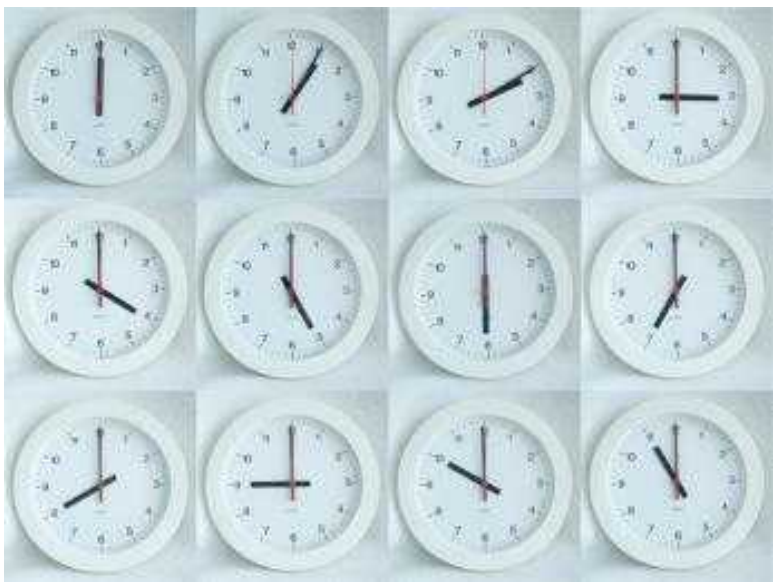
# A brief history of ClockTHREE



**TIME** : It's all about numbers, but whichever way you look at it, your brain turns it into a set of words

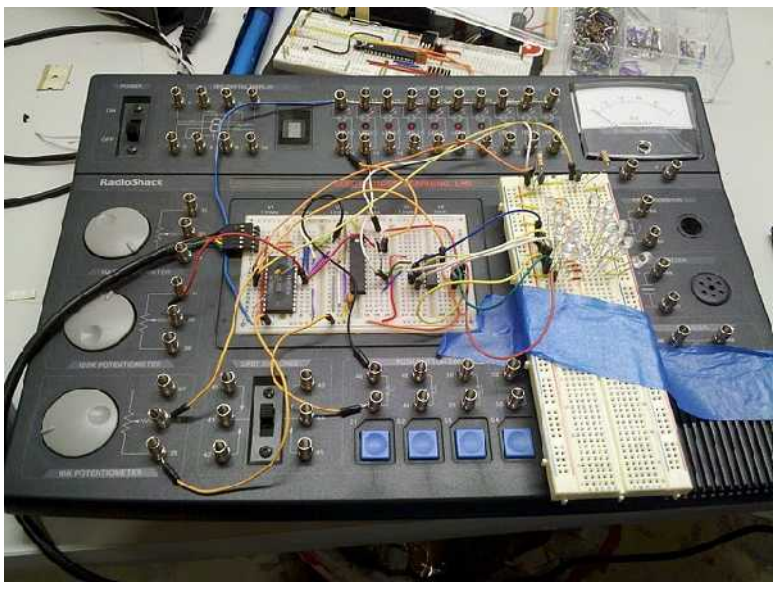
4:30 pm is “Four thirty in the evening”
10:45 am is “Quarter to Eleven in the morning”
- and isn't that funny – the number 10 is interpreted as the word Eleven !

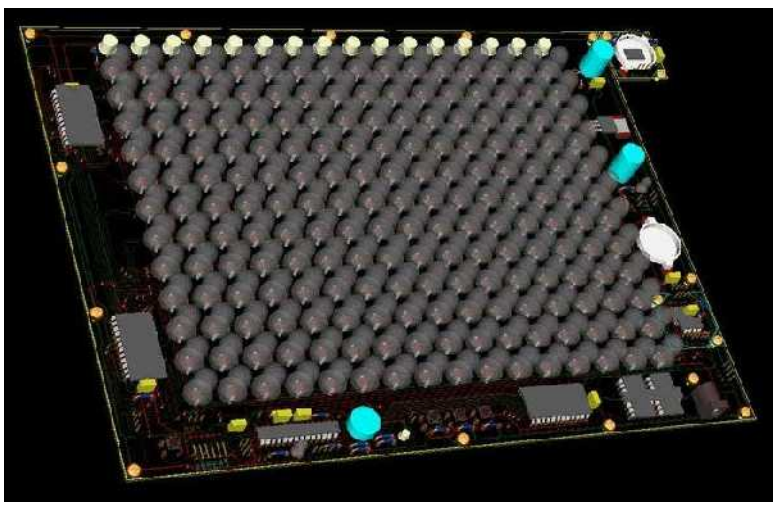

And hence **Word Clocks** are born – time pieces that show time as a sentence or a group of words. These clocks contains an array of LEDs behind a lettered faceplate. The faceplate itself is like a word search that contains all of the words needed to spell out the time, but hidden in the array of letters. The words become visible only when they are selectively backlit with computer-controlled LEDs. Although the spacing is a little different, the clock is read left to right, top to bottom. Care is taken to ensure that the the displayed time is a complete sentence, that, when spoken, flows naturally.


QlockTWO, from Biegert & Funk, is a commercially available word clock. This is a beautiful clock, but lacks hacker friendliness


A lot of open source designs emerged to fill this gap. Doug Jackson really got the hacker community going with an excellent “instructable” giving step-by-step directions, showing how the technically savvy could create their own word clock. Alden Hart upped the ante by creating a miniaturized version that literally fits in the palm of your hand.

Our first version, the **Worduino** based on Doug Jackson's design, has fixed LED word groups. So it is also very difficult to modify for a new language without hardware redesign. Further, most of these clocks are limited to a single color LED behind each letter.



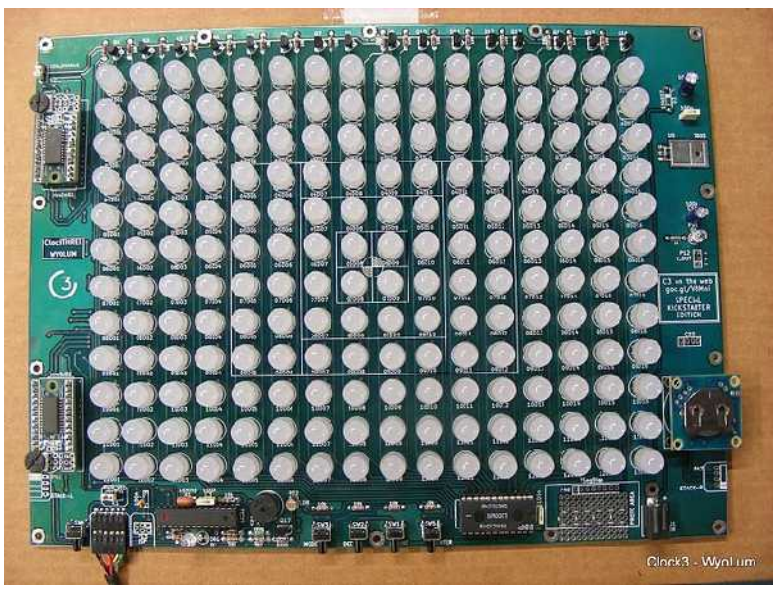


So, we went back to the drawing board, and brain-stormed to come up with a radically different design. The plan was to get the following features :

•Flexible – with individually addressable LEDs
•large array – something like 16x16
•RGB LEDs for full color control
•Real Time Clock for precise timing

This resulted in the **ClockTWO** – second in our line of clocks. We made a couple of errors in the hardware layout – ending up with the classical problem of square pegs in round holes (ouch!).

**ClockTHREE**, our third clock, finally comes to fuition with an array of multi-color red/green/blue (or RGB) LEDs, each of which can be controlled completely independently. You can think of this array as a very very low resolution TV screen with 16 columns and 10 rows of RGB LEDs. This array allows for a much more dynamic display. Now, with a new faceplate and some custom programming, any written language can be supported. So far, English and German have been implimented.



ClockTHREE opens up several advantages to both QlockTWO and the Worduino. QlockTWO is a beautiful piece that would look great on any wall, but, since it is closed source, it is very difficult customize, say to add a new language. And of course, a word clock is not complete without a designated time every day: "IT'S BEER THIRTY."

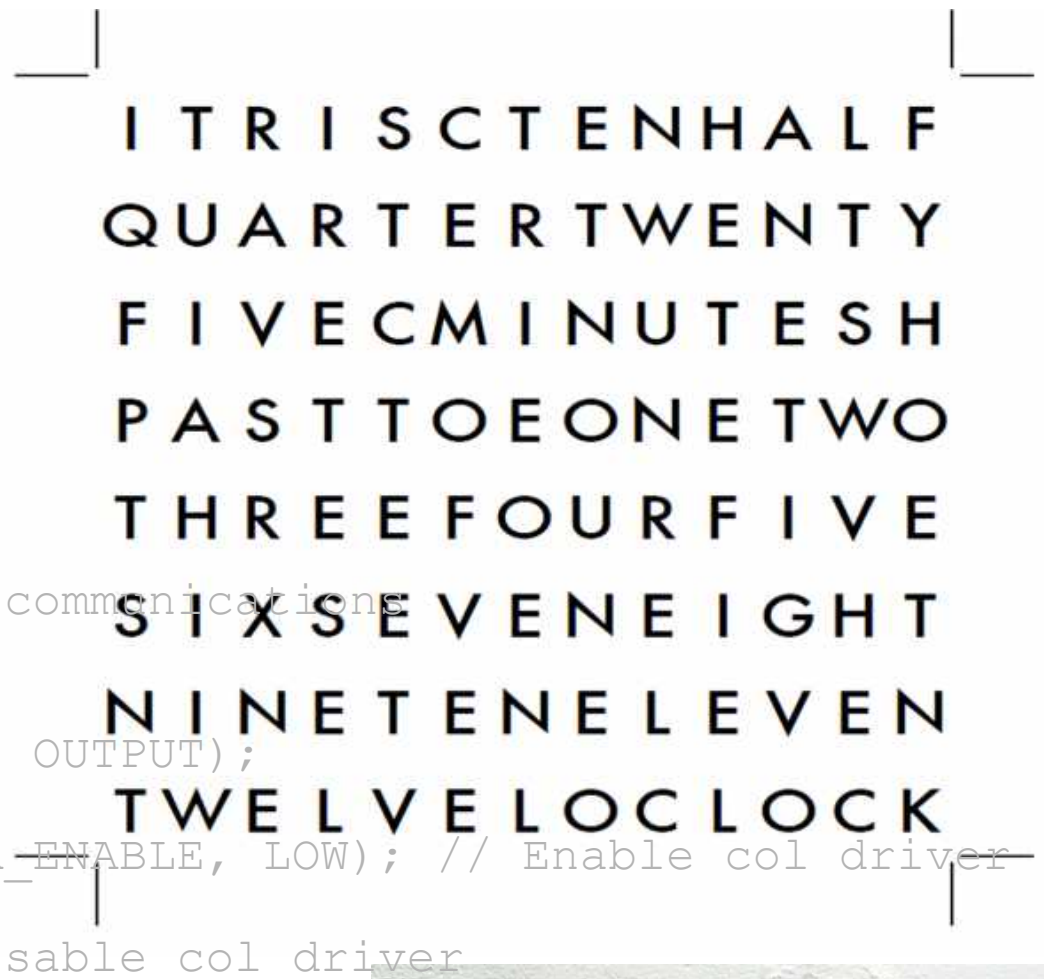
Applications are not limited to word clocks. We think a cool app for ClockTHREE would be the sunclock. At a glance you can see where on the Earth the sun is shining. We have the possibility to add in a small digital display to show the actual time.


**ClockTHREE** turned out to be more expensive than we expected. The array by itself was massively huge – 16 columns and 10 rows of RGB LEDs plus another two rows of mono LEDs.

And so we joined forces with **FlorinC**, our anonomous partner, and created **ClockTHREEjr.**, a pared down version of the ClockTHREE, still with 16 columns, but this time with just 8 rows of single color LEDs. Other than that, it is just as versatile and flexible as the ClockTHREE and will be capible of supporting mutiple languages.

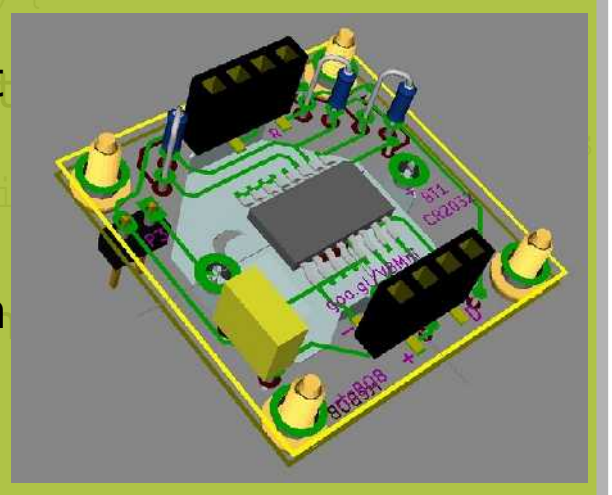
Along the way, we have been fortunate to collaborate with a lot of smart people from around the world: **Angus** from **Hines Design Labs** pioneered the painted faceplate manufacturing technique, **FlorinC** from Toronto (maker of the **WiseClock**, among others), **Peter** from Germany who helped with the **German translation**.

```
// #define CLOCKTHREEJR
#include "ClockTHREE.h"
#include "MsTimer2.h"
#include "Time.h"
#include "rtcBOB.h"
// #include "Screen.h"

ClockTHREE::ClockTHREE(){
}

// Hardware initialization
void ClockTHREE::init(){
  SPI.begin(); // start SPI communications
  pinMode(DBG, OUTPUT);
  pinMode(COL_DRIVER_ENABLE, OUTPUT);

  // digitalWrite(COL_DRIVER_ENABLE, LOW); // Enable col driver
(slower)
  PORTC |= 0b00001000; // Disable col driver

  display = NULL;

  // set column driver outputs.
#ifdef CLOCKTWO
  DDRD |= 0b00001111;
#else
  DDRD |= 0b11110000;
  pinMode(DEC_PIN, INPUT);
#endif

  ////SET MOSI, SCK Output, all other SPI as input:
  DDRB |= 0b00101110;
```




## RTC

The crazy folks at EMSL ran out of their popular Chronodot stocks faster than we could say RTC. Presenting, rtcBoB – our real time chip break out board. Pin compatible with Chronodot. But with a replaceable CR2032 battery, unlike the old CD.



## SMD to DIP

Turns out the row driver we selected for the clocks – the STPxxDP05 series – would be available only in SMD packages. The DIP versions are discontinued. DiY'ers wouldn't be too enthused with soldering SMD parts.

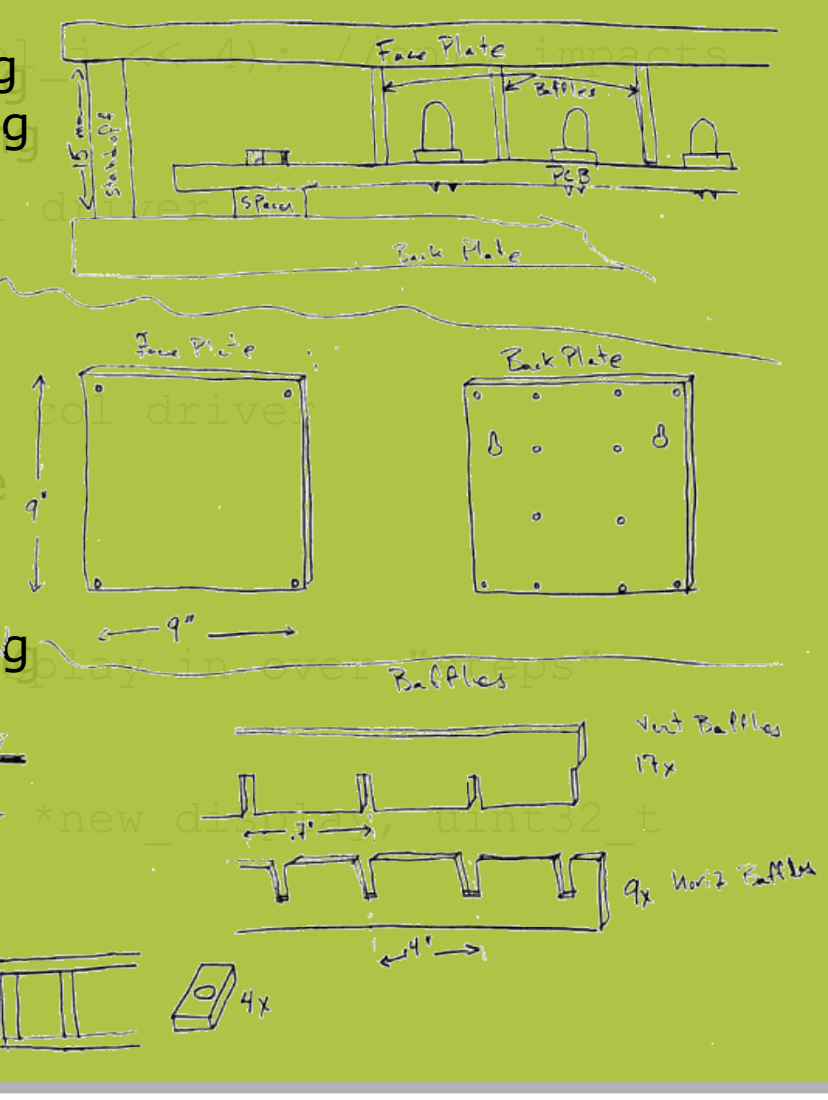
So we built the rowBoB – the row driver break out board. We also put a potentiometer on it to allow manual brightness control. And it plugs in to a standard 24 pin DIP outline for the STPxxDP05 series.

## A "baffling" problem

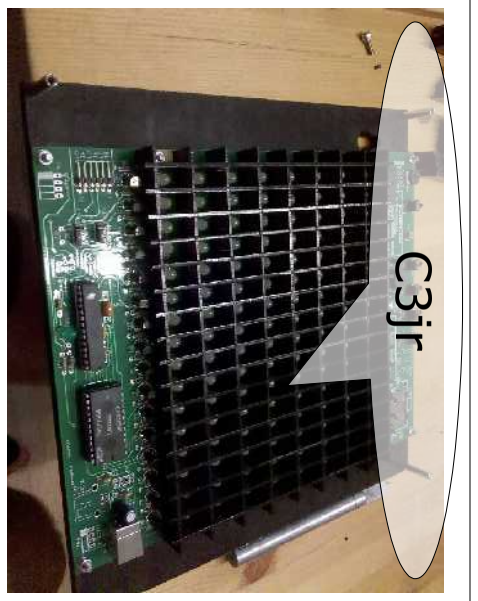
What's the best way to hold in light, and still let it out ? With the individually addressable LEDs on the Clocks, its important to enclose each LED in a closed light box so it doesn't spill over to the other, and let all the light fall on to its associated alphabet.

A set of inter-locking baffle plates, forming a grid of squares. Easy to laser cut, And easier to assemble.

Sandwich the whole assembly between a front and rear plate, and everything fit in nice and well

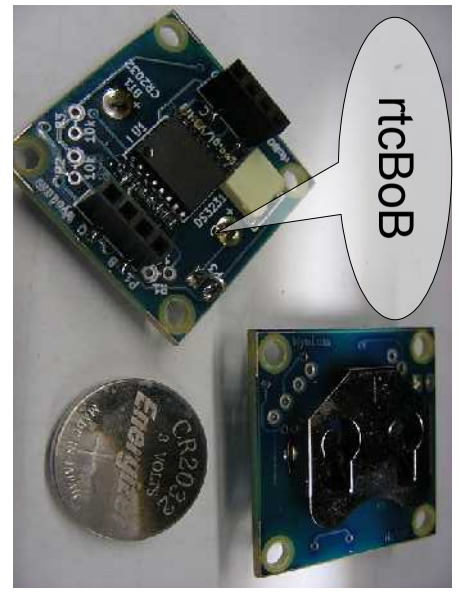


Alden Hart's
Mini Word Clock

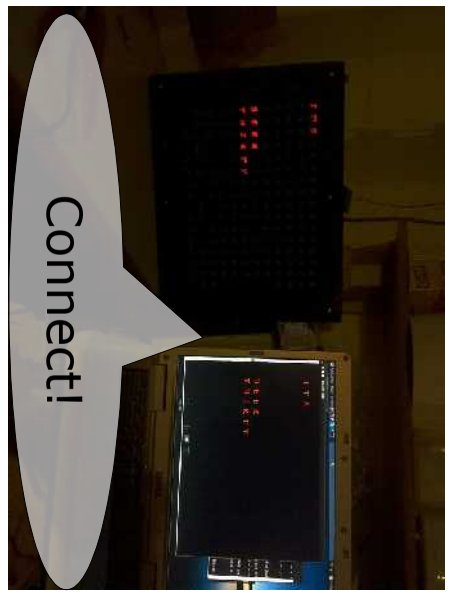



Angus
Hines Design Labs

ClockTHREE
Kick Starter Page



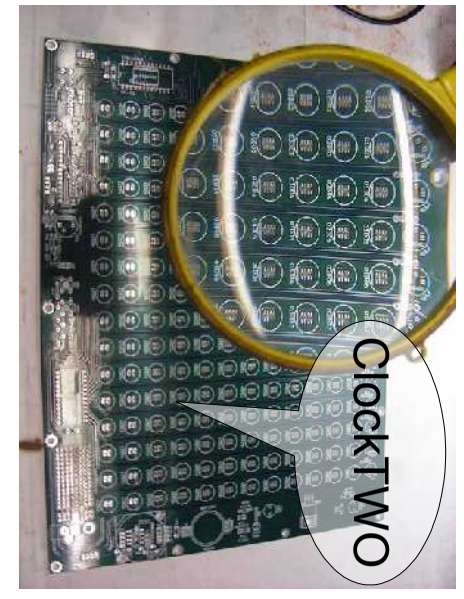

Dougs Word Clock
Instructable




FlorinC
timewitharduino

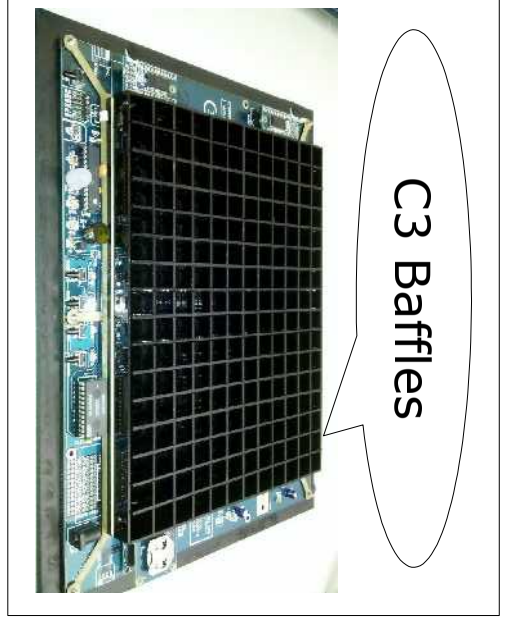

ClockTHREE
Google Site

Wyolum.com




A sleek Word Clock
On Instructibles

Doug Jackson's
Word Clocks



qlocktwo.com

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