



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 6

PRESENTATION

ZTI has selected a high precision time server synchronized by GPS with PoE (Power over Ethernet) for indoor or outdoor use, 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 ± 200 nanoseconds for the receive packet and ± 600 nanoseconds for the transmit packet with the P1 μ s version (else 10 μ s with the P10 μ 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 μ 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.

```

De: T101@heoldesign.com
A:
Cc:
Objet: T101 NTP Server Status Report : IP : 192.168.1.100 MAC : 00-1F-77-01-01-02

-----
T101 Status OK. Self-survey active.
-----

#1, Mode 5, UTC 5:32:57, 15/2/2008, Sat used 6 / seen 12, Levels 4 28 28 28 4 24 20 0 12 16 12 0
#2, Mode 5, UTC 4:32:57, 15/2/2008, Sat used 7 / seen 12, Levels 12 28 28 4 28 0 0 12 4 4 24 20
#3, Mode 5, UTC 3:32:57, 15/2/2008, Sat used 7 / seen 12, Levels 12 4 8 12 28 0 0 28 28 4 20 4

```

One or two **2500V isolated** event inputs (available on specific I/O connector) allows to time-stamp external events with very high accuracy (± 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) (**± 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.

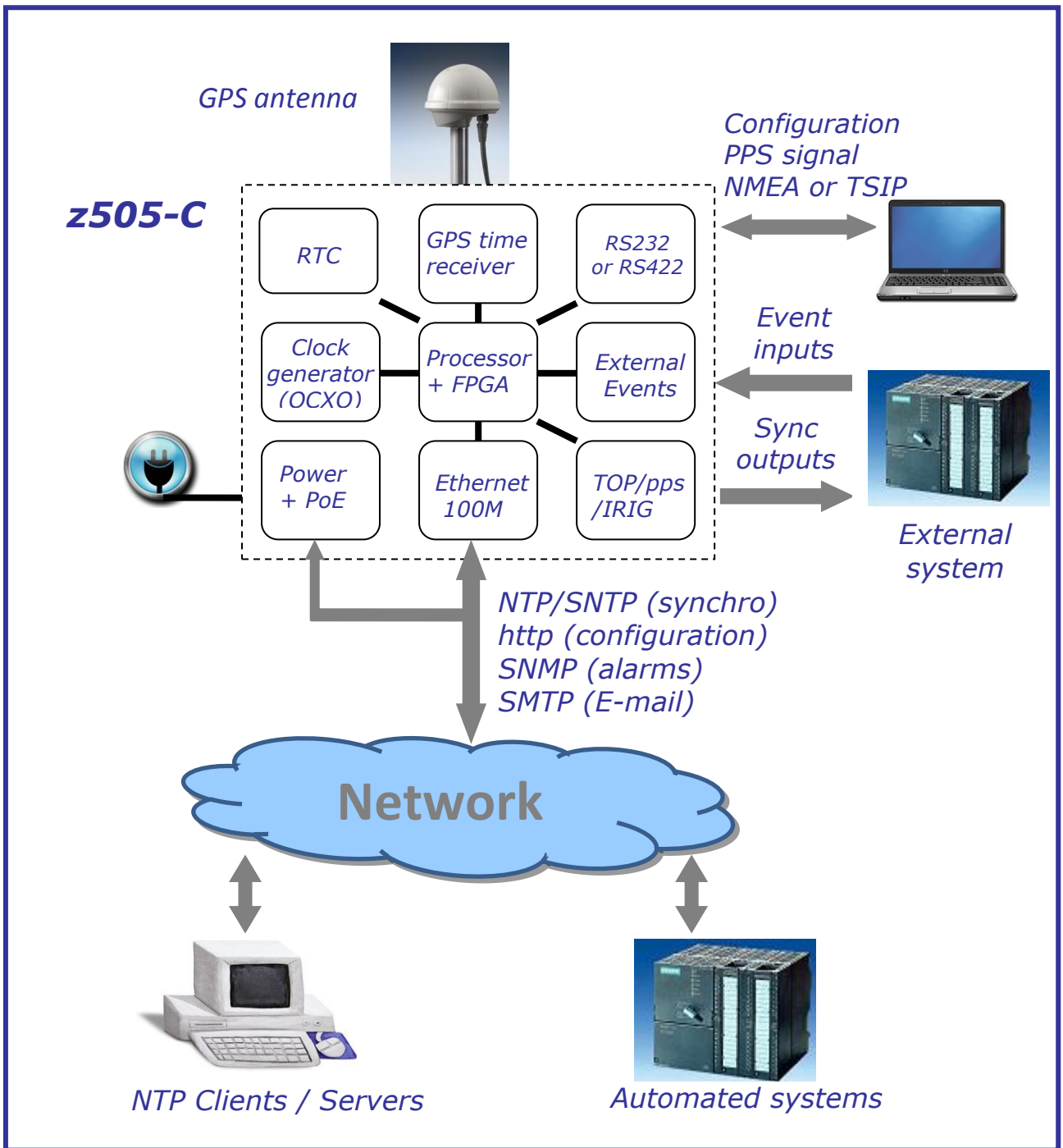
A RS232 or RS422 serial port can be accessed for remote control and monitoring: protocol output selectable through the web server: TSIP (Trimble protocol) or NMEA protocol output).

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.

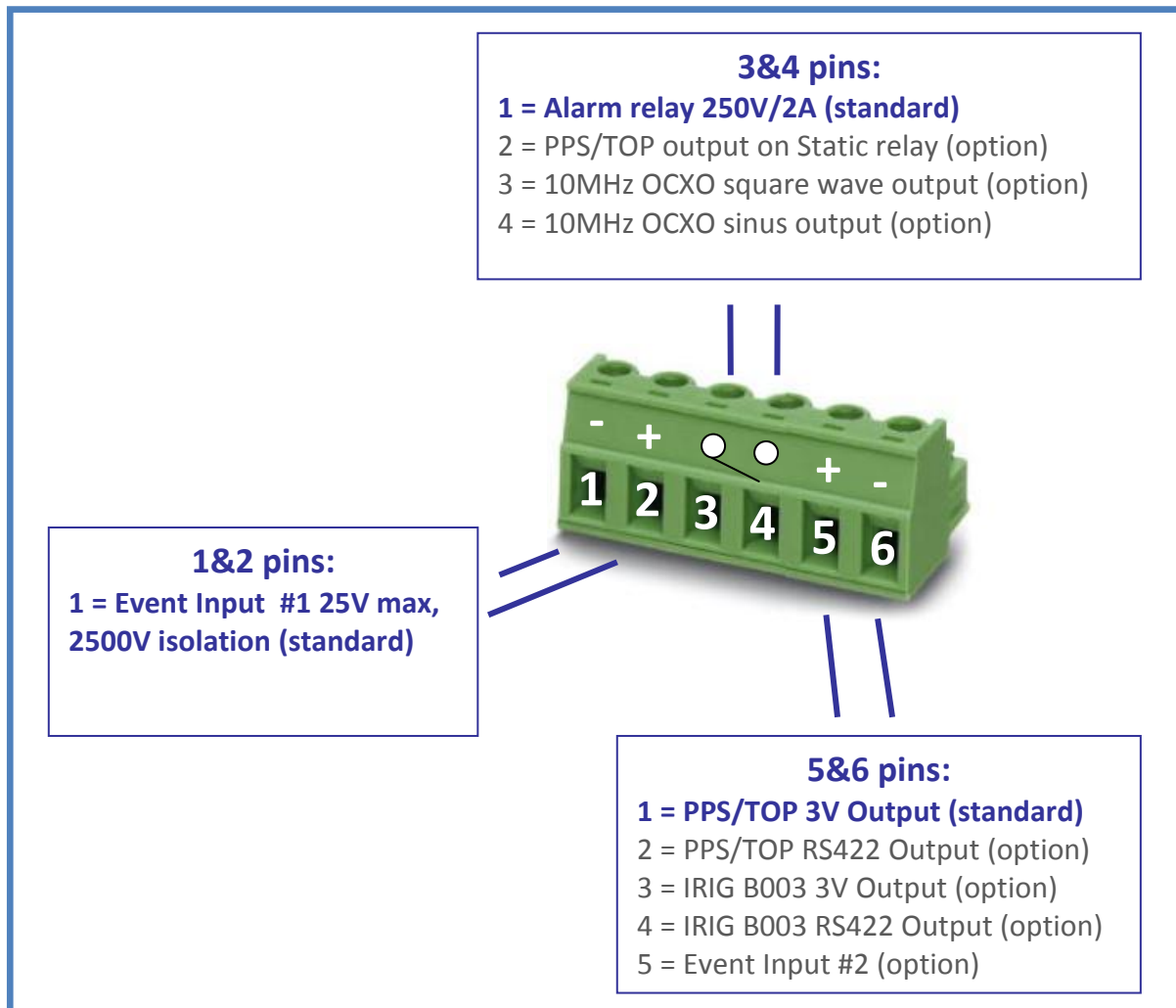


z505-C is packaged in **metal housing** (no rack model available).



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 Close to Open. 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

GPS Receiver	Type	12 channels
	Sensitivity	-160dBm
	Position Accuracy	<2.5 meters
	Time Accuracy (PPS)	±100 ns (static) ±200 ns (mobile)
	Cold start (Time to First Fix)	< 39 seconds (90%)
	Start-up time	≤1 minute
	Active Antenna Voltage	5V or 3V, configurable
	Timing Generator	
Timing Ethernet Protocol	SNTP V4, NTP Broadcast/Unicast (100 requests per second maximum)	
Configuration / Monitoring	http server or SNMP manager	
Absolute Timestamp Error (refer to UTC time)	Version P10µs: 10µs Version P1µs: ±200 ns (Rx) ±600 ns (Tx)	
Timestamp drift when synchronisation lost	Less than 100µs/day with 10°C temperature variation	
RTC S option	1 second accuracy Autonomy: 3 to 5 days Drift ~ 1s/day (10°C temp. variation)	
RTC T option	1 second accuracy Autonomy: 6 months Drift ~ 0.2s/day (40°C temp. variation) Drift ~ 0.7s/day (full temperature range)	
OCXO output		
Frequency	10.000000 MHz (other on request)	
Output impedance	50 ohms	
Output level	Square-wave: 3.3V Sinus: 2dBm min.	
Spurious response	-70dBc	
Phase noise	-90dBc Typ. (@ 1 Hz) -100dBc Typ. (@10 Hz) -130dBc Typ. (@100 Hz) -140dBc Typ. (@1,000 Hz) -150dBc Typ. (@10,000 Hz)	
Power supply		
Input Voltage	Power On Ethernet: compliant with IEEE 802.3af. Auxiliary: 12 to 60VDC	
Power Consumption	7W max at start-up 4W typical at ambient temperature	
Interfaces		
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) NMEA or TSIP protocol	
PPS Output (Pulse Per Second)	RS422/RS232 (option), or fast static relay output on SUB-D9 or 6 pin I/O connector (3.81mm), 3V logic level	
Alarm Relay	On I/O connector 2A/250V. 2500V isolation	
Event Input(s)	On I/O connector 25V max peak voltage (add R series for more), 2500V isolation, ±100ns accuracy	
OCXO output	Option on I/O connector	

Environmental	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 **CE** 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.

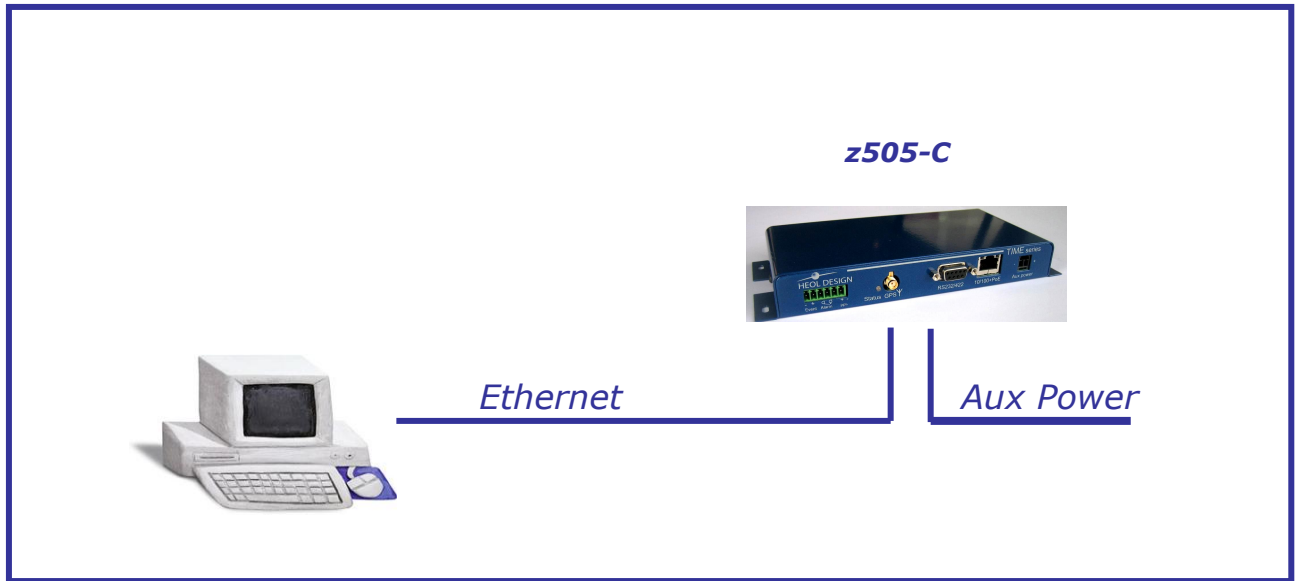
*Note: the specifications in this document are subject to change without notice.
ZTI is not responsible for the operation or failure of operation of GPS satellites or the availability of GPS satellite signals.*

MECHANICAL DRAWINGS

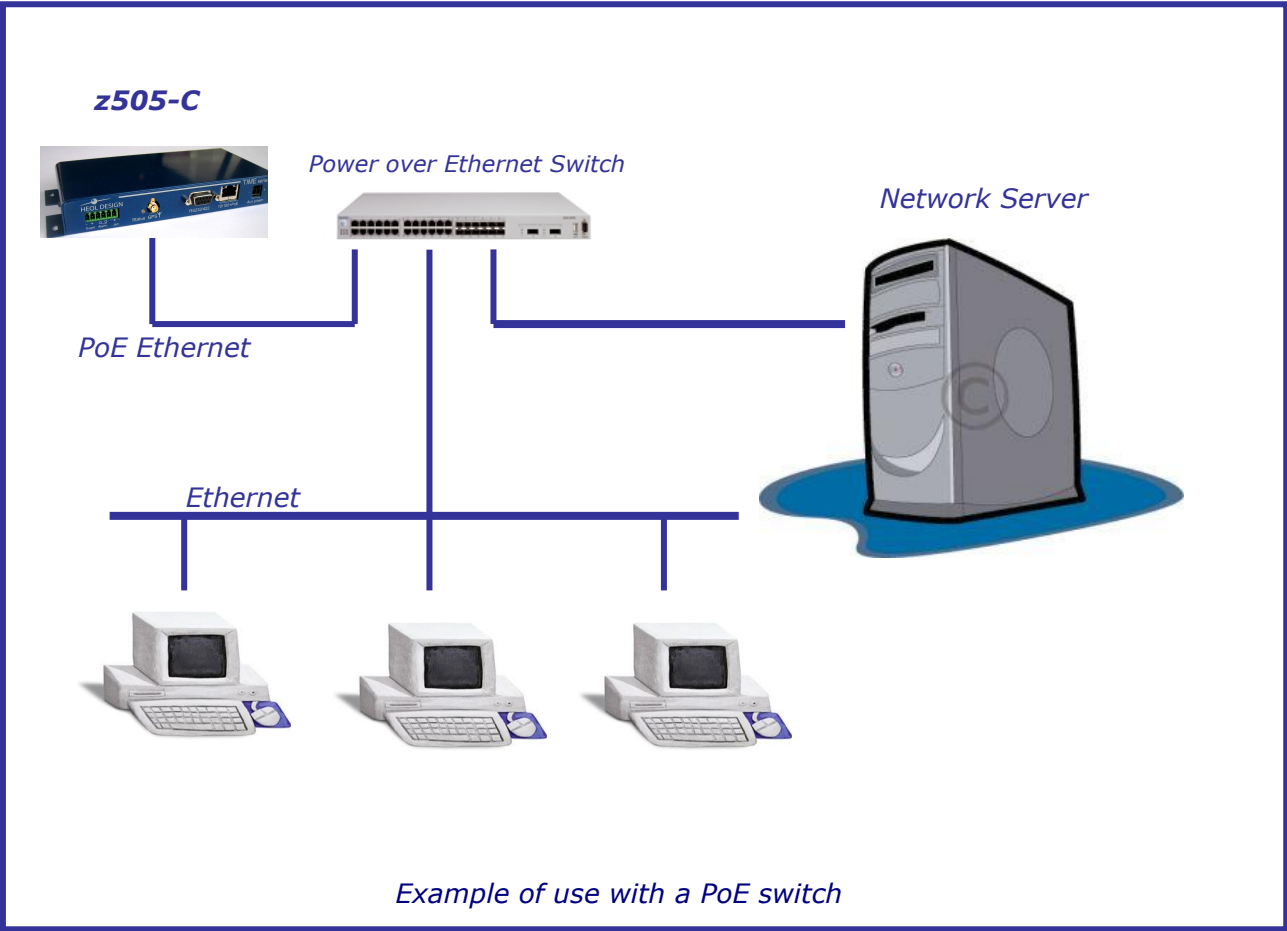
z505-C (Compact) Front View



Input/Output Connector



Example of use with direct Ethernet connection and auxiliary power



ORDERING PART NUMBER

The factory standard part number is:

z505S-C / P10 μ s -232 -I/O = 1 1 1 (Compact Version)

However, you can request several options as described hereafter.

Compact Version:

z505S-C / P10 μ s -232 -I/O=1 X Y

- RTC option (for quick start without satellites):
S (Standard quartz)
T (TCXO + battery)
- Timestamp accuracy: **P10 μ s** (standard)
 P1 μ s
- 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