



# z500 Series

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

**z500-C** (Compact version)



**z500-R** (Rack version)



***Indoor / Outdoor Antenna***

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



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## 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 z500 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.

z500 is well suited for both **static** and **mobile** applications with a very large temperature range from **-30°C** to **+70°C**.

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) – 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 z500, 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
À :
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 ( $\pm 100$  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 z500.

Alarms are reported through SNMP traps (Ethernet interface) or through the RS232/422 interface. SNMP can also be used to configure the z500 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) (**±100ns accuracy**) is available on SUB-D9 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).

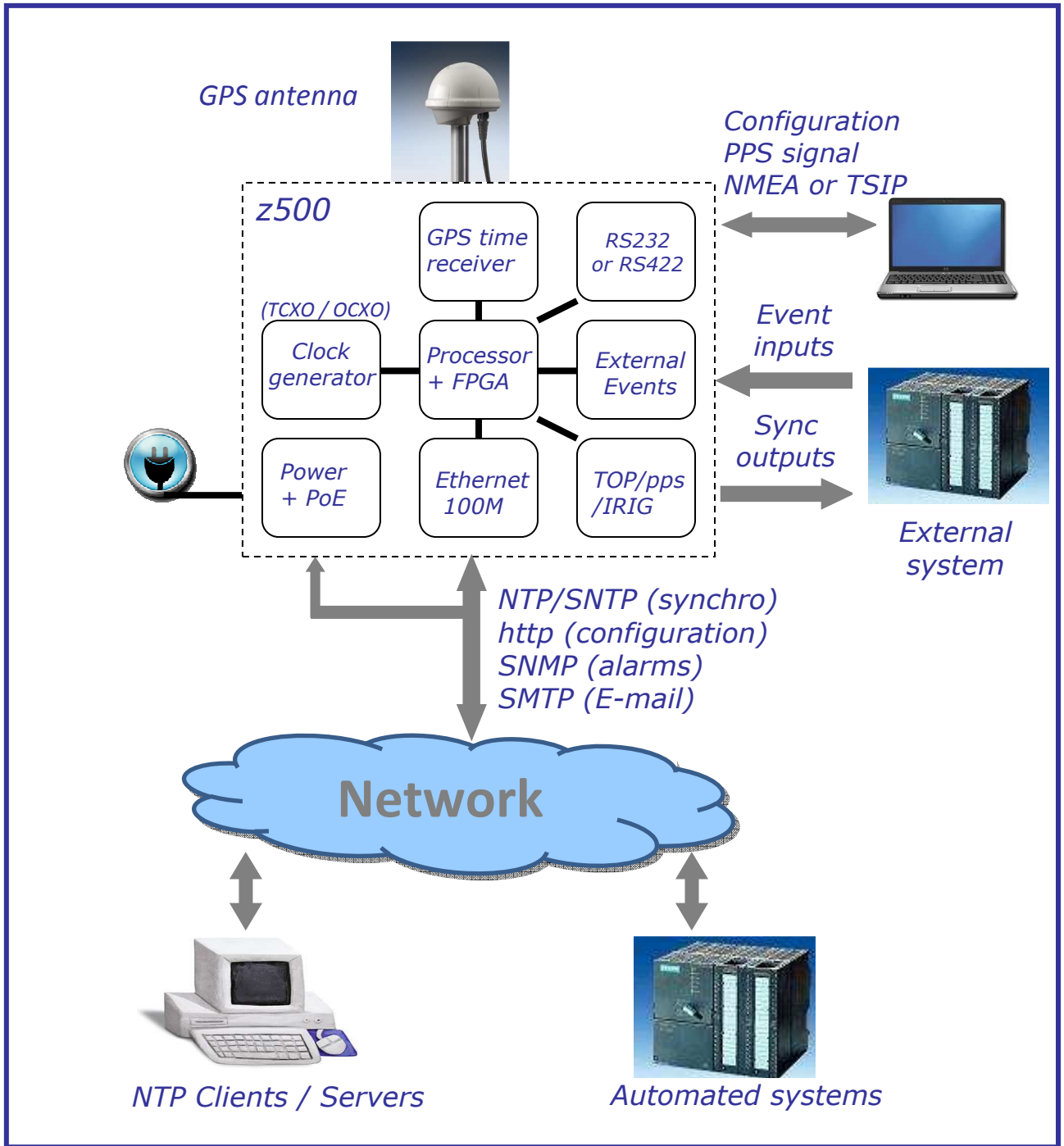
The **Power On Ethernet** feature enables installation of z500 without the need for additional cables to provide power.



z500 is available in 2 different **metal housings**, either compact (z500-C) or 19" rack (z500-R) mounted form factor.

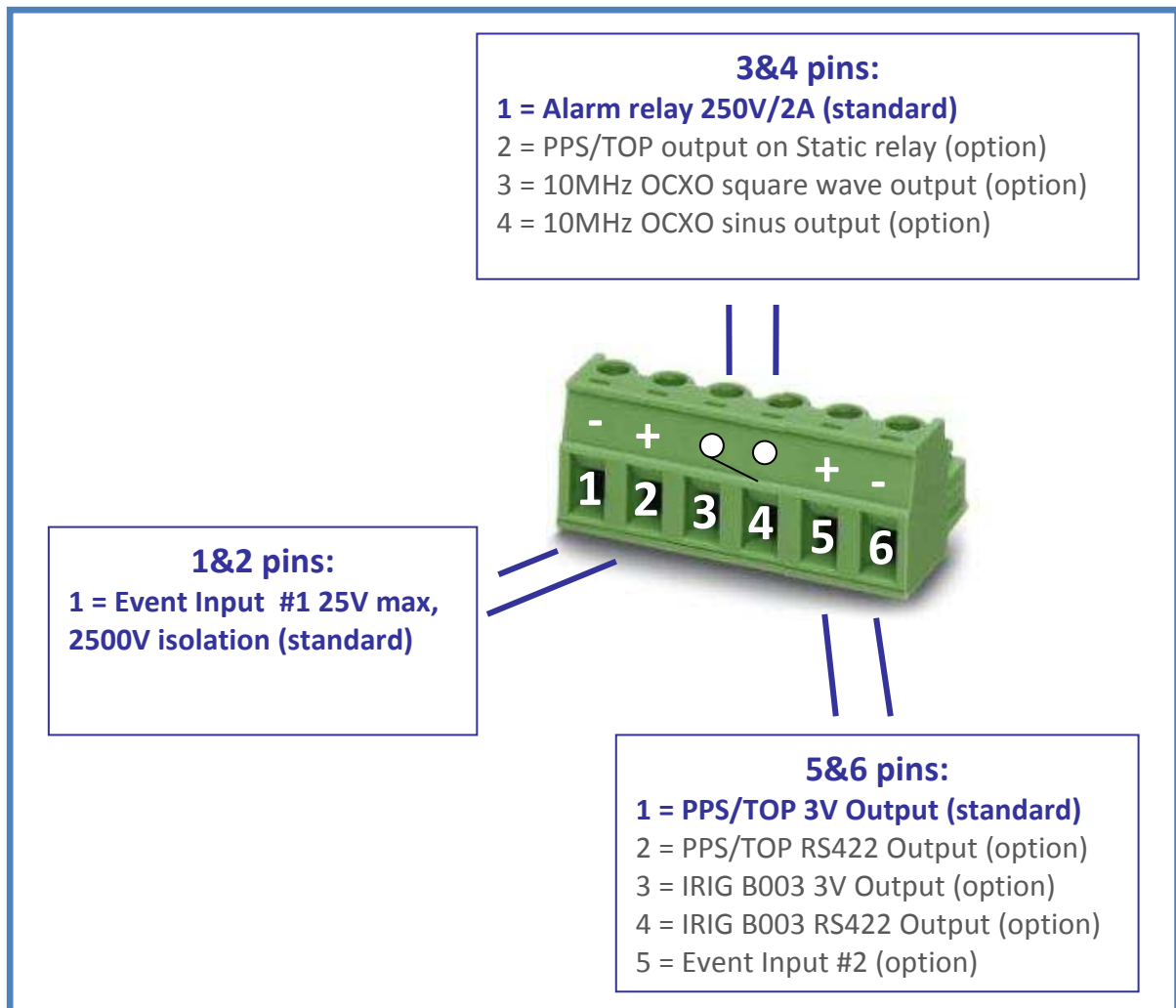
The rack unit displays on a LCD module the status and timing information.

*Note: for operating conditions under -20°C, it is recommended to use the Compact version as the LCD module will not operate properly for such low temperatures.*



**z500 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 z500 (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	
	Cold start (Time to First Fix)	< 39 seconds (90%)	
	Active Antenna Voltage	5V or 3V, configurable	
<b>Timing Generator</b>	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)	±200ns for Rx (1µs version) ±600ns for Tx (1µs version)	
	Timestamp drift when synchronisation lost	Less than 100µs/day with 10°C temperature variation	
<b>OCXO output</b>	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)	
<b>Power supply</b>	Input Voltage	Power On Ethernet: compliant with IEEE 802.3af. Auxiliary: 12 to 60VDC (z500-C) or 110/250VDC (z500-R) 47/63Hz	
	Power Consumption	6W (z500-C), 8W (z500-R)	
<b>Interfaces</b>	Auxiliary Power Supply	2.54mm header, anti-extraction	
	GPS Active Antenna	z500-C: 'SMA' connector z500-R: 'SMA' or 'SMB' or 'N' connector	
	Ethernet Link	RJ45, 10/100Mbps + Power	
	RS232 / RS422	SUB-D9, 38400/8/No/1 (default)	
	PPS Output (Pulse Per Second)	RS422/RS232, or fast static relay output on SUB-D9 or 6 pin I/O connector (3.81mm)	
	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	On I/O connector	
	<b>Environmental</b>	Operating Temperature	-30°C / +70°C
		Storage Temperature	-30°C / +75°C
Humidity		90% non-condensing	
Dimensions (z500-C)		180 x 90 x 27 (mm)	
Weight (z500-C)		340 grams	
Dimensions (z500-R)		1U - 482.6 mm (19") - depth with SMA connector 130 mm - depth with N connector 150 mm	
Weight (z500-R)		1,85 Kg	

- According to **CE** directive, the z500 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 z500 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

z500-C (Compact) Front View



Input/Output Connector

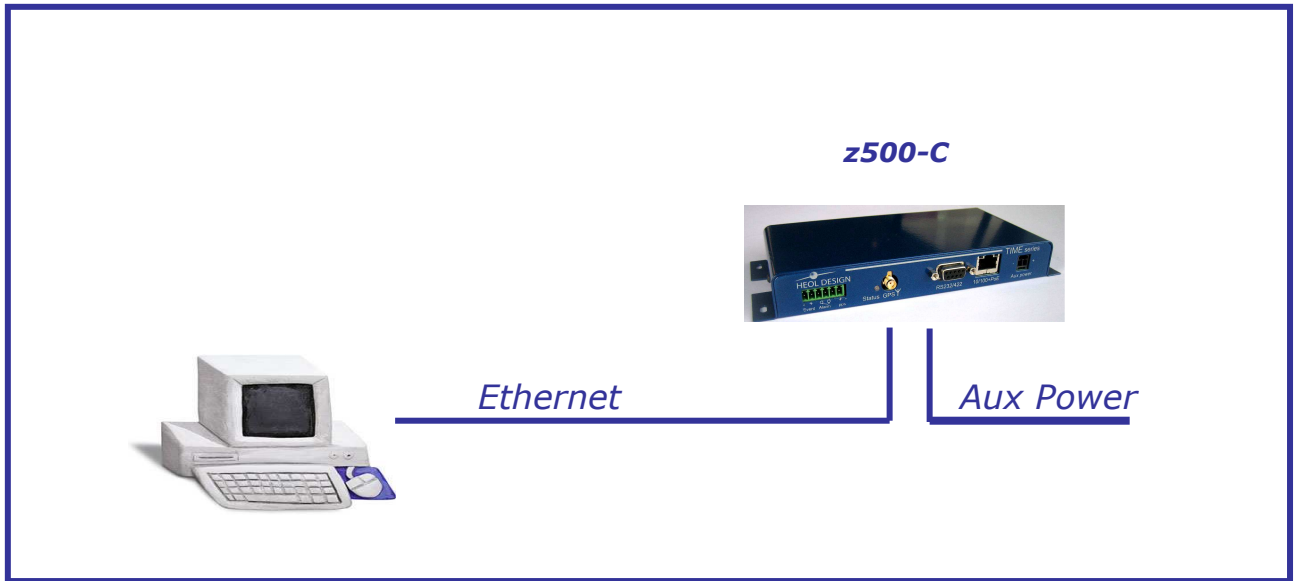
z500-R (19" Rack) Front View



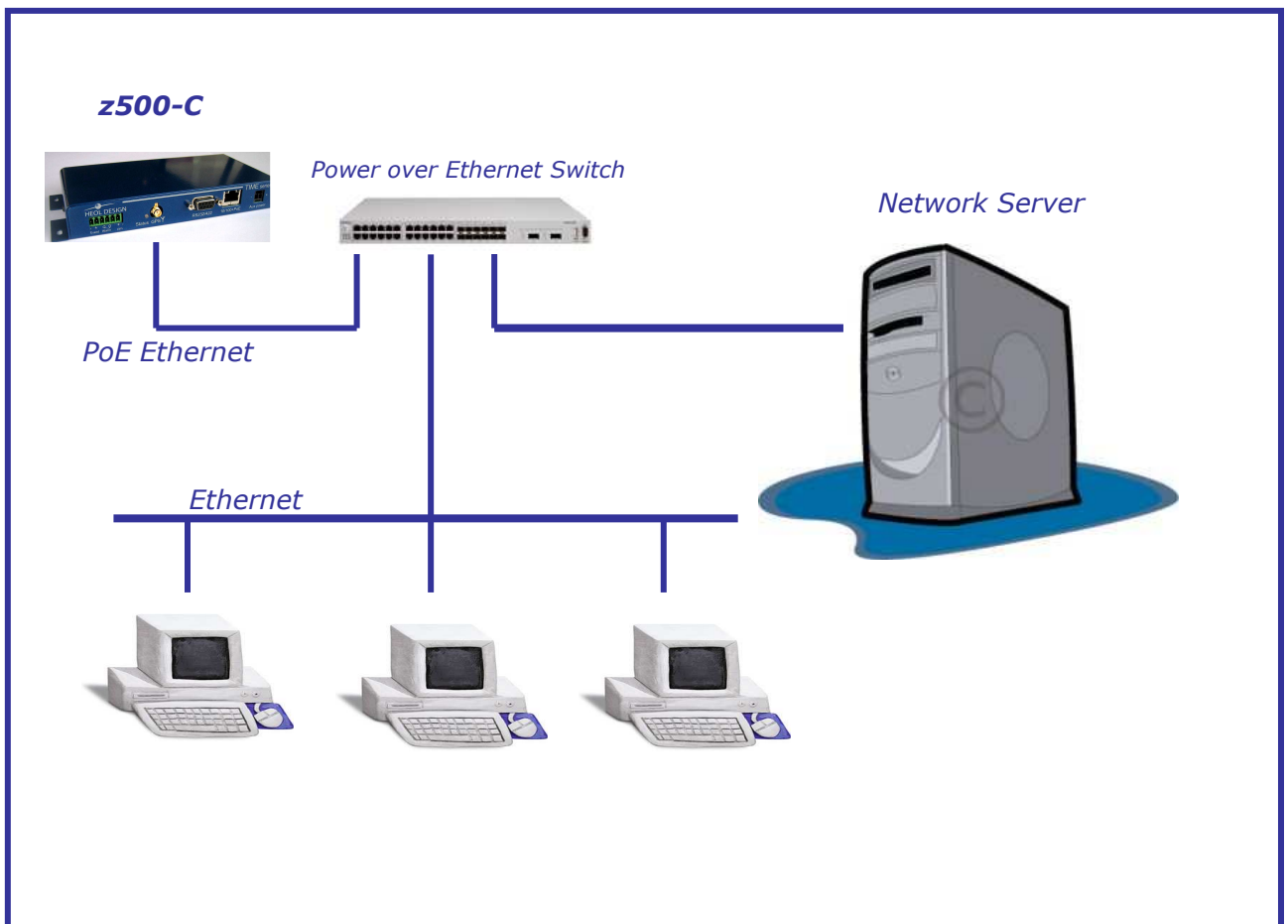
z500-R (19" Rack) Rear View (with 'N' antenna connector)



Input/Output Connector



Example of use with direct Ethernet connection and auxiliary power



Example of use with a PoE switch

## ORDERING PART NUMBER

The factory standard part number is:

**z500-C / P10 $\mu$ s -232 -I/O = 1 1 1** (Compact Version)

or **z500-R / P10 $\mu$ s -232 -A -DC -I/O = 1 1 1** (Rack Version)

However, you can request several options as described hereafter.

### Compact Version:

**z500-C / P10 $\mu$ s -232 -I/O=1 X Y**

- Timestamp accuracy: **P10 $\mu$ s** (standard)  
P1 $\mu$ 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

Factory Standard Part Number = **z500-C / P10 $\mu$ s -232 -I/O = 1 1 1**

**19" Rack housing: z500-R / P10µs -232 -A -DC -I/O=1 X Y**

- 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)
- Antenna connector: **A**: SMA (standard)  
B: SMB  
N: 'N' plug
- Power: **DC**: 12 to 60V (standard)  
AC: 110 to 250V
- 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

Factory Standard Part Number = **z500-R / P10µs -232 -A -DC -I/O = 1 1 1**