

# WHAT IS GPS?



**GPS**   
31 satellites

## DEFINITION

GPS time (GPST) is the time system of the navigation satellites of the Global Positioning System (GPS). It is defined as International Atomic Time (TAI) minus 18 seconds. The constant necessary correction due to the drift of the atomic clocks is carried out by comparison with the ground station of the United States Naval Observatory. In addition, GPS is one of the Global Navigation Satellite Systems.

## LEAP SECONDS

The GPS time is sent as an integer. The signal contains the number of seconds since the GPS clocks were first switched on (January 1980). Originally, GPS time was set to UTC, but since GPS satellites have been in space for the last few years, no leap seconds increase was made, unlike UTC - so GPS currently runs exactly 18 seconds ahead of UTC. The General Conference on Weights and Measures (CGPM) delegates decided in 2022 that the leap second should be abolished by the year 2035 at the latest.

## HOW WE USE?

If a GPS receiver has synchronized to several GPS satellites, it is possible to derive a time signal with nanosecond accuracy by calculation. A GPS time server uses a GPS receiver as a reference time source and then distributes the time in the network. Every GPS satellite is equipped with one or more atomic clocks. The time thus determined, together with the exact position of the satellite, is a prerequisite for determining the position of the GPS receiver. The time received by a GPS receiver is initially the GPS time, an atomic time scale without leap second. The satellite message contains the current difference between GPS time and UTC. This allows the exact UTC to be calculated in the receiver. If the transit time of the satellite signal is determined accurately, the GPS system guarantees a deviation from UTC of no more than one microsecond.

### ADVANTAGES GPS SYNCHRONIZED TIME SERVER

- The worldwide availability of GPS satellites enables the synchronization of time servers all over the world.
- A GPS-synchronized time server can achieve an accuracy of up to +/- 20 nanoseconds, which is very high accuracy.
- The fact that the GPS system is distributed across 24 operational satellites generally makes it a fail-safe method.

### DISADVANTAGES GPS SYNCHRONIZED TIME SERVER

- Clear „line of sight“ of the antenna to the sky required: A clear line of sight is required to receive the GPS signal and synchronize an accurate time. If obstacles such as buildings or trees block the line of sight, this can affect the accuracy of the synchronized time.
- Dependence on an operator (USA): As GPS synchronization is based on GPS signals, a GPS signal failure or interference can affect the accuracy of the synchronized time.
- GPS receivers are susceptible to jamming or spoofing.