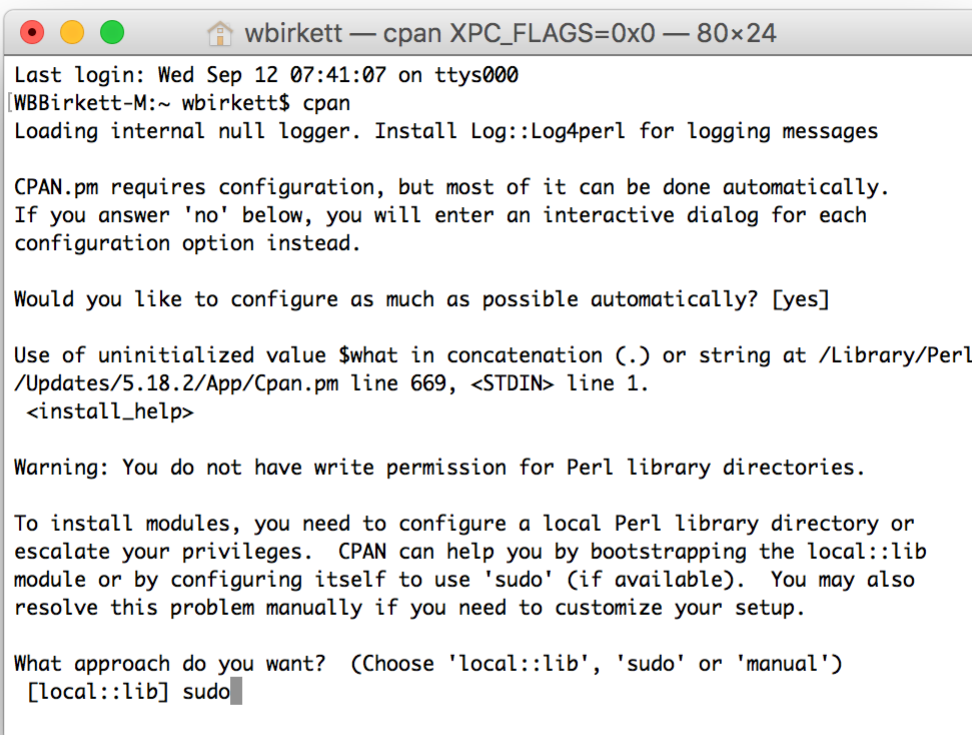
```
WBBirkett-M:~ wbirke...$ make -v
GNU Make 3.81
Copyright (C) 2006 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.
There is NO warranty; not even for MERCHANTABILITY or FITNESS FOR A
PARTICULAR PURPOSE.

This program built for i386-apple-darwin11.3.0
WBBirkett-M:~ wbirke...$
```

A brief message is displayed with the version number, 3.81 in this case. You may see a slightly different message, depending on your Mac OS version.

cpan tool

CPAN stands for [Comprehensive Perl Archive Network](#). It is also the name of the command line program we will use to install the color tool kit. Start the program by typing **cpan** followed by return.

A screenshot of a macOS Terminal window. The title bar shows the user 'wbirkett' and the window size '80x24'. The terminal output shows the command 'cpan', the loading of an internal null logger, and a series of configuration prompts. The user has responded with 'sudo' to the question 'What approach do you want?'.

```
WBBirkett-M:~ wbirke...$ cpan
Loading internal null logger. Install Log::Log4perl for logging messages

CPAN.pm requires configuration, but most of it can be done automatically.
If you answer 'no' below, you will enter an interactive dialog for each
configuration option instead.

Would you like to configure as much as possible automatically? [yes]

Use of uninitialized value $what in concatenation (.) or string at /Library/Perl
/Updates/5.18.2/App/Cpan.pm line 669, <STDIN> line 1.
<install_help>

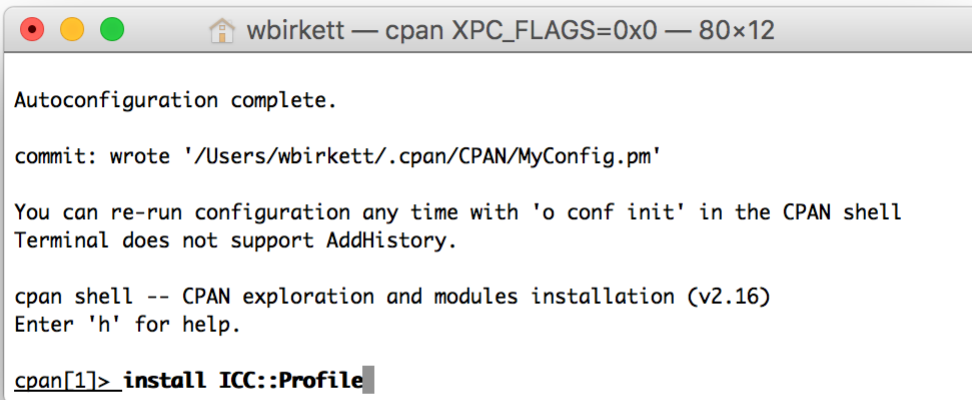
Warning: You do not have write permission for Perl library directories.

To install modules, you need to configure a local Perl library directory or
escalate your privileges. CPAN can help you by bootstrapping the local::lib
module or by configuring itself to use 'sudo' (if available). You may also
resolve this problem manually if you need to customize your setup.

What approach do you want? (Choose 'local::lib', 'sudo' or 'manual')
[local::lib] sudo
```

The first time you run **cpan** it will need to be configured. This can be done automatically, answering the install method question with **sudo**, as shown above.

The **cpan** prompt, **cpan[1]>**, will be displayed when the configuration is completed. Now, use **cpan** to install the Color Tool Kit by entering the command **install ICC::Profile** followed by return.



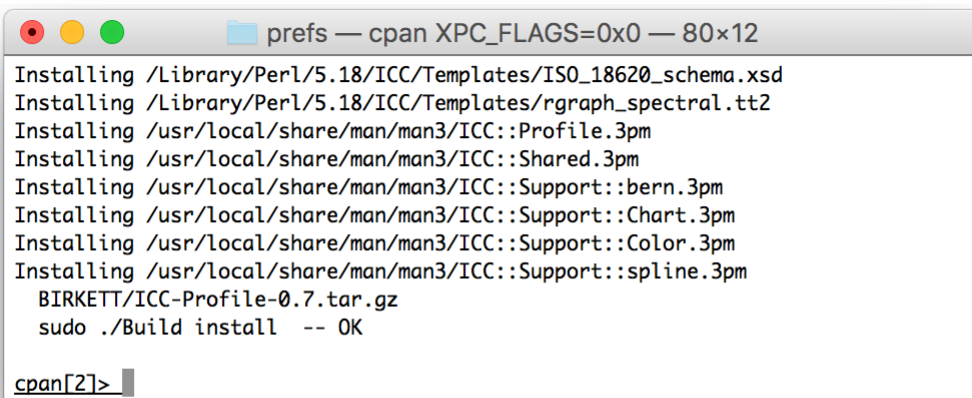
```
wbirkett — cpan XPC_FLAGS=0x0 — 80x12
Autoconfiguration complete.
commit: wrote '/Users/wbirkett/.cpan/CPAN/MyConfig.pm'
You can re-run configuration any time with 'o conf init' in the CPAN shell
Terminal does not support AddHistory.
cpan shell -- CPAN exploration and modules installation (v2.16)
Enter 'h' for help.
cpan[1]> install ICC::Profile
```

This initiates a process where the latest versions of the **ICC::Profile** modules are downloaded, compiled, tested, and installed, along with any prerequisite modules that are missing. These files are copied to the **/Library/Perl** folder which has read-only permissions. The **cpan** program uses the **sudo** command to enable this copying, and will ask for your admin password (note your password will not be displayed as you type it).



```
prefs — sudo ◀ cpan XPC_FLAGS=0x0 — 80x12
t/62_nNET.t ..... ok
t/63_nNET2.t ..... ok
t/64_nPINT.t ..... ok
t/65_Color.t ..... ok
All tests successful.
Files=42, Tests=390, 5 wallclock secs ( 0.15 usr  0.07 sys +  3.66 cusr  0.51 c
sys =  4.39 CPU)
Result: PASS
  BIRKETT/ICC-Profile-0.7.tar.gz
  ./Build test -- OK
Running Build install
Password: ?
```

If the install succeeded, the **Terminal** window should look like this, the dialog ending with **OK**.

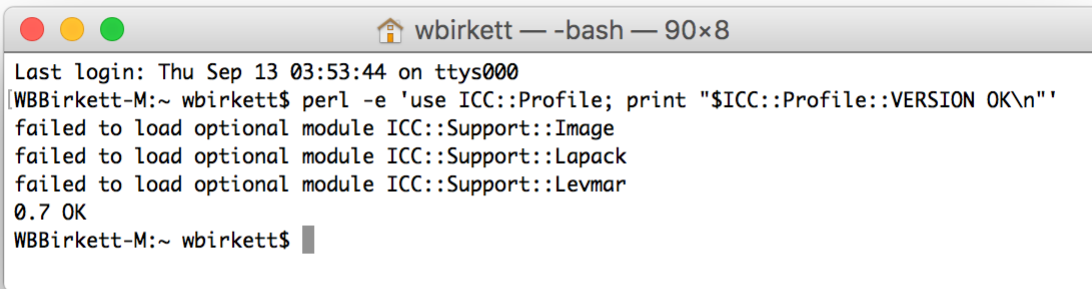


```
prefs — cpan XPC_FLAGS=0x0 — 80x12
Installing /Library/Perl/5.18/ICC/Templates/ISO_18620_schema.xsd
Installing /Library/Perl/5.18/ICC/Templates/rgraph_spectral.tt2
Installing /usr/local/share/man/man3/ICC::Profile.3pm
Installing /usr/local/share/man/man3/ICC::Shared.3pm
Installing /usr/local/share/man/man3/ICC::Support::bern.3pm
Installing /usr/local/share/man/man3/ICC::Support::Chart.3pm
Installing /usr/local/share/man/man3/ICC::Support::Color.3pm
Installing /usr/local/share/man/man3/ICC::Support::spline.3pm
  BIRKETT/ICC-Profile-0.7.tar.gz
  sudo ./Build install -- OK
cpan[2]>
```

If there were problems, the dialog will end with **NOT OK** followed by an explanation of what went wrong. Exit **cpan** by typing the letter **q** (for quit) followed by return. This is essential for the next steps.

Verify Install

Verify the install was successful by entering the following command in the **Terminal** window, `perl -e 'use ICC::Profile; print "$ICC::Profile::VERSION OK\n"'` followed by return. This will load the `ICC::Profile` modules, and print the version number.



```
WBBirkett-M:~ wbirdkett$ perl -e 'use ICC::Profile; print "$ICC::Profile::VERSION OK\n"'
failed to load optional module ICC::Support::Image
failed to load optional module ICC::Support::Lapack
failed to load optional module ICC::Support::Levmar
0.7 OK
WBBirkett-M:~ wbirdkett$
```

If the version number is printed, followed by **OK**, the installation was successful.

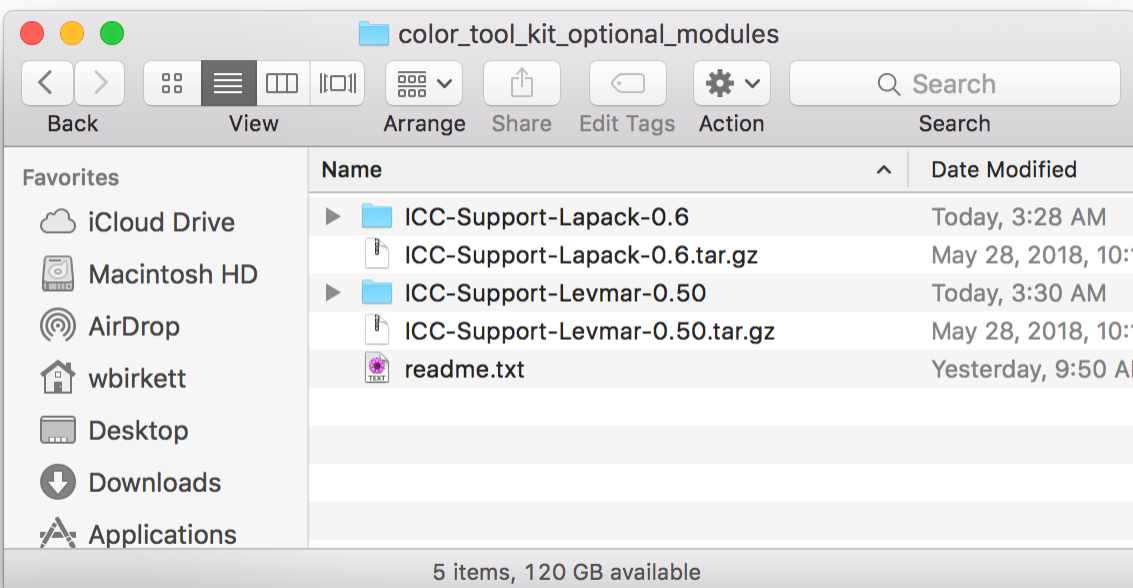
Optional Modules

You may have noticed that some optional modules failed to load during verification (above). These modules provide additional functions derived from some powerful C-language libraries. The optional modules are the glue to these libraries, and are also written in C-language. Their installation requires compiling and linking to the libraries. These steps are very dependent on the operating system. The optional modules were developed using Mac OS, and have not been ported to or tested on other platforms. Therefore, they are not available through CPAN, and must be installed manually.


The basic Color Tool Kit does not require these optional modules. They add some powerful functions, but may not be necessary for your application. The **PressCal 3** program does not need the optional modules, but the **PressCal 12U** program does need the **ICC::Support::Lapack** and **ICC::Support::Levmar** modules. So please continue if you wish to use **PressCal 12U** (recommended).

Installing the Optional Modules

[Download the optional modules](#). Move the downloaded **.zip** file to your Desktop, and double-click on it. Open the unzipped folder, and double-click on the two **.tar.gz** files. Your folder should now look like this.

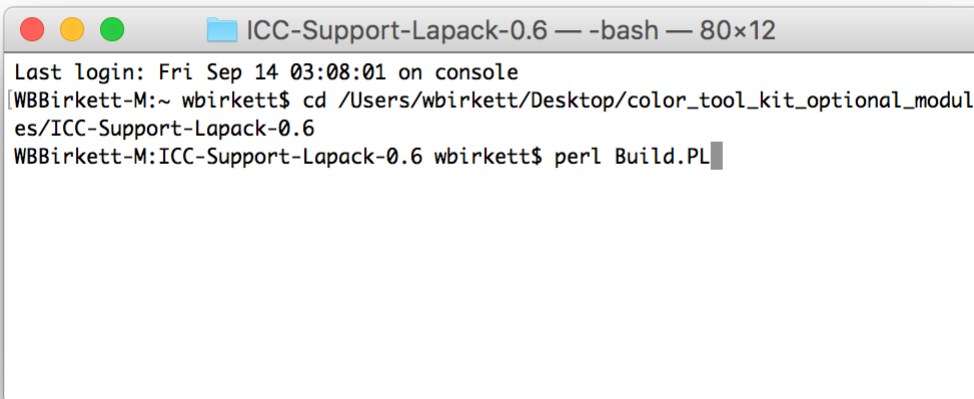


Close the **Terminal** window, then open a new window. At the prompt, type **cd** followed by a space. Then drag the **ICC-Support-Lapack-0.6** folder to the **Terminal** window, and hit return. This selects the folder as the working directory. The **Terminal** window should now look similar to this.



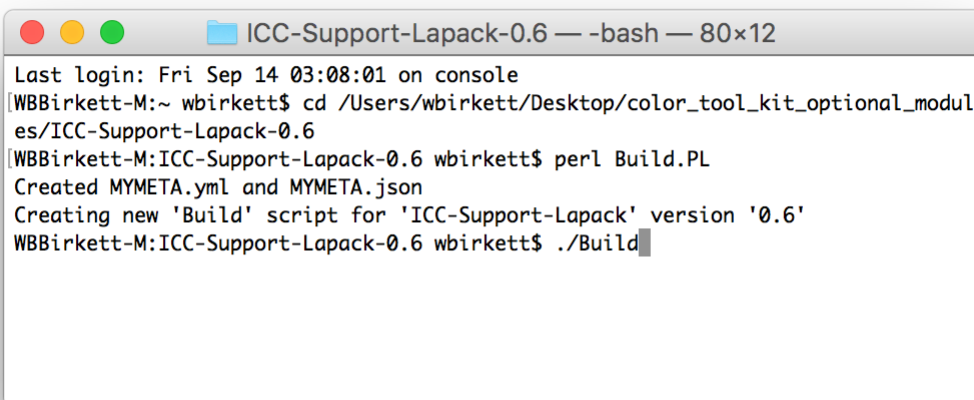
```
ICC-Support-Lapack-0.6 — -bash — 80x12
Last login: Fri Sep 14 03:27:21 on ttys000
[WBBirkett-M:~ wbirdkett$ cd /Users/wbirdkett/Desktop/color_tool_kit_optional_modul]
es/ICC-Support-Lapack-0.6
[WBBirkett-M:ICC-Support-Lapack-0.6 wbirdkett$
```

At the prompt, type **perl Build.PL** followed by return. This creates this installation script that will compile and install the module.



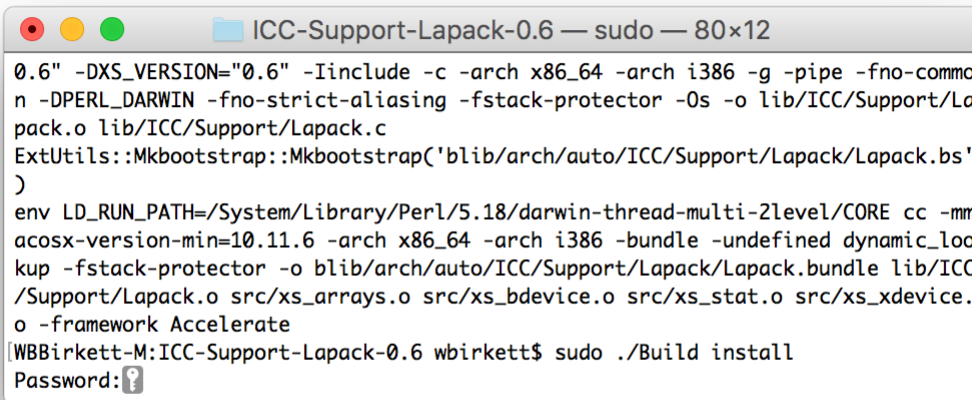
```
ICC-Support-Lapack-0.6 — -bash — 80x12
Last login: Fri Sep 14 03:08:01 on console
[WBBirkett-M:~ wbirdkett$ cd /Users/wbirdkett/Desktop/color_tool_kit_optional_modul]
es/ICC-Support-Lapack-0.6
[WBBirkett-M:ICC-Support-Lapack-0.6 wbirdkett$ perl Build.PL
```

At the prompt, type **./Build** followed by return. This will compile and link the module. The **Terminal** will display the details of this process, ultimately linking the [Perl XS code](#) with the Mac OS [Accelerate framework](#).



```
ICC-Support-Lapack-0.6 — -bash — 80x12
Last login: Fri Sep 14 03:08:01 on console
[WBBirkett-M:~ wbirdkett$ cd /Users/wbirdkett/Desktop/color_tool_kit_optional_modul]
es/ICC-Support-Lapack-0.6
[WBBirkett-M:ICC-Support-Lapack-0.6 wbirdkett$ perl Build.PL
Created MYMETA.yml and MYMETA.json
Creating new 'Build' script for 'ICC-Support-Lapack' version '0.6'
[WBBirkett-M:ICC-Support-Lapack-0.6 wbirdkett$ ./Build
```

At the prompt, type **sudo ./Build install** followed by return. This will copy the compiled module into the appropriate location in the **/Library/Perl** folder. The **sudo** command temporarily elevates your privileges to permit this operation. You will need to enter your admin password, as with **cpan**.



```
ICC-Support-Lapack-0.6 — sudo — 80x12
0.6" -DXS_VERSION="0.6" -Iinclude -c -arch x86_64 -arch i386 -g -pipe -fno-commo
n -DPERL_DARWIN -fno-strict-aliasing -fstack-protector -Os -o lib/ICC/Support/La
pack.o lib/ICC/Support/Lapack.c
ExtUtils::Mkbootstrap::Mkbootstrap('blib/arch/auto/ICC/Support/Lapack/Lapack.bs'
)
env LD_RUN_PATH=/System/Library/Perl/5.18/darwin-thread-multi-2level/CORE cc -mm
acosx-version-min=10.11.6 -arch x86_64 -arch i386 -bundle -undefined dynamic_loo
kup -fstack-protector -o blib/arch/auto/ICC/Support/Lapack/Lapack.bundle lib/ICC
/Support/Lapack.o src/xs_arrays.o src/xs_bdevice.o src/xs_stat.o src/xs_xdevice.
o -framework Accelerate
[WBBirkett-M:ICC-Support-Lapack-0.6 wbirdkett$ sudo ./Build install
Password: ?
```

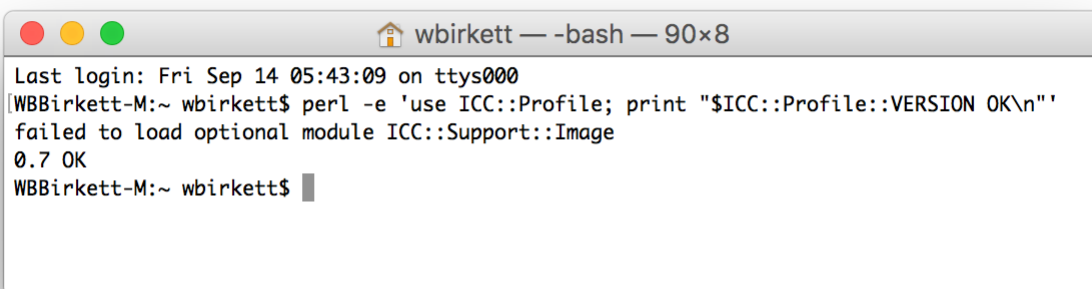
Now, repeat these steps for the **ICC-Support-Levmar-0.50** module. Here is a list of the steps.

1. In the **Terminal** window, type **cd** followed by a space.
2. Drag the **ICC-Support-Levmar-0.50** folder into the window and hit return.
3. Type **perl Build.PL** followed by return.
4. Type **./Build** followed by return.
5. Type **sudo ./Build install** followed by return (and entering your password).

This completes the installation of the optional modules. You may discard the folder you created on the Desktop.

Verify Install

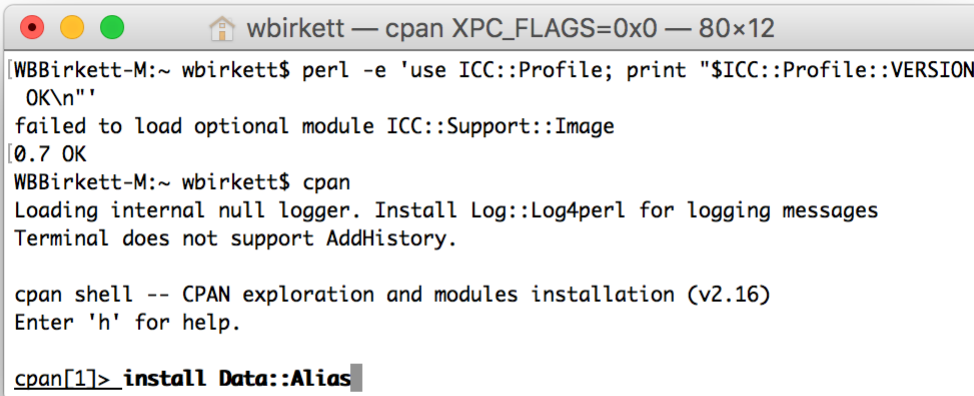
Verify the install was successful by entering the following command in the **Terminal** window, **perl -e 'use ICC::Profile; print "\$ICC::Profile::VERSION OK\n"'** followed by return. This is the command you ran previously, which listed three optional modules as missing. This time, only one module should be missing, because you just installed the other two.



```
wbirdkett — -bash — 90x8
Last login: Fri Sep 14 05:43:09 on ttys000
[WBBirkett-M:~ wbirdkett$ perl -e 'use ICC::Profile; print "$ICC::Profile::VERSION OK\n"'
failed to load optional module ICC::Support::Image
0.7 OK
[WBBirkett-M:~ wbirdkett$
```

Data::Alias and Sub::Util Modules

PressCal 12U uses two additional modules which you must install with **cpan**. In the **Terminal** window, at the prompt, type **cpan** followed by return. Since you've already used **cpan** to install the **ICC::Profile** modules, it is not necessary to go through the setup questions. At the **cpan** prompt, **cpan[1]>** , type **install Data::Alias** followed by return.

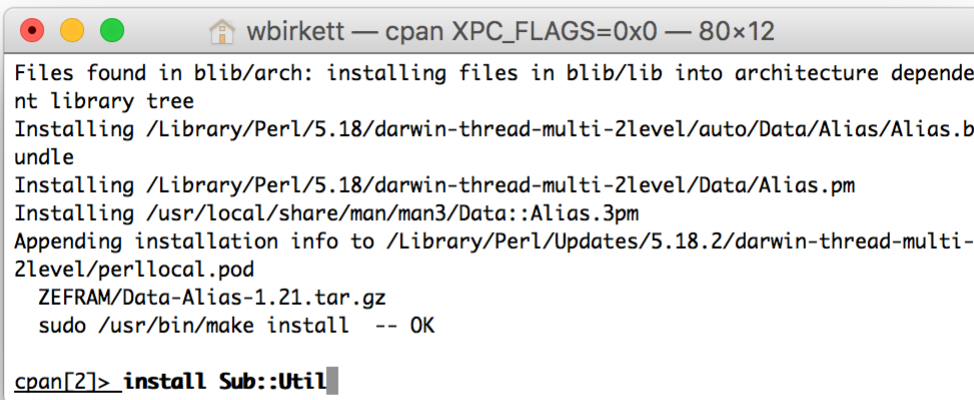


```
wbirkett — cpan XPC_FLAGS=0x0 — 80x12
WBirkett-M:~ wbirkett$ perl -e 'use ICC::Profile; print "$ICC::Profile::VERSION\n\n"; print "OK\n\n"'
failed to load optional module ICC::Support::Image
0.7 OK
WBirkett-M:~ wbirkett$ cpan
Loading internal null logger. Install Log::Log4perl for logging messages
Terminal does not support AddHistory.

cpan shell -- CPAN exploration and modules installation (v2.16)
Enter 'h' for help.

cpan[1]> install Data::Alias
```

Data::Alias and **Sub::Util** are both XS modules, so **cpan** will follow the same steps we used installing the optional **ICC::Support** modules. You will again be asked for your password to copy the files. When that is complete, the **cpan** prompt will return. Next, type **install Sub::Util** followed by return.



```
wbirkett — cpan XPC_FLAGS=0x0 — 80x12
Files found in blib/arch: installing files in blib/lib into architecture dependent library tree
Installing /Library/Perl/5.18/darwin-thread-multi-2level/auto/Data/Alias/Alias.bundle
Installing /Library/Perl/5.18/darwin-thread-multi-2level/Data/Alias.pm
Installing /usr/local/share/man/man3/Data::Alias.3pm
Appending installation info to /Library/Perl/Updates/5.18.2/darwin-thread-multi-2level/perllocal.pod
ZEFRAM/Data-Alias-1.21.tar.gz
sudo /usr/bin/make install -- OK

cpan[2]> install Sub::Util
```

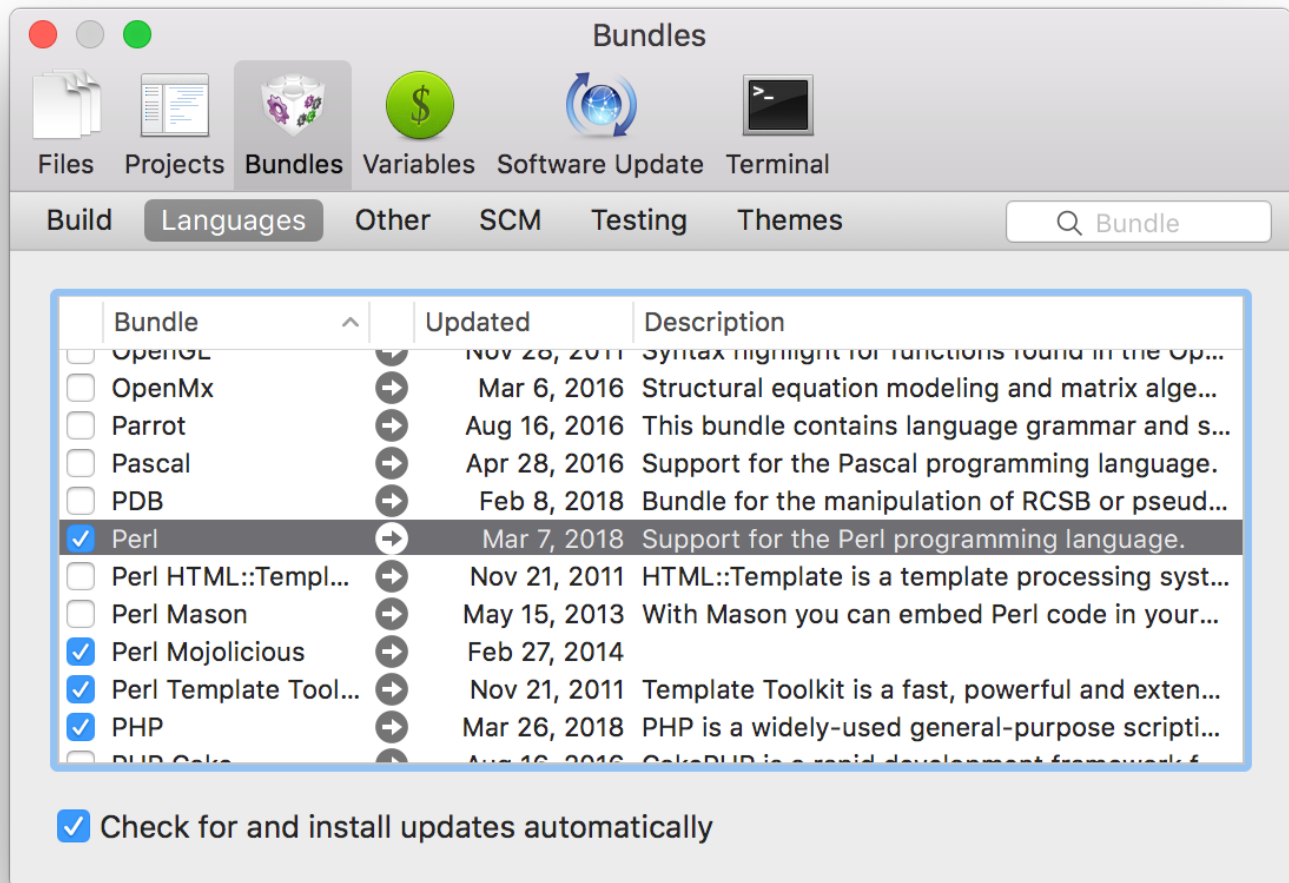
When the **Sub::Util** installation is complete, the **cpan** prompt will return. Quit **cpan** by typing **q** followed by return, then quit the **Terminal** program. This completes the installation of the **Data::Alias** and **Sub::Util** modules.

TextMate Editor

PressCal contains a data block which must be edited to change the settings. This can be done with any text editor, but we recommend you use the **TextMate** editor. This is a wonderful piece of software that includes support for the Perl language. TextMate can be obtained from <https://macromates.com/>. Download the latest version for your Mac, and double-click on the file. Locate the TextMate app and drag it to your applications folder.

The first time you run TextMate it will have a different appearance from our screen shots. The appearance is controlled by a **theme**, which may be changed using the **View/Theme** menu selection. We like the **Mac Classic** theme, but you might prefer another.

To enable the Perl-specific features of TextMate, open the Preferences pane, and select the Bundles tab. Scroll down to the Perl entry, and check the box.



This will enable the Perl bundle. The coloring of program text will now follow the Perl language syntax, which helps to locate typing errors.

Download and unzip the PressCal program ([PressCal 3](#) or [PressCal 12U](#)). Open the **.plx** file in TextMate, and choose a theme to your liking. Type **⌘R** to run the program. A window should open for the output log, displaying the program's progress.

At this point, the installation is complete, and you should refer to the **Quick Start Guide** packaged with PressCal, or the more comprehensive **PressCal User Manual**.