



TIM 2015 Speaking Clock

INFORMATION SHEET

TIM 2015 is part-funded by the Telecommunications Heritage Group (THG) and designed by



Using a GPS receiver module to synchronise TIM 2015

1 Choosing a GPS receiver

The GPS receivers used with TIM 2015 make use of ready-made devices that were designed to be attached to the windscreens (windshields) of motor vehicles for providing a location reference for on-board sat-nav (satellite navigation) devices. The latest receivers used with sat-nav installations are becoming increasingly sensitive and sophisticated, meaning that older receivers are being sold on auction websites at very affordable prices. These older receivers are perfectly adequate for our purposes. The same components are also being repackaged for sale to nixie tube clock owners by firms such as PV Electronics, who make this handy product that is not, however, the cheapest on the market:

https://www.pvelectronics.co.uk/index.php?main_page=product_info&cPath=9&products_id=33

See photos below.



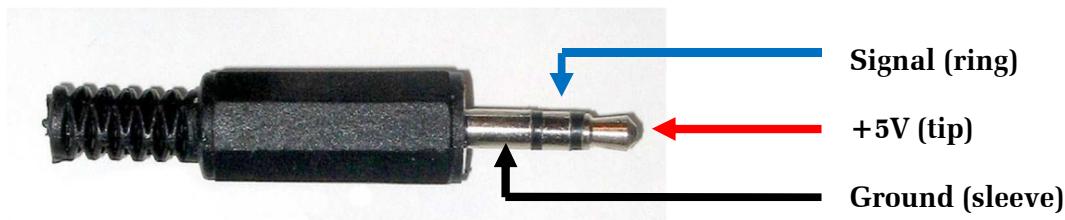
The low-cost GPS receiver module that Sam Hallas and Ross Herbert use. It is usually easy to find on eBay and other auction sites (Photo by Sam Hallas)

An alternative GPS receiver module: the GPS4 by PV Electronics
(www.pvelectronics.co.uk)

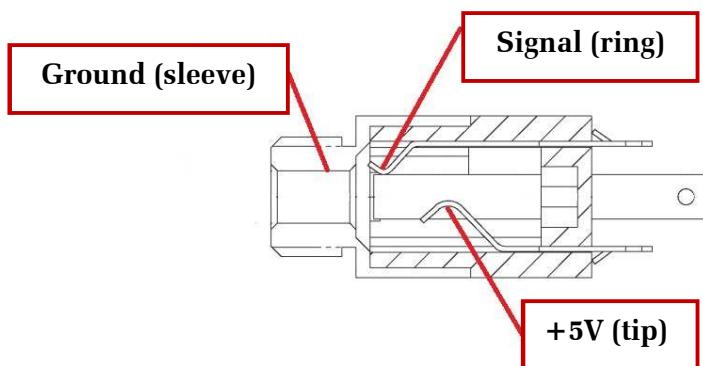


2 Connecting the GPS receiver module to TIM 2015

Regardless of which model of receiver you buy, the connections are almost always the same, using a 3.5mm 'stereo headphones' plug. The connections are as follows:



3.5mm plug connections (wire colours used inside the cable will vary)



3.5mm socket (jack) connections

The 3.5mm socket for connecting the GPS receiver is located on the rear panel of TIM 2015's case.

When you are ready to connect your GPS receiver, **switch off the power**, plug in the GPS receiver and switch on TIM 2015 again. You must now tell TIM 2015 which **Time Source** you are using. Go into the Settings menu, select **Time Source** and select **GPS**. The blue **Data** LED will flash at about 0.5s intervals until the yellow sync LED lights up, indicating that synchronisation has been established, then the blue LED goes out. With no receiver connected the blue light doesn't flash. Even if you now reconnect the GPS receiver, it will not flash again until you switch TIM 2015 off and on.

Under normal conditions it takes around four or five minutes to 'acquire' the signal from the satellite, at which time the yellow sync LED illuminates. Ross Herbert remarks: It is interesting to note that when using GPS as the time source (as I do) the only settings necessary after a power-on (PON) reset are the GMT time offset (+08 in my case) and the Time Source (set to GPS). After saving these parameters it is just a matter of waiting about five minutes until the GPS locks on and the time and date will then be current. There is no need to set the current time and date using the menu options.

- Customers are welcome to have their existing TIM 2015 clock fitted with a socket for a GPS receiver at a modest fee. Please e-mail andrew.emmerson@btinternet.com .

3 Antenna positioning (with thanks to Molex and u-Blox)

A GPS receiver needs to receive signals from as many satellites as possible and at least three. Optimal performance will not be available inside buildings or in narrow streets and underground parking lots or if objects cover the antenna. Poor visibility may result in position drift or a prolonged Time-To-First-Fix (TTFF). Good sky visibility is therefore an important advantage.

When you are obliged to use a GPS receiver indoors, as you normally will with TIM 2015, then you should do your best to place the antenna as close to a window as possible, even if this means using an extension lead (3.5mm female to male, available on eBay as a 'stereo headphones extension cable') to reach where your TIM 2015 is installed. The length of the cable is not critical because it is carrying only a baseband data signal and 5V DC power supply. The radio signal from the GPS satellite is converted to baseband in the small receiver module at the 'window' end of the cable.

The reason for locating the antenna close to a window is because GPS signals are very weak in relative terms and placing the antenna where it has some visibility of satellites improves your chance of successful operation. A larger antenna would capture more signal but it would be an inconvenience. The reason a GPS receiver manages to work without a large antenna is to do with the GPS signal's structure and the GPS receiver's ability to 'de-spread' it. Put another way, the power for extracting a decent GPS signal out of the ether's general background noise is concentrated in the receiver rather than the antenna.

Fortunately, the receivers available to us are quite sensitive and will work with weak signals. Another factor that works in our favour is that whereas GPS receivers used for identifying the user's whereabouts (which the receiver does by triangulating its position in relation to several different satellites), we are interested only in the current time of day, for which sight of just one single satellite will suffice.

The so-called patch antennas used in the receiver modules discussed here achieve highest gain when placed horizontally on a surface, enabling them to receive all propagated GPS signals. Lower gain will be experienced if the patch antenna is mounted on a surface that makes an angle with the horizontal. That said, it is always worthwhile adjusting the position of the antenna, as you may find that it works better vertically than horizontally. Try it in a number of orientations for this reason. This YouTube video may give you some ideas: <https://www.youtube.com/watch?v=bgOZLgaLa0g> .

It is best to place the antenna as far away as possible from other electronic devices that may radiate interfering signals. Putting it close to TIM 2015 is feasible but only where the GPS signal is strong.

- If you have any problems or questions please contact andrew_emmerson@btinternet.com. Thanks.

Please note. As far as possible we re-use packing material, not because we're cheapskates but because we support recycling and sustainability. Also we want to keep the price that you pay as low as possible!

