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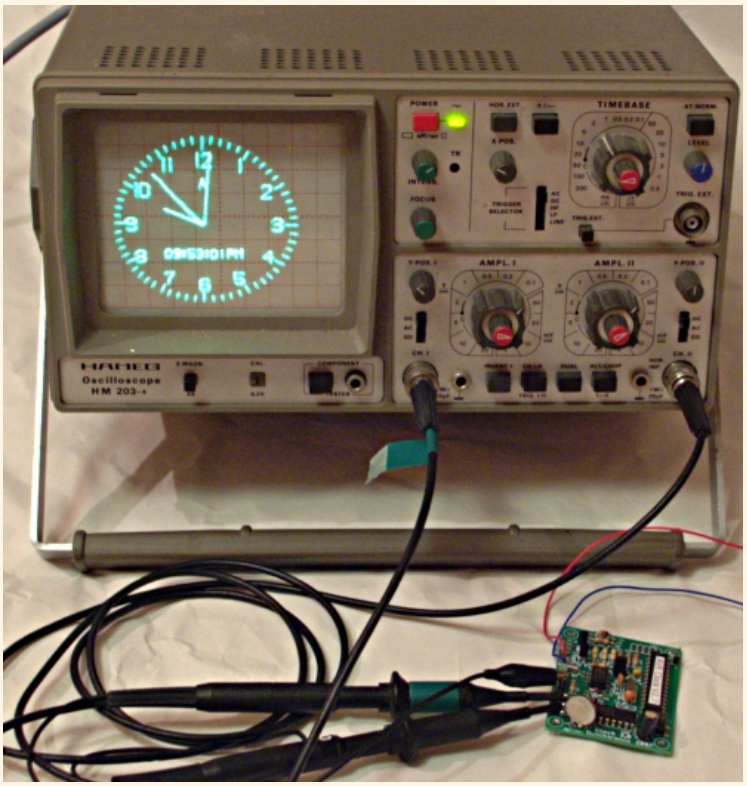
By Guido Socher

An oscilloscope clock



Abstract:

Jan de Rie from dutchtronix.com has developed an oscilloscope clock. It displays an analog clock on any X-Y capable analog oscilloscope. A very nice idea.

The scopeclock

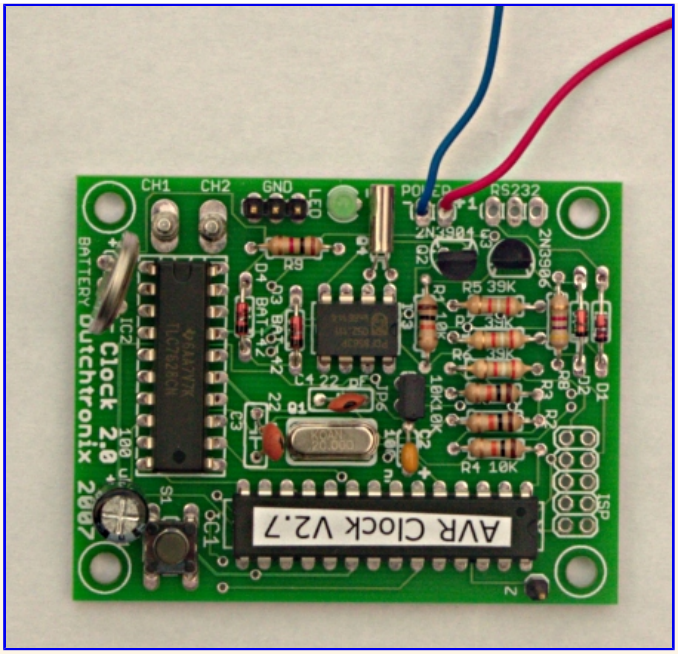
The scopeclock is a atmeg168 based clock. It's a pretty "screensaver" for the oscilloscope in your lab. Just connect it via two 10x probes and put the oscilloscope in X-Y mode. The clock requires 5V DC power and is battery buffered. It has Automatic Screen Repositioning to prevent screen burn-in.

More information is about this clock is available at: http://www.dutchtronix.com/ScopeClockH2-0.htm

The circuit/building the clock

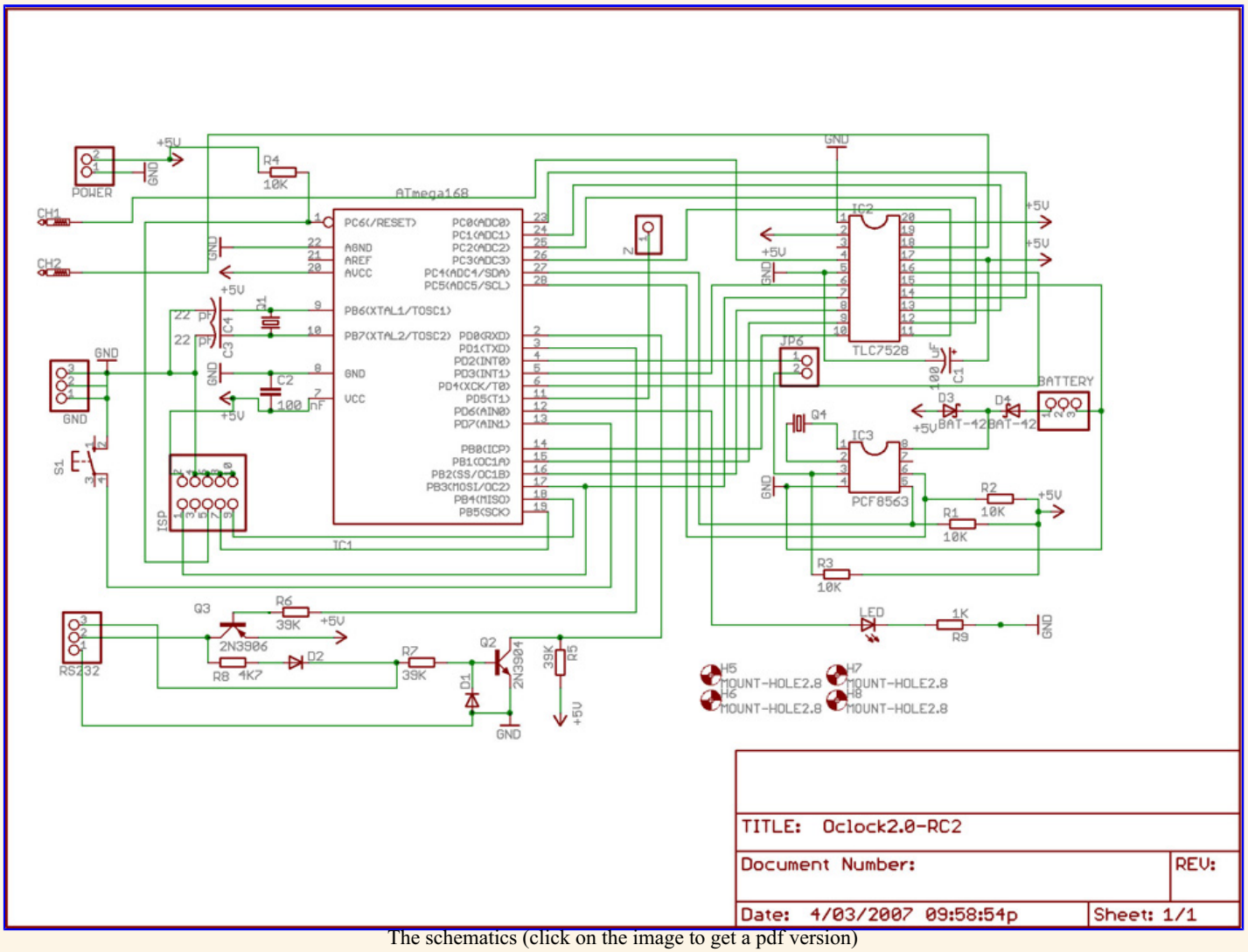
Tuxgraphics is a re-seller of this clock and you can order it at shop.tuxgraphics.org. Below is therefore the needed assembly documentation and instructions on how to use it.

More details are available from dutchtronix.com at: http://www.dutchtronix.com/ScopeClockH2-0.htm

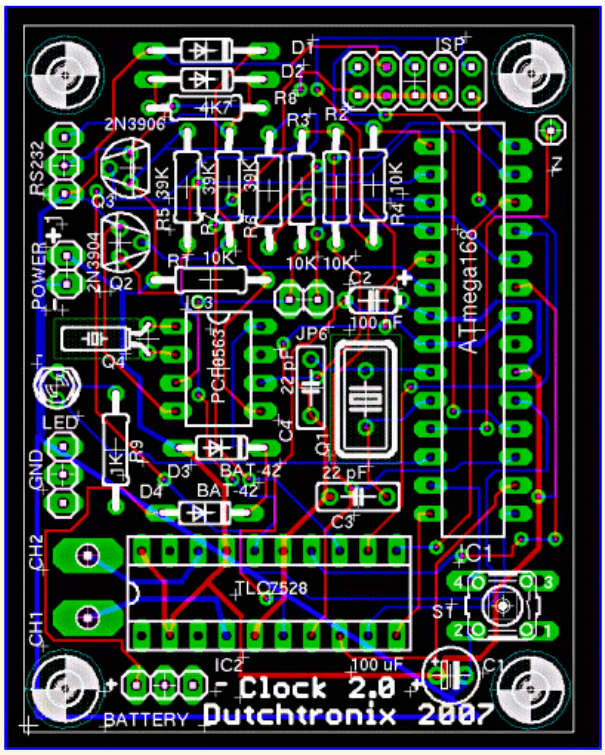


The assembled board

The kit contains sockets for all ICs. Note however that connectors and sockets become after several years of handling and operation a reliability problem. At tuxgraphics we recommend therefore to avoid sockets when possible.



The schematics (click on the image to get a pdf version)



Board, top view

Using the clock

The atmega168 comes with software pre-loaded. The clock is therefore ready to use after the assembly of the board.

Connect 5V DC to the power pins. Set the scope in XY mode and connect the probes to channels 1 and 2. Set both channels to DC mode and the voltage range to 0.5V per division.

Most scopes define CH1 and the X axis and CH2 as the Y axis. There are however some exceptions. Swap the probes if the clock appears the wrong way round on the screen.

Control of the clock is primarily done using the on-board button switch. This button switch has 2 actions:

- Long push (> 1 second: keep the button switch pushed down until something happens on the screen)
- Short push (<1 second: push and release the button switch

The long push enters the Time Set mode, the short push enters the Menu mode.

Time Set mode:

- short push advances the current field one
- long push moves to the next field.

Changing the time on the AVR Clock using the button switch:
A long push will enter the Time Set mode; the clock is stopped in this mode. The field being modified (hours, minutes or seconds) will flash. A short push will increment the current field. A long push will move to the next field, using the current field value as the new time value. Once done with the seconds field, a message pops up "PUSH TO START". A short push will restart the clock at the selected time. However a long push will restart the clock at the actual time, as kept by the on-board Real Time Clock. This is handy if you entered the Time Set mode by accident or you changed your mind.

Menu mode:

- short push selects the next value (or activates the current option)
- long push moves to the next option.

Options available on the on-screen menu:

```
Option  Default Value   Other Values  Function
BOOT                                  reboots the clock
DEMO                                  enter DEMO mode
CAL      OFF             ON           Display Calibration Screen
NUMERIC  12HR            24HR/OFF     Controls Numeric Display
MASTER   AVR             RTC          Clock time keeping mode
LED      ON              OFF          Controls LED
BURNIN   ON              OFF          Screen burn-in prevention
DIAL     FULL            MIN          Clock face
SPEED    NORM            FAST         Clock speed
DIR      NORM            REV          Clock direction
```

Changing an option on the AVR Clock using the button switch:
A short push will enter the Menu Mode. The option being updated/selected is flashing. Move to the next option by a long push. The first two options (BOOT and DEMO) are activation options. A short push will activate them. The other options are selection values. A short push will show the next selection value. Moving to the next option (using a long push) when the selection value has changed, will activate the selected value and the clock will leave the menu mode.
If an option cannot be changed in the current configuration (for example SPEED FAST only works in AVR Clock Master Mode), the selection value cannot be changed.

Optional RS-232 serial interface:
The clock can also also be operated through the RS-232 serial port, using a PC (or any other terminal device), though this interface may be removed in the future. To do this, you will need a cable consisting of a female DB-9 connector (for most PCs) and the 3 pin connector included with the AVR clock. Wiring is as follows

```
3-pin connector - 1:GND,  2:out/RXpc, 3:in/TXpc.
DB-9 connector  - 5:GND,  2:RX,       3:TX.
```

The clock is set for a baudrate of 19,200. You can use the HyperTerminal program included with Windows, or use a freeware program like Bray's Terminal, which can be also downloaded from this page.

Once the cable is connected properly, the clock will display a sign-on message on the terminal when it powers up. The command 'X' is used to get the clock's attention (interactive mode). A prompt will show:

```
Enter command (A,B,C,D,F,H,L,N,P,S,T,V):

A: Toggle Clock Master Mode
B: Toggle Burn-in Prevention
C: Toggle Calibration Output
D: Set Date
F: Toggle All Clock Face Digits Display
H: Display Help
L: Toggle LED Blinking
N: Toggle Numeric Display
P: Toggle AM/PM Display
S: Show Day and time
T: Set Time
V: Toggle Verbose Output
```

Execution of any of these commands, or another 'X' will end the interactive mode. Note that the commands can be given in either upper or lower case. If

References

- dutchtronix.com Scope Clock version 2: **http://www.dutchtronix.com/ScopeClockH2-0.htm**
- dutchtronix.com Scope Clock version 3: **http://www.dutchtronix.com/ScopeClockH3-1-Basic.htm**

- The scopeclock is available at: shop.tuxgraphics.org

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