



# **z505 Series**

**High Precision Time Server  
synchronized by GPS  
for Static or Mobile Applications**



**z505S-C | z505T-C**  
**Compact Models**

***Indoor / Outdoor Antenna***

**High Precision Ethernet Time Server / GPS Master Clock  
with PoE and advanced Input/Output features  
(Indoor or Outdoor use)**

*Revision 5*

## PRESENTATION

ZTI has selected a high precision time server synchronized by GPS with PoE (Power over Ethernet) for indoor or outdoor use, produced by Heol Design to provide accurate timing information for network synchronization and measurement applications.

The z505-C time server has been designed to provide accurate timing information through an Ethernet link (using NTP/SNTP protocol), without the need to be connected to an external network, hence preserving your network insulation.

z505-C is well suited for both **static** and **mobile** applications with a very large temperature range from **-40°C** to **+70°C**.

In case of failure of GPS signals, z505-C still provides all its timing functions (Holdover mode).

With the "fast start" feature, z505-C needs less than 1 minute at power-up to provide accurate timing information. And if it has already GPS Almanac and Ephemeris loaded in memory, then it is fully operational in about 20 seconds. Then it becomes possible to power-up z505-C only a few minutes per day, to synchronize the different elements of your system.

Two models are available depending on the quality of the RTC option used to provide the time at **power-up** if no GPS signal is available (antenna disconnected or hidden inside a building for example) and if no synchronization is possible with other external time servers (private or public):

- z505**S**-C: the **S** option means RTC with **S**tandard quartz – drift of 1 to 2 seconds per day. The RTC delivers the time during a few days depending upon environmental conditions – typically 3 to 5 days).
- z505**T**-C: the **T** option means RTC with **T**CXO powered by internal lithium battery - drift of 4 minutes max for one year with the temperature range -40°C / +70°C (drift of a few seconds for one year at constant temperature). Note: the RTC delivers the time during 6 months.

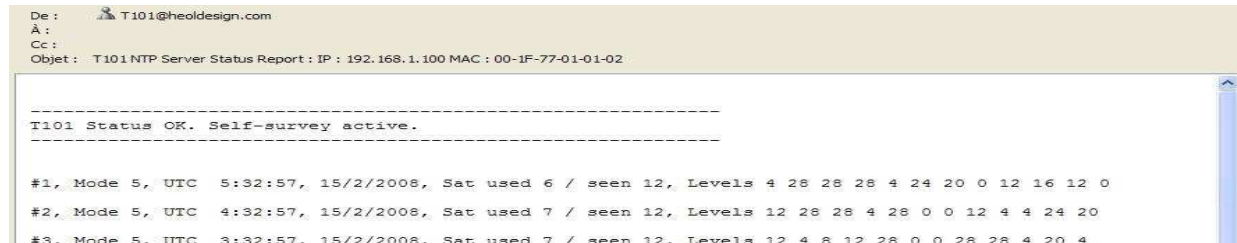
Based on a high performance 12 channels GPS chipset (with -160dBm sensitivity), it delivers accurate timing information, even in poor signal level conditions (**indoor**, urban canyons and signal obscured environments). The antenna (protected against short-circuit) does not need to be located up a mast or on the rooftop as is the norm, which considerably **reduces the cost and complexity** of deployment in terms of antenna cabling and lightning strike protection and reduces the cost of maintenance.



Thanks to its self-survey mode, the accuracy of the timestamp (compliant with SNTP protocol) is better than  $\pm 200$  nanoseconds for the receive packet and  $\pm 600$  nanoseconds for the transmit packet with the P1 $\mu$ s version (else 10 $\mu$ s with the P10 $\mu$ s version) – reference is UTC atomic clock. This accuracy is achievable **even with only 1 satellite being tracked**.

If the satellites signals are completely lost, the **hold-over** mode enables the module to keep sending accurate Ethernet frames, with a **drift better than 100 $\mu$ s/day** thanks to the integrated **OCXO**.

A **web server** with secure access allows configuring the z505-C, and monitoring the status at a glance (GPS satellites strength signals, Ethernet connections, alarms, input/output...). Automatic **E-mails** can be sent periodically or when alarms appear. This function is fully configurable by using the http server.



One or two **2500V isolated** event inputs (available on specific I/O connector) allows to time-stamp external events with very high accuracy ( $\pm 100$  nanoseconds, refer to UTC atomic clock). The timestamp information is reported by e-mail, SNMP trap, broadcast frame or through the RS232/RS422 port.

**Alarm relay** is available optionally on specific I/O connector, for driving of external systems in case of failure of the z505-C.

Alarms are reported through SNMP traps (Ethernet interface) or through the RS232/422 interface. SNMP can also be used to configure the z505-C parameters (instead of the web server).

The integrated **OCXO** delivers a square-wave or sinus output (option available on the I/O connector). Default frequency is 10MHz (GPS disciplined), but can be any other upon customer request.

A highly accurate **pps** signal (**TOP** signal) ( **$\pm 100$ ns accuracy**) is available on SUB-D9 (option) or specific I/O connector (polarity, period, length, and delay compensation are configurable by user). It is also available with optional 1500V isolated static relay (in this case the alarm relay is not available).

In option **IRIG-B003** output is available in RS422 or TTL level.

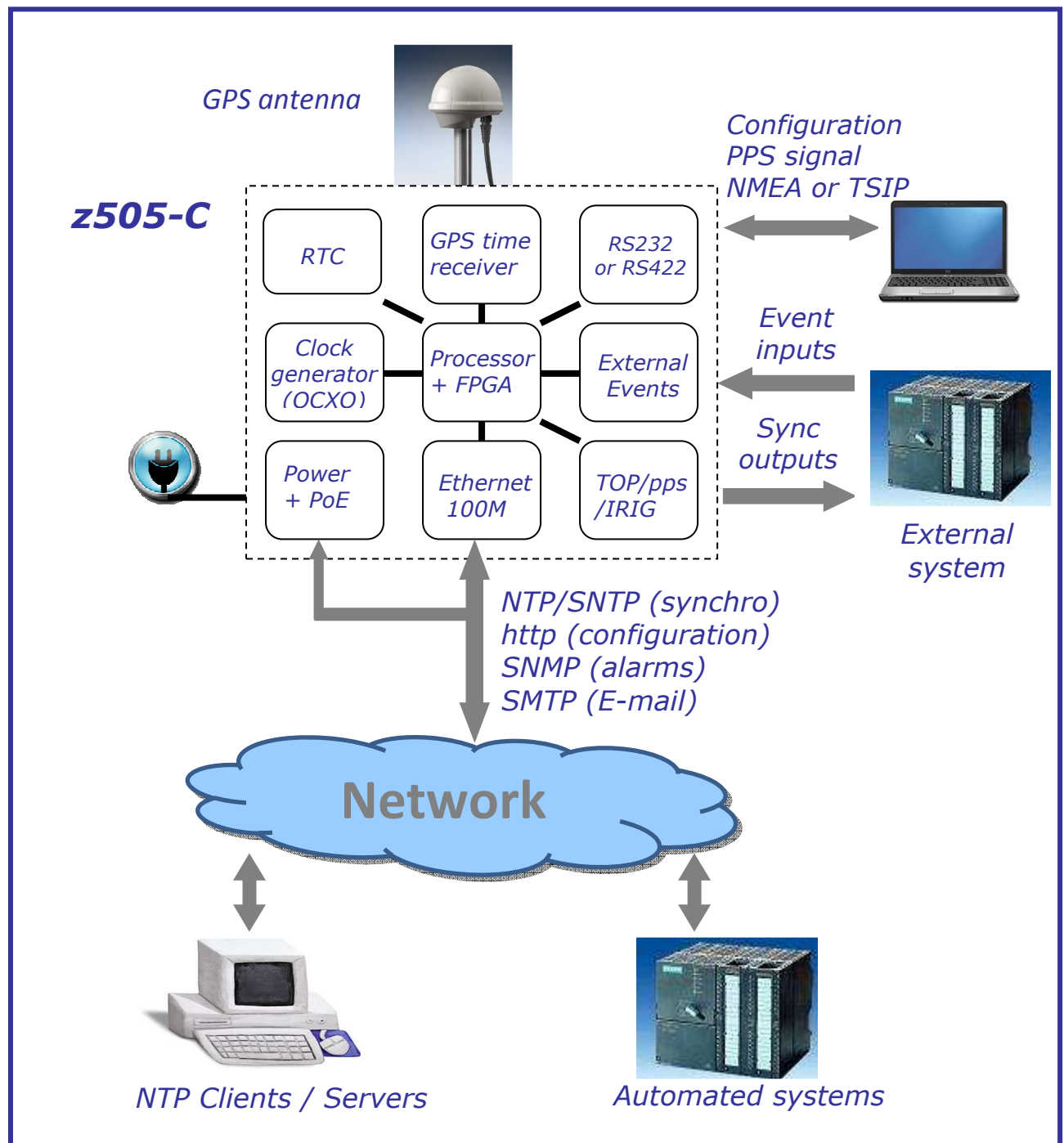
A RS232 or RS422 serial port can be accessed for remote control and monitoring: protocol output selectable through the web server: TSIP (Trimble protocol) or NMEA protocol output).

Historic data can be backed-up to an EEPROM (over 8000 status records).

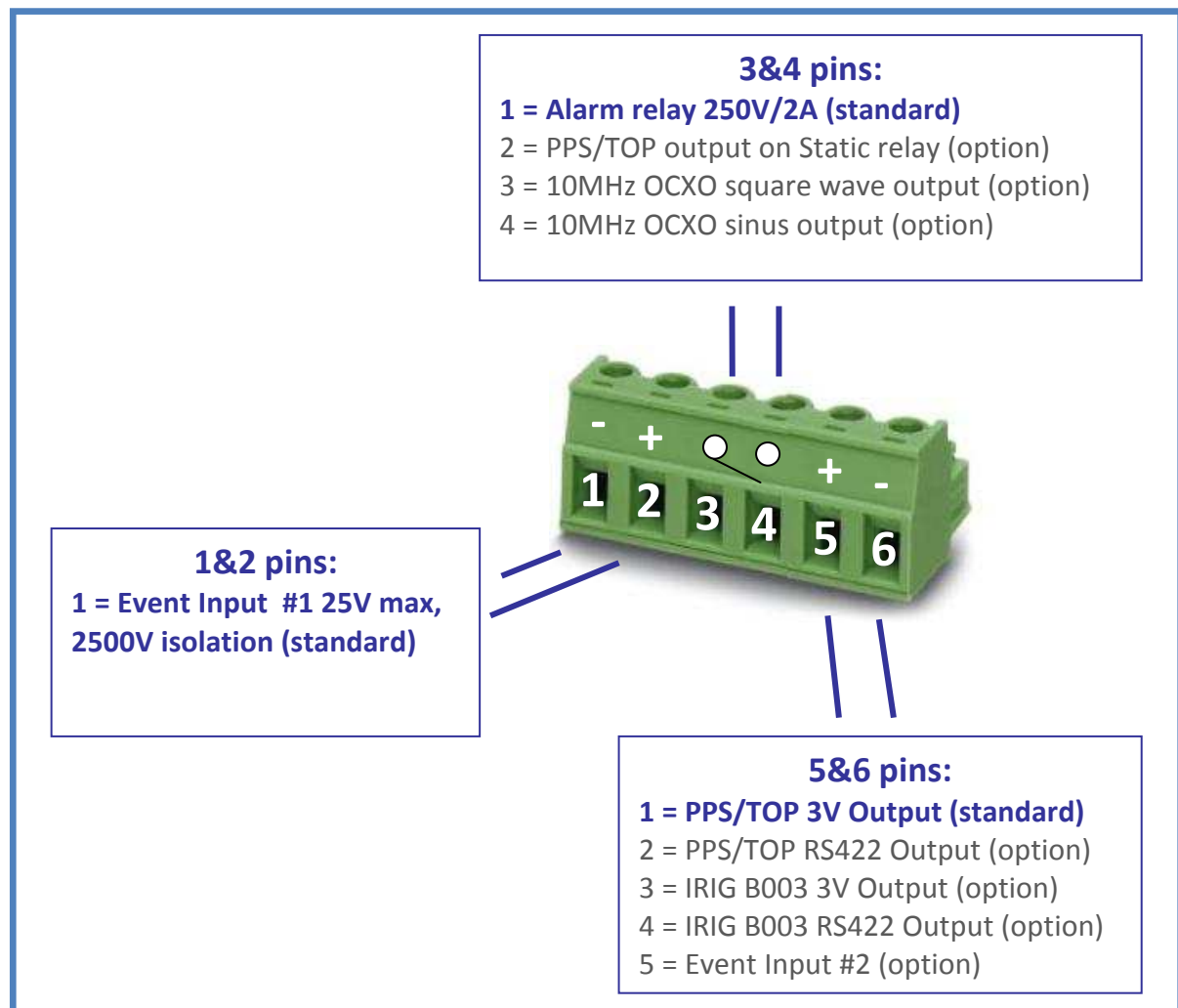
The **Power On Ethernet** feature enables installation of z505-C without the need for additional cables to provide power.



z505-C is packaged in **metal housing** (no rack model available).

**z505-C Synoptic and external links**

The 6-pin I/O connector gives access to specific functions:



### I/O Connector Details

- Opto-isolated event input, for time-stamping external events with  $\pm 100\text{ns}$  accuracy (notification via RS232, Email or NTP broadcast frame). The pulse level can be up to  $\pm 25\text{V}$  (expandable by adding a series resistor). Threshold voltage is 1V for the rising edge, and 0.5V for the falling edge. It is fully isolated to prevent from any damage (2500VDC).
- 250V/2A Alarm relay output for driving of external systems. When synchronization is lost (user-configurable threshold), or when power is removed, the relay switches from Open to Close. You can disable Relay activity and select the threshold level by configuration.
- Highly accurate PPS signal (TOP signal) ( $\pm 100\text{ns}$  accuracy) available on SUB-D9 or I/O connector (polarity, period, length, and delay compensation are configurable by user). It is also available with optional 1500V isolated fast static relay (option #2 for pins 3&4 on the I/O connector). Polarity is programmable, as well as period, pulse length, and compensation delay. Compensation delay can be useful if you have long cables or slow detection components.

With the Static Relay option for z505-C (option #2 on pins 3&4 of the I/O connector):

- If the polarity is 'positive', the relay is closed during the PPS/TOP pulse (switching time is about  $200\mu\text{s}$ , and can be compensated using compensation delay),
- If the polarity is 'negative', the relay is opened during the PPS/TOP pulse (switching time is about  $8\mu\text{s}$ ).

## Specifications

|                     |                                |                                      |
|---------------------|--------------------------------|--------------------------------------|
| <b>GPS Receiver</b> | Type                           | 12 channels                          |
|                     | Sensitivity                    | -160dBm                              |
|                     | Position Accuracy              | <2.5 meters                          |
|                     | Time Accuracy (PPS)            | ±100 ns (static)<br>±200 ns (mobile) |
|                     | Cold start (Time to First Fix) | < 39 seconds (90%)                   |
|                     | Start-up time                  | ≤1 minute                            |
|                     | Active Antenna Voltage         | 5V or 3V, configurable               |

|                         |   |   |
|-------------------------|---|---|
| <b>Timing Generator</b> | Timing Ethernet Protocol                        | SNTP V4, NTP Broadcast/Unicast<br>(100 requests per second maximum)   |
|                         | Configuration / Monitoring                      | http server or SNMP manager   |
|                         | Absolute Timestamp Error<br>(refer to UTC time) | Version P10µs: 10µs<br>Version P1µs: ±200 ns (Rx) ±600 ns (Tx)  |
|                         | Timestamp drift when<br>synchronisation lost    | Less than 100µs/day with<br>10°C temperature variation  |
|                         | RTC S option                                    | 1 second accuracy<br>Autonomy: 3 to 5 days<br>Drift ~ 1s/day (10°C temp. variation)   |
|                         | RTC T option                                    | 1 second accuracy<br>Autonomy: 6 months<br>Drift ~ 0.2s/day (40°C temp. variation)<br>Drift ~ 0.7s/day (full temperature range) |

|                    |                   |  |
|--------------------|-------------------|--|
| <b>OCXO output</b> | Frequency         | 10.000000 MHz (other on request)   |
|                    | Output impedance  | 50 ohms  |
|                    | Output level      | Square-wave: 3.3V<br>Sinus: 2dBm min.  |
|                    | Spurious response | -70dBc   |
|                    | Phase noise       | -90dBc Typ. (@ 1 Hz)<br>-100dBc Typ. (@10 Hz)<br>-130dBc Typ. (@100 Hz)<br>-140dBc Typ. (@1,000 Hz)<br>-150dBc Typ. (@10,000 Hz) |

|                     |                   |   |
|---------------------|-------------------|---|
| <b>Power supply</b> | Input Voltage     | Power On Ethernet: compliant with IEEE 802.3af.<br>Auxiliary: 12 to 60VDC |
|                     | Power Consumption | 7W max at start-up<br>4W typical at ambient temperature                   |

|                   |                                  |   |
|-------------------|----------------------------------|---|
| <b>Interfaces</b> | Auxiliary Power Supply           | 2.54mm header, anti-extraction  |
|                   | GPS Active Antenna               | SMA connector   |
|                   | Ethernet Link                    | RJ45, 10/100Mbps + Power  |
|                   | RS232 / RS422                    | SUB-D9, 38400/8/No/1 (default)<br>NMEA or TSIP protocol   |
|                   | PPS Output<br>(Pulse Per Second) | RS422/RS232 (option), or fast static relay<br>output on SUB-D9 or 6 pin I/O connector<br>(3.81mm), 3V logic level |
|                   | Alarm Relay                      | On I/O connector<br>2A/250V. 2500V isolation  |
|                   | Event Input(s)                   | On I/O connector<br>25V max peak voltage (add R series for<br>more), 2500V isolation, ±100ns accuracy             |
|                   | OCXO output                      | Option on I/O connector   |

|                      |                       |                    |
|----------------------|-----------------------|--------------------|
| <b>Environmental</b> | Operating Temperature | -40°C / +70°C      |
|                      | Storage Temperature   | -40°C / +70°C      |
|                      | Humidity              | 90% non-condensing |
|                      | Dimensions (z505-C-C) | 180 x 90 x 27 (mm) |
|                      | Weight (z505-C)       | 500 grams          |
|                      | Maximum Speed         | 515 m/s            |
|                      | Maximum Altitude      | 18000 m            |
|                      |                       |                    |

According to  directive, z505-C module has passed the following tests:

- EN55022/55011 class B: conducted and radiated emissions.
  - EN61000-4-2: Immunity to electrostatic discharges.
  - EN61000-4-3: Immunity tests on electromagnetic fields radiated at radio-electrical frequencies, with 10V/m electromagnetic field.
  - EN61000-4-4: Immunity to rapid transients.
  - EN61000-4-5: Immunity to surge.
  - EN61000-4-6: Immunity tests on conducted interference, induced by radio-electrical fields.
  - EN61000-4-8: Immunity to Power frequency magnetic field (30 A/m)
  - EN61000-4-11: Voltage dips, short interruptions and voltage variations immunity tests.
- Compliance with the International Safety Standard for Information Technology (IEC/EN 60950).



The z505-C product is RoHS (lead free) compliant.

*Note: the specifications in this document are subject to change without notice.  
ZTI is not responsible for the operation or failure of operation of GPS satellites or the availability of GPS satellite signals.*

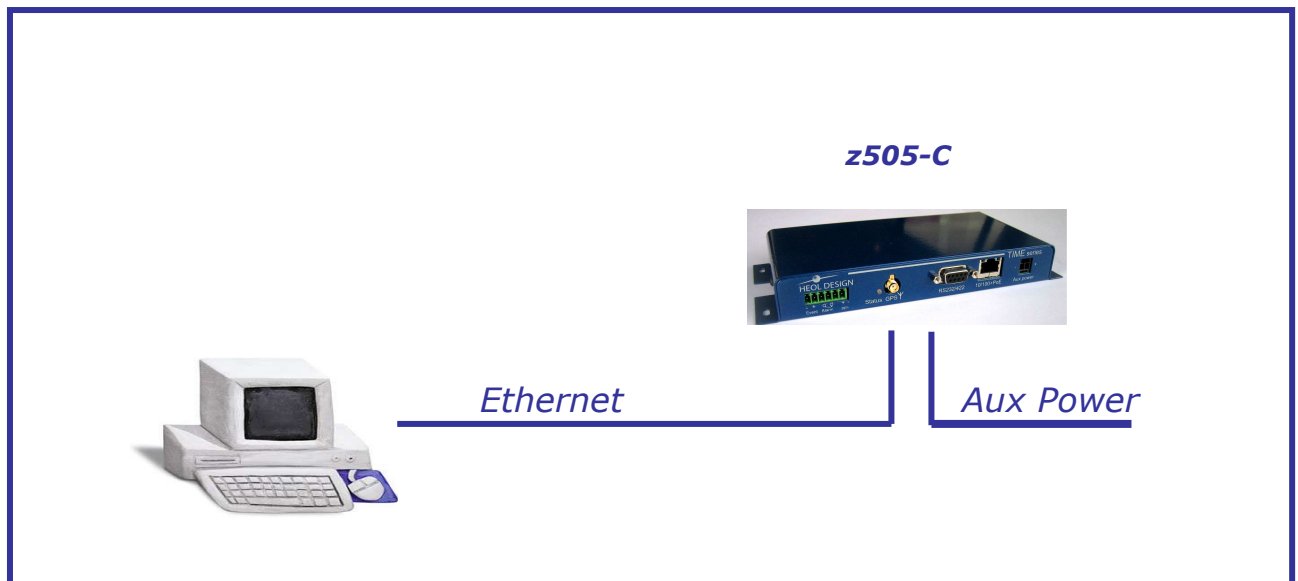


## MECHANICAL DRAWINGS

### z505-C (Compact) Front View

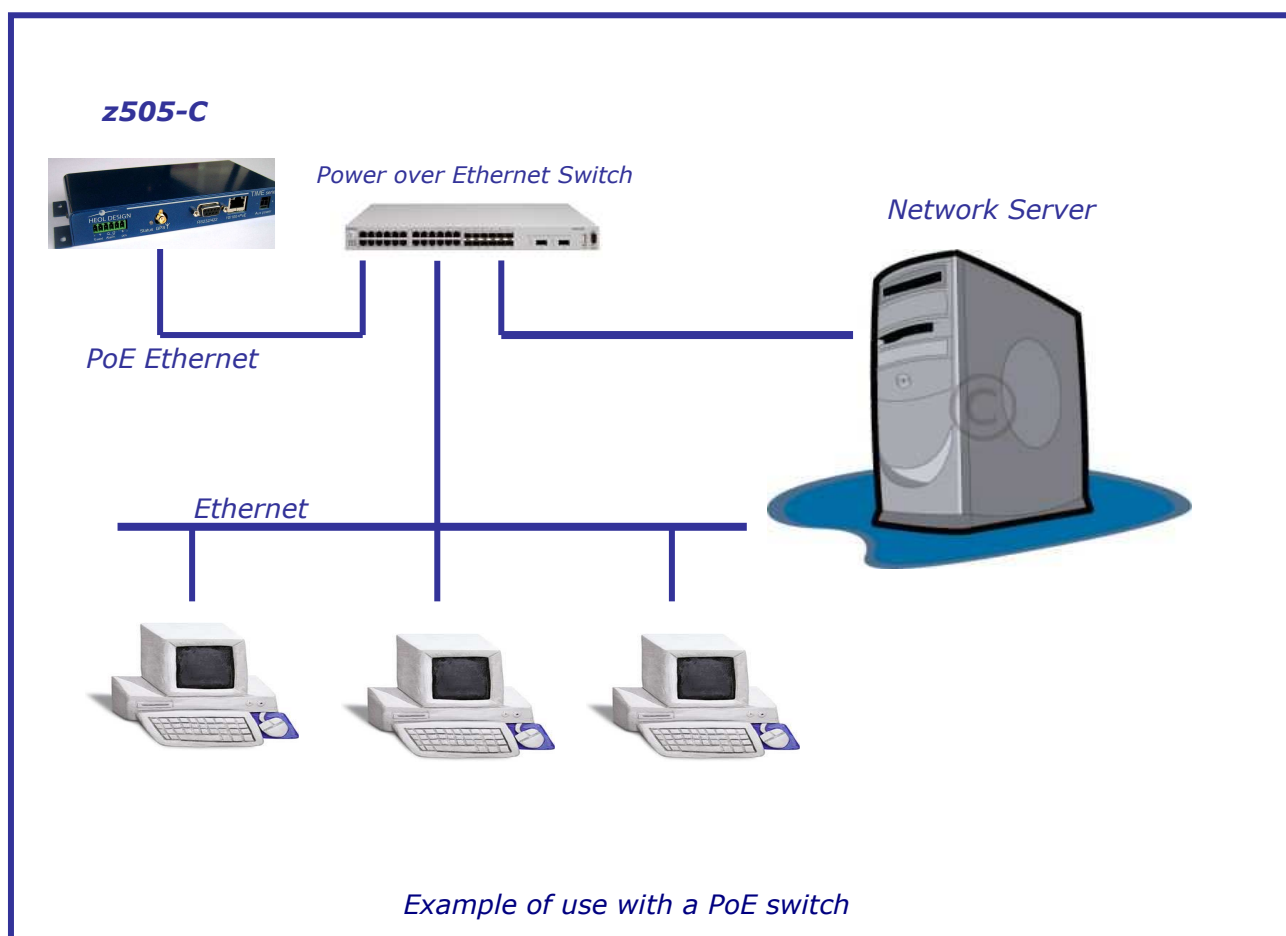


Input/Output Connector



Example of use with direct Ethernet connection and auxiliary power





## ORDERING PART NUMBER

The factory standard part number is:

**z505S-C / P10µs -232 -I/O = 1 1 1** (Compact Version)

However, you can request several options as described hereafter.

### Compact Version:

**z505S-C / P10µs -232 -I/O=1 X Y**

- RTC option (for quick start without satellites):  
**S** (Standard quartz)  
**T** (TCXO + battery)

- Timestamp accuracy: **P10µs** (standard)  
P1µs

- Serial link:  
**232**: RS232 (standard)  
232p: with PPS (RS232 level)  
232t: with PPS (TTL level)  
422: RS422  
422p: with PPS (RS422 level)

- I/O connector:

#### 1 & 2 pins:

**1 = Event Input #1** (standard)

#### 3 & 4 pins options:

**1 = Alarm Relay 250V/2A** (standard)  
2 = PPS/TOP output on Static Relay  
3 = 10Mhz OCXO square wave output  
4 = 10Mhz OCXO sinus output

#### 5 & 6 pins options:

**1 = PPS/TOP 3V Output** (standard)  
2 = PPS/TOP RS422 Output  
3 = IRIG B003 3V Output  
4 = IRIG B003 RS422 Output  
5 = Event Input #2

- Antenna connector: SMA
- Power: DC 12 to 60 Volts