

K148T2. STOPWATCH with PAUSE

Another in the series of timer kits based on the K148 hardware platform. This is a classic stopwatch timer with a pause feature as well. Timing is in hours, minutes, seconds and hundredths of a second up to a maximum of '99:59:59.99'. An output signal which pulses low every minute is also available.

Refer to the "K148 4-DIGIT TIMING MODULE" documentation for details of hardware features, circuit description and assembly instructions.

TIMER SPECIFICATIONS

Timing ranges	0 to 99h 59m 59.99s
Timing resolution	1/100 second
Inputs	Start, Stop and Reset
Output pulse	20mS second active low every minute.
Output type	Open collector NPN transistor, 100mA @ 30V
Display	4-digit 7-segment with decimal point, 14mm RED LED
Supply voltage	9 to 12V DC
Supply current	30 to 50mA, depending on the number displayed.
Physical size	51mm x 66mm (2.0" x 2.6")
Connection	10-way right-angle SIL header pins, 0.1" spacing

OPERATING INSTRUCTIONS

On power up or reset the display shows '00.00' seconds. Press the START button to commence timing. The display starts counting up in hundredths of a second.

At the **end of every minute** the display changes over for **1 second** to show the elapsed hours and minutes time. It then reverts to displaying and counting seconds.

PAUSE function

While the timer is running press the START button – the display will 'freeze' at the current elapsed time. The timer is still running in the background – only the display has been stopped. **Note:** The output pulse every minute will continue because the timer is still running. Press the START button again to re-start the display. It will jump to show the current elapsed time.

The PAUSE function can be used to measure LAP times during a race. However the 'LAP' time does not reset when the START button is pressed again.

STOP function

Similarly, pressing the STOP button while the timer is running also causes the display to freeze. **However the timer is stopped as well.** The output pulses every minute are also stopped. Press the START button again to continue on.

Displaying hours and minutes

In both the above cases when the display is 'frozen' you can press the STOP button to toggle the display between hours/minutes and seconds/hundredths of seconds. The

hours/minutes display does not have a decimal point between the hours and minutes digits.

RESET function

At any time you can reset the timer via an earth on the RESET input to the module (just short the reset pins together). You can also reset the timer using the STOP button. In this case 'freeze' the display as described above then press **and hold** the STOP button for 1/2 a second. The display will blink off momentarily and then display '00.00' again.

OUTPUT pulse

At the end of every minute the open collector output pulses 'low' for 20mS. (For more information about what an open collector output is please read the note at www.kitsrus.com/zip/opencol.txt)

You can use this output to externally count the number of elapsed minutes. This feature can be altered in the firmware on request. If, for example, your application needs an output pulse every hour instead of every minute. Or it needs an 'overflow' output when the timer rolls over from '99:59:59.99' to '00:00:00.00' (a pulse every 100 hours) then please contact the software writer below and he may be able to do a special firmware chip for you. It is only software after all. It is not like adding new cmos IC's to the PCB like in the old days.

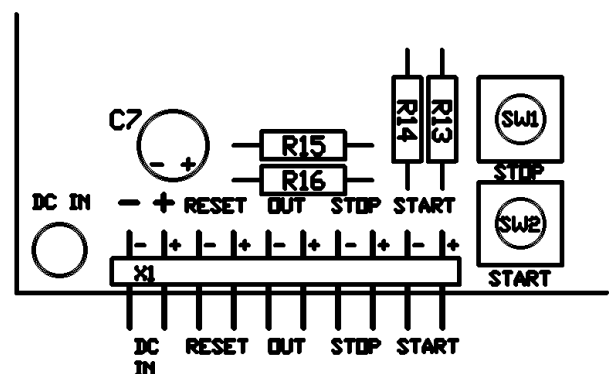
APPLICATIONS

The most obvious use would be in timing races, either by hand or via external signals as they cross the finish line. We have one customer who uses a slightly modified version as the heart of a greyhound racing timing system.

Add a timing function to your slot car or train set. Or measure the duration of a telephone call.

CONNECTING TO THE TIMER

A 10-way header strip provides external connection to the timer, including power. All the inputs and the output are organized as 'pairs' of pins, with each input or output having a corresponding ground pin, as per the following diagram.



The '+' sign indicates the actual input or output pin and the '-' sign indicates its associated ground pin.

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Note: When using the output to switch a load (relay, buzzer, etc) connect the load between the output pin and a positive DC voltage. For example, if switching a 12V relay connect the relay between the output pin and +12V.

OTHER TIMING MODULES

There are other firmware IC's available for K148:

1. **K148T1.** Simple Photographic Timer
2. **K148T3.** 40KHz Auto Ranging Frequency Meter
3. **K148T0.** Programmable Down Timer counting down in seconds from a maximum of 10,000 sec
4. **K148T4** Programmable Down Timer counting down in minutes from a max of 10,000 minutes
5. **K148T5** Programmable Down Timer counting down in hours from a max of 10,000 hours

See our website at www.kitsrus.com for details.

If you have any questions or changes to the firmware you would like to discuss please contact the kit developer at frank@ozitronics.com

Please note we do not provide the source code for any of our firmware.