

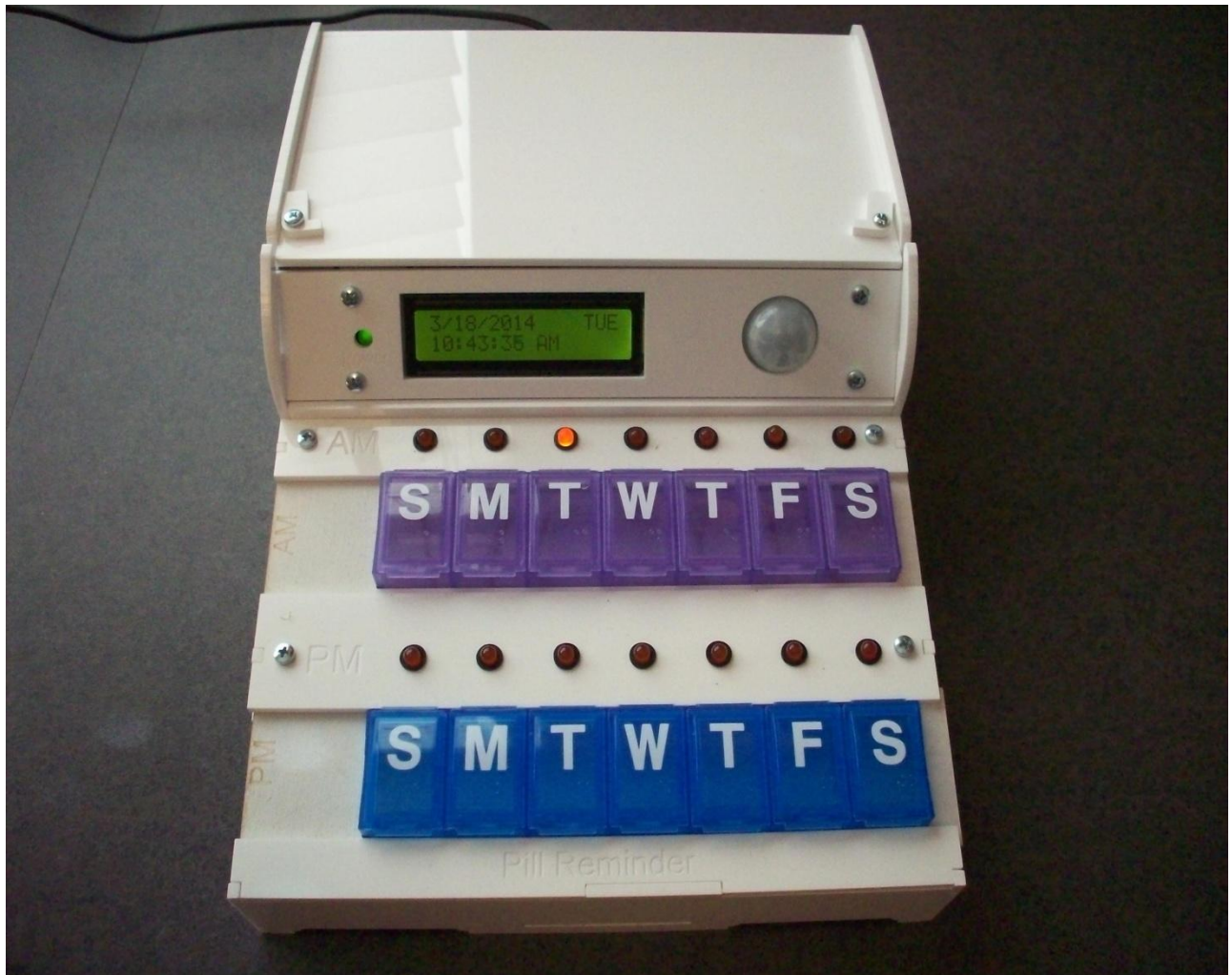
# Pill Reminder

## Introduction and Overview of the version 1.0 Release Package

---

Shrimpware LLC

5/14/2014



***Read this document first!***

## ***License and Disclaimer***

The Pill Reminder is subject to the terms of use, licenses and disclaimers contained in the document “Terms\_Of\_Use\_License\_and\_Disclaimer” that is included with this release package. This document can also be viewed at: <http://www.shrimpware.com/pillreminder/TOU.html>

Copyright © 2014 Shrimpware LLC. All rights reserved.

The material contained within this release package may not be copied, duplicated, or reproduced in whole or in part using any method, for any reason, or under any circumstances without expressed written permission by Shrimpware LLC. Individuals may download and keep one unaltered copy for non-profit, personal use of the contents.

## *Table of Contents*

### **Contents**

1	Introduction.....	4
2	Contents of the Release Package. ....	5
3	Pathways. ....	7
3.1	Pathway #1: Building and Using the Pill Reminder. ....	7
3.2	Pathway #2: Manufacturing Your Own Enclosure Parts or Modifying the Enclosure Design. ....	7
3.3	Pathway #3: Fabricating your own Shield Board or modifying the Shield Board design. ....	8
3.4	Pathway #4: Modifying the Pill Reminder Software. ....	8
4	History.....	10
5	Frequently Asked Questions (FAQ). ....	12
5.1	How can I buy a Pill Reminder that is already assembled and tested? I do not wish to purchase piece parts and build one. ....	12
5.2	Where can I purchase a complete set of parts for the Pill Reminder, so that I do not have to buy parts from the many vendors in the Parts List? ....	12
5.3	How do I use and maintain the Pill Reminder once I have built and tested it?.....	12
5.4	The default pill taking times do not address my needs. How can I change these? .....	12
5.5	The timekeeping function of the Pill Reminder is US specific. I live in a different country that observes “summertime” whose dates and time changes differ from US daylight savings time. How can I modify the Pill Reminder to observe my summertime rules?.....	13
5.6	I like the Pill Reminder concept, but the plans in this package are for a device that supports only morning and evening pills. I need a Pill Reminder that supports three or four pill taking periods per day. How can I obtain a Pill Reminder that meets my needs? .....	14

## 1 Introduction.

The Pill Reminder is a very simple to use device to remind someone to take their medications (pills). This version of the Pill Reminder supports morning and evening pill sets.

The Pill Reminder is intended to provide the User with a very simple, even intuitive, means to determine what medications may be taken at any given time and day. In this regard, the Pill Reminder differs from many other devices that are intended to alert, even nag, the User to take their pills. The Pill Reminder shows the User what medications may be taken at any given time and, by exception, what medications should not be taken at that time. The difference here is subtle, but important. The Pill Reminder is intended as an aid not only to help Users avoid missing taking their pills (under medicating), but equally to help Users avoid taking duplicate sets of pill or sets of pills spaced too closely in time (over medicating).

The Pill Reminder is released by Shrimpware LLC as an open source, do it yourself (DIY) project. This release package contains complete material to allow you to procure parts, build your Pill Reminder, operate your Pill Reminder, and possibly even modify your Pill Reminder. You must assemble the Pill Reminder yourself based upon the documentation contained in this release package. Shrimpware LLC is not a manufacturer, supplier or distributor of the Pill Reminder, nor of any of its component parts, nor of the documentation in this release package. Shrimpware LLC is only acting as a repository from which you may download this release package and the documentation contained herein.

The material in this release package is subject to terms of use, license and disclaimers contained in the document “Terms\_Of\_Use\_License\_and\_Disclaimer” that is included with this release package. This document can also be viewed at:

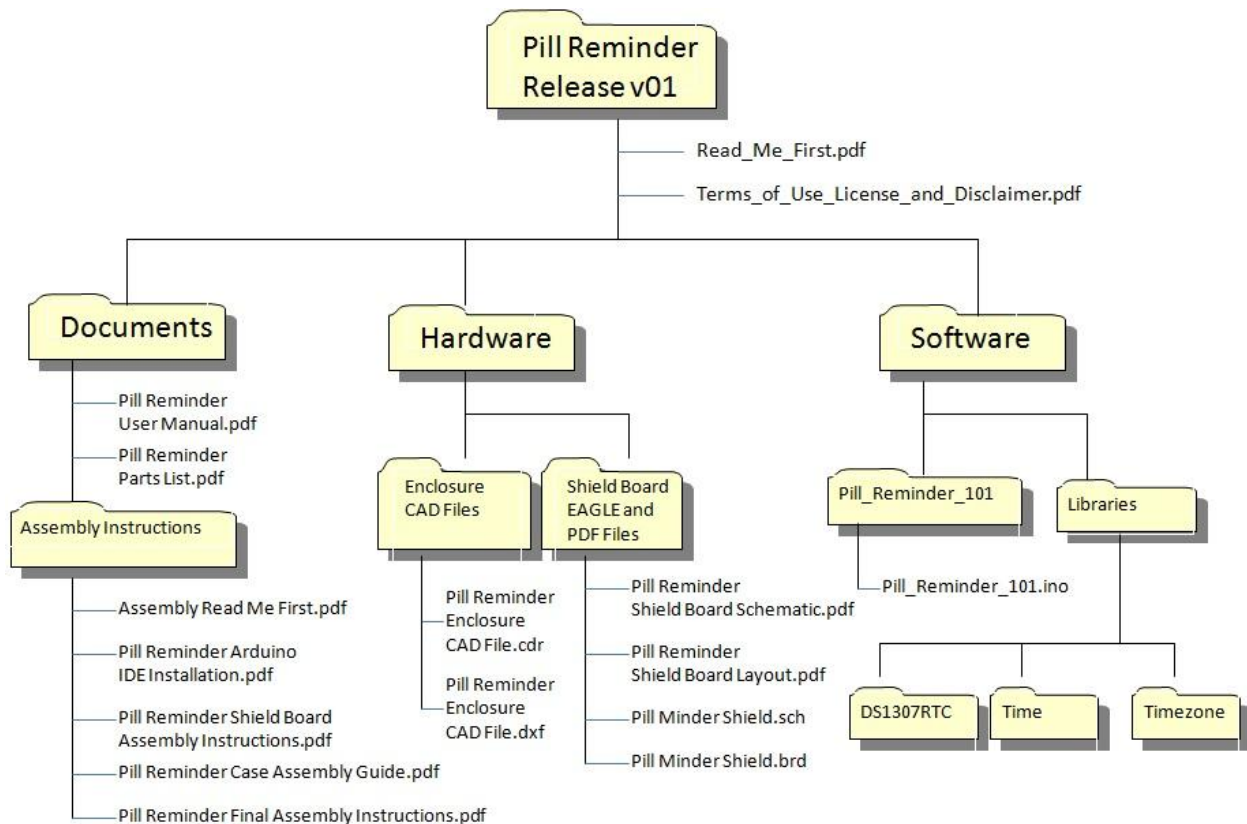
<http://www.shrimpware.com/pillreminder/TOU.html>

You may use any material in this release package for your own personal and non-commercial use, according to the license described in the aforementioned “Terms\_Of\_Use\_License\_and\_Disclaimer” document.

The material in this release package requires that you build the Pill Reminder yourself, using only the materials and documentation contained herein. Please review all materials and documents in this package prior to purchasing any parts or attempting any assembly. It is your responsibility to ensure that you have the skills, tools and means to complete and use the Pill Reminder safely, using only the materials contained herein. *Shrimpware LLC cannot provide technical support* and you are on your own if you run into problems or have trouble completing the Pill Reminder or making it work.

## 2 Contents of the Release Package.

The diagram below depicts the contents and organization of this release package. The release package is a .zip archive and you must download this archive to your computer and unzip it before you can access any of the material contained herein.



This release package is organized as a series of folders and subfolders, as shown in the figure above. A brief description of the package contents, by folder, is given below:

- **Top Level Folder.** The top level folder “Pill Reminder Release v01” contains this document and the document “Terms\_Of\_Use\_License\_and\_Disclaimer”. You must read and agree to all of the terms and conditions in the latter document before you have permission to use any other material in this package.
- **Documents.** The “Documents” folder contains all of the documents that you will need to build and to operate the Pill Reminder. The folder contains the User Manual and Parts List. The subfolder “Assembly Instructions” contains a series of documents for assembling and testing the major subsystems of the Pill Reminder, as well as Final Assembly Instructions for integrating and testing the Pill Reminder. The document “Assembly Read Me First” will lead you though the rest of the documents in this subfolder.

- **Hardware.** This folder contains CAD files for both the enclosure and the shield board. You do not need these files to build and operate the Pill Reminder. They are provided as part of the open source concept so that you have complete information about the Pill Reminder, including files that you can use, subject to the open source license, to make your own modifications to the Pill Reminder.
- **Software.** This folder contains the software files that you must compile and upload to your Pill Reminder in order for it to operate. The Pill Reminder software, in the folder “Pill\_Reminder\_101” is source code that you can alter, subject to the open source license, to make your own modifications to the Pill Reminder. This software is written in the “wiring” language for the Arduino computer that is part of the Pill Reminder. You do not need to make any modifications to this software to build and operate the Pill Reminder, but you do need to compile it and upload it to your Arduino Uno microcontroller board, along with the libraries contained in the “Libraries” subfolder, in order for the Pill Reminder to operate. Complete instructions for installing the Arduino IDE on your computer, for adding the libraries in this package to your IDE, and for compiling and uploading the software to the Arduino Uno board that is part of the Pill Reminder, are contained in the document “Pill Reminder Arduino IDE Installation” that is included in the “Documents | Assembly Instructions” folder.

### **3 Pathways.**

The documentation that is included in this release package and described in section 2 above may be used in a number of application pathways. The pathways and the documents needed for each are described in this section.

#### **3.1 Pathway #1: Building and Using the Pill Reminder.**

The “Documents” folder contains all of the instructions that you need to build and operate the Pill Reminder. Under “Documents” you will find the User Manual and the Parts List. The Parts List contains a list of all parts (but not tools and materials) that you will need to buy in order to assemble one or more Pill Reminders. All parts can be ordered over the Internet using the links provided in the Parts List. It must be noted that certain links in the Parts List provide more parts than are needed for a single Pill Reminder; i.e. 3 shield boards (one is needed), 20 micro pushbutton switches (3 are needed), etc. This is an inevitable consequence of a small quantity build and you might want to find other Pill Reminder builders to consolidate a parts order for more cost effective parts procurement.

The “Assembly Instructions” subfolder contains a series of documents that describe, in annotated step by step detail, the assembly instructions for all parts of the Pill Reminder, and for the integration and testing of these parts into a finished unit. The “Assembly Read Me First” document provides a detailed overview. Each of the detailed assembly documents lists the tools and materials needed for that stage of the assembly.

You should read through all documents in the “Documents” folder first, before you order any parts, begin any assembly, or otherwise undertake any part of this project. *It is your responsibility to ensure that you are prepared to undertake a project of this scope and magnitude.*

#### **3.2 Pathway #2: Manufacturing Your Own Enclosure Parts or Modifying the Enclosure Design.**

The folder “Hardware | Enclosure CAD Files” contains two versions of the 2D CAD drawings for the parts needed to build the Pill Reminder enclosure. You do not need to use these files because the Parts List contains a link to a vendor that can supply these parts, pre-cut, for you. However, you may elect to fabricate these parts yourself, for which you will need these CAD files and a laser cutter.

There are two CAD files in this subfolder. The files are for the identical design and you only need one of them. The file “Pill Minder.cdr” is in Corel Draw’s internal file format, and the file “Pill Minder.dxf” is the same CAD file converted to this more common format. *These CAD files are provided to you as-is.* We have made our best effort to ensure accuracy and correctness of the data therein; however, if you use them, you are on your own!



You may also use these files to modify the enclosure in Coral Draw or using any other 2D CAD program that you can import either of these files into. Any modifications that you make are subject to the terms and conditions, license and disclaimers contained in the document “Terms Of Use License and Disclaimer” that is included with this release package.

### **3.3 Pathway #3: Fabricating your own Shield Board or modifying the Shield Board design.**

The folder “Hardware | Shield Board EAGLE and PDF Files” contains the following information:

- “Pill Reminder Shield Board Schematic.pdf” is a pdf version of the shield board schematic diagram. It is provided for those who wish to view, but not modify, the schematic.
- “Pill Reminder Shield Board Layout.pdf” is, likewise, a pdf version of the shield board printed circuit layout. It is provided for those who wish to view, but not modify, the board layout.
- The files “Pill Minder Shield.sch” and “Pill Minder Shield.brd” are EAGLE files produced by the EAGLE electronic CAD software from Cadsoft corporation (version 6.5.0). See [www.cadsoft.de](http://www.cadsoft.de) for further information or to download a free, hobbyist version of this software.

You do not need any of these files to build or use the Pill Reminder, as the blank shield board can be procured from a vendor listed on the Parts List. However, you may use the EAGLE CAD files to procure shield board PC boards from another vendor of your choice, to manufacture your own shield boards if you have printed circuit manufacturing capability, or to modify the shield board electronic design to tailor the Pill Reminder to your needs. Any modifications that you make are subject to the terms and conditions, license and disclaimers contained in the document “Terms Of Use License and Disclaimer” that is included with this release package.

### **3.4 Pathway #4: Modifying the Pill Reminder Software.**

The folder “Software | Pill\_Reminder\_101” contains the source code for the Pill Reminder. It is provided to you *subject to the terms and conditions, license and disclaimers contained in the document “Terms Of Use License and Disclaimer” that is included with this release package.*

The software is written in the “wiring” language, which is the standard programming language for the Arduino. The software has been written, compiled and tested under the Arduino IDE version 1.0.5. You do not have to make any modifications to this software, nor know anything about the wiring language or programming an Arduino, in order to build the Pill Reminder and use it as described in the User Manual. However, we have attempted to extensively comment the



## **Pill Reminder – release 1.0**

source code so that you can understand it, if you wish, and make modifications to it as you see fit. Any modifications that you make to the Pill Reminder software is your own responsibility and Shrimpware LLC cannot provide and consultation or technical support regarding the released software or any modification(s) that you make therein.

See section 5, FAQ, for a discussion of some specific changes that you might wish to make in the Pill Reminder software in order to further customize it to meet some specific needs.

## 4 History.

The Pill Reminder is a project that came about through a conversation at a “Baby Boomer Makers, Hackers, and Entrepreneurs” meet-up held at the Mid Peninsula TechShop ([www.techshop.ws](http://www.techshop.ws)) one cold January evening in 2014. Bob Glicksman had the idea for the Pill Reminder and said he had wanted to make one for a long time, but he could not find the right case. Jim Schrempp had been looking for a project and said: “if you design the electronics, I will design the enclosure.” That night, the collaboration was born.

Bob was inspired to invent the Pill Reminder out of need to support his elderly mother (“Mom”). Mom has dementia and near total short term memory loss. Bob had long supplied her with her medications in weekly “AM/PM” pill organizers. Bob would call Mom twice a day, morning and evening, to remind her to take her medications. Nevertheless, at the weekly refill time, Bob would frequently find either that Mom had missed taking some pills, or alternatively (perhaps worse), Mom would call a day or two before the pills should have run out to say that she was out of pills (meaning that she took multiple day doses, possibly leading to overdosing).

Bob experimented with many products and means to help Mom prevent overdosing; for example, mounting a clock over bathroom sink with the day of the week displayed in large letters. Nevertheless, the compliance issues persisted. Bob came up with the basic Pill Reminder concept after being frustrated with failure after failure of existing products to solve the problem. Bob reasoned that the issue with Mom was a failure to comprehend when to take what medicines and when not to take some medicines. Bob thought that a simple and intuitive method of signaling Mom when she could open a pill dispenser slot (and take any pills therein), and when she should not open a slot, would be the key to solving the problem.

The “Baby Boomer Makers, Hackers, and Entrepreneurs” meet-up group was of great assistance in flushing out the device requirements, present and potential future features, and in finalizing a development specification. Jim and Bob then went off to design, develop, test and document the Pill Reminder.

As of the date of this writing, Mom has had her Pill Reminder for over 4 weeks and has achieved 100% compliance throughout. Previously, Mom would have a fully compliant week only once in every three, on the average. Four weeks in a row of perfect compliance is highly significant, even given that it is early in deployment and testing.

The only instructions given to Mom were: “if a light is lit, open the dispenser slot under the light and take any pills in it. If there are no pills in it, then you have already taken them, even if you don’t remember doing so. Under no circumstances are you to open a dispenser slot when the light above it is not lit”. In follow up research, Mom has been unable to articulate the meaning of the light over each pill slot. Clearly, then, these excellent early results demonstrate that Pill Reminder operation is quite intuitive (a major goal when dealing with people with short term memory loss).

To date, Bob and Jim have constructed three additional Pill Reminders from the plans and instructions released in this package. Although these three devices have not yet been deployed to people who really need them, they are all running and proving (a) that the build instructions

seem to be clear and complete, and (b) that the Pill Reminders operate reliably in a “real world” environment.

Bob and Jim agreed early on to release the Pill Reminder plans as an open source, do it yourself (DIY) project, freely licensed for non-commercial use. By including all source code and source CAD files, they hope that people will not only make Pill Reminders for their own use or as gifts, but will customize and modify the design and openly and freely share their efforts with the user community. For example, you can use the 2D mechanical CAD files to make your own enclosure. The enclosure can be cut from 3mm Baltic birch plywood for “cheap but cheerful” version, and spray painted however you like. Alternatively, the pieces can be cut out of your favorite color 3mm (0.118 inch) acrylic for the more “real product” look. If you are so inclined, you might want to use a 2D CAD program to modify the design of the enclosure to create a different look, or to better fit onto a bathroom sink or night stand. We would be very interested in other people’s ideas for improvement. Please e-mail your thoughts, ideas, experiences, and modifications to [pillreminder@shrimpware.com](mailto:pillreminder@shrimpware.com).

## **5 Frequently Asked Questions (FAQ).**

This section contains some frequently asked questions and their answers.

### **5.1 How can I buy a Pill Reminder that is already assembled and tested? I do not wish to purchase piece parts and build one.**

As of this writing, the Pill Reminder is only available as an open source, do it yourself (DIY) project, based upon the material in this release package. Nobody is presently licensed to manufacture or sell fully or partially assembled Pill Reminders. If you are interested in manufacturing or selling fully or partially assembled Pill Reminders, please contact us at: [pillreminder@shrimpware.com](mailto:pillreminder@shrimpware.com)

### **5.2 Where can I purchase a complete set of parts for the Pill Reminder, so that I do not have to buy parts from the many vendors in the Parts List?**

As of this writing, the Pill Reminder is only available as an open source, do it yourself (DIY) project, based upon the material in this release package. Nobody is presently licensed to manufacture or sell parts kits or partially assembled Pill Reminders. If you are interested in manufacturing or selling parts kits or partially assembled Pill Reminders, please contact us at: [pillreminder@shrimpware.com](mailto:pillreminder@shrimpware.com)

### **5.3 How do I use and maintain the Pill Reminder once I have built and tested it?**

Please see the User Manual for complete information about operating and maintaining your Pill Reminder. The “Pill Reminder User Manual” can be found in the “Documents” folder of this release package.

### **5.4 The default pill taking times do not address my needs. How can I change these?**

The Pill Reminder software uses generic times for allowable taking of AM and PM pills. These times are specified by defined constants in the Pill Reminder software. Since you have the source code available, you may change these defined constants to fit your needs.

When you open the Pill Reminder software in the Arduino IDE, you can read more about these defined constants in the comments at the top of the program (lines 11 through 20). You can change the defined constants that control these times by editing lines 159 through 162 of the software. You must then recompile and upload the software to your Pill Reminder (Arduino Uno board) in order for the new times to take effect.

Please note that the software design requires that you leave at least one minute between AM off time and PM on time, and likewise between PM off time and AM on time. If you do not do so, the proximity sensor will not re-arm and the LEDs will not blink when the proximity sensor is tripped the first time during any pill taking period.

You are fully responsible for any and all changes that you make to the Pill Reminder software. If you do make changes to the software, please make sure to test your revised software completely and thoroughly before releasing the altered Pill Reminder for use. Please note that you are required, under our licensing agreement, to release your modifications as open source, non-commercial and provide proper attribution to us.

**5.5 The timekeeping function of the Pill Reminder is US specific. I live in a different country that observes “summertime” whose dates and time changes differ from US daylight savings time. How can I modify the Pill Reminder to observe my summertime rules?**

The Pill Reminder software uses a “Timezone” library written by Jack Christensen and downloaded from <https://github.com/JChristensen/Timezone>.

Lines 187 and 188 of the Pill Reminder software define structures that are used by this library to implement changes from standard time to daylight savings time and again from daylight savings time back to standard time. The two lines of code are:

- TimeChangeRule dt = {"DT", Second, Sun, Mar, 2, 60};
- TimeChangeRule st = {"ST", First, Sun, Nov, 2, 0};

You can read about these structures, and how to change them, in the documentation for the Timezone library at the url given above. Specifically, the second and third arguments specify which day of which month (4<sup>th</sup> argument) the change is to take place, and the last argument specifies the magnitude of the change in minutes. Consequently, the change “DT” (first argument) is to take effect beginning on the Second, Sunday (Sun), at 2 AM, and it is to add 60 minutes to the “normal” time. Likewise, the change “ST” (first argument) is to take effect beginning on the First, Sunday (Sun), at 2 AM, and it is to add zero minutes to the “normal” time.

Please note that the Pill Reminder software does not use the Timezone library to convert to and from UTC, as the library’s author intends. It only uses the Timezone library to implement a one hour (60 minute) shift from the standard to daylight savings time, according to the dates and times defined in these structures.

Since you have the Pill Reminder source code, you can open it in the Arduino IDE and make any changes that you wish. You can change these structures to change the dates and time of day that the changes to and from summertime take place in your locale, as well as the magnitude of the change (in minutes). You must then recompile and upload the software to your Pill Reminder (Arduino Uno board) in order for the new daylight savings time definitions to take effect.

You are fully responsible for any and all changes that you make to the Pill Reminder software. If you do make changes to the software, please make sure to test your revised software completely and thoroughly before releasing the altered Pill Reminder for use. Please note that you are required, under our licensing agreement, to release your modifications as open source, non-commercial and provide proper attribution to us.

**5.6 I like the Pill Reminder concept, but the plans in this package are for a device that supports only morning and evening pills. I need a Pill Reminder that supports three or four pill taking periods per day. How can I obtain a Pill Reminder that meets my needs?**

This release of the Pill Reminder only supports AM and PM pills. Extensive changes would need to be made in order to support more pill taking times. These changes include:

- Re-design of the enclosure to hold more pill dispensers and house more LEDs.
- Re-design of the shield board to extend the shift register that drives the LEDs and to add connectors for the extra LEDs.
- Extensive changes to the software in order to accommodate more LEDs and act upon more pill taking intervals.

This release package contains all of the source files (mechanical CAD, electrical CAD, and software source) for the Pill Reminder and it is therefore possible to use this material to re-design the Pill Reminder for more pill taking times. The scope of this effort is large, however, and you should only attempt it if you have the necessary skills in mechanical design, electrical design and Arduino software development that are all needed to make such an extensive re-design work. If you do accomplish this, please follow the license requirements and release your modifications as open source, non-commercial, with proper attribution to us. And please let us know that you did this by e-mailing to: [pillreminder@shrimpware.com](mailto:pillreminder@shrimpware.com)

---