

# z300 Series

**High Precision Time Server  
(1, 10 or 100 microseconds)  
synchronized by GPS  
for Static Applications**

**z300-C** (Compact version)



**z300-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)**

Revision 9

## PRESENTATION

The recommended high precision time server z300 is synchronized by GPS with PoE (Power over Ethernet) for indoor or outdoor use, and is produced by Heol Design. The z300 provides excellent timing information with extremely high accuracy (1, 10 or 100 microseconds depending upon the version) for network synchronization and measurement applications without the need to be connected to external network, thus preserving your network insulation.

The z300 product has been designed for static applications to provide accurate timing information through an Ethernet link (using NTP/SNTP protocol) with an operating temperature range of 0°C / +50°C.

This GPS reference time module can operate with an outdoor or indoor antenna, depending upon the environmental conditions in which the unit is installed.

Based on a high performance 12 channels GPS chipset (with -160dBm sensitivity), the z300 delivers accurate timing information, even in poor signal level conditions (e.g. indoor, urban canyons and signal obscured environments). The antenna which is protected against short-circuit, does not need to be located on a mast or a rooftop which considerably **reduces the cost and complexity** of deployment in terms of antenna cabling and lightning strike protection, this in turn reduces the cost of maintenance.



Due 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 1 $\mu$ 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 continue sending accurate Ethernet frames, with a **drift better than 100 $\mu$ s/day** for the OCXO version and **100 $\mu$ s/hour** for the standard version with TCXO.

A **web server** with secure access allows configuration of the z300, and monitoring of 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 using the http server.

```

De : T101@heol-design.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) facilitates the time-stamping of events from external systems with very high accuracy ( $\pm 100$  nanoseconds, refer to UTC atomic clock). The timestamp information is reported through the RS232 port, e-mail, SNMP trap or broadcast frame.

**Alarm relay** is an available option on specific I/O connector, for employment of external systems in case of failure of the z300 unit.

Alarms are reported through SNMP traps (Ethernet interface) or through the RS232 interface. As an alternative to the web server, SNMP can also be used to configure z300 parameters.

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

A highly accurate **pps (TOP)** signal ( $\pm 40\text{ns}$ ) is available on RS232 SUB-D9 or specific I/O connector for which polarity, period, length, and delay compensation are configurable. It is also available with optional 1500V isolated static relay, however in this case the alarm relay is not available.

On request an option for **IRIG-B003** and A003 output can be made available in RS422 or TTL level.

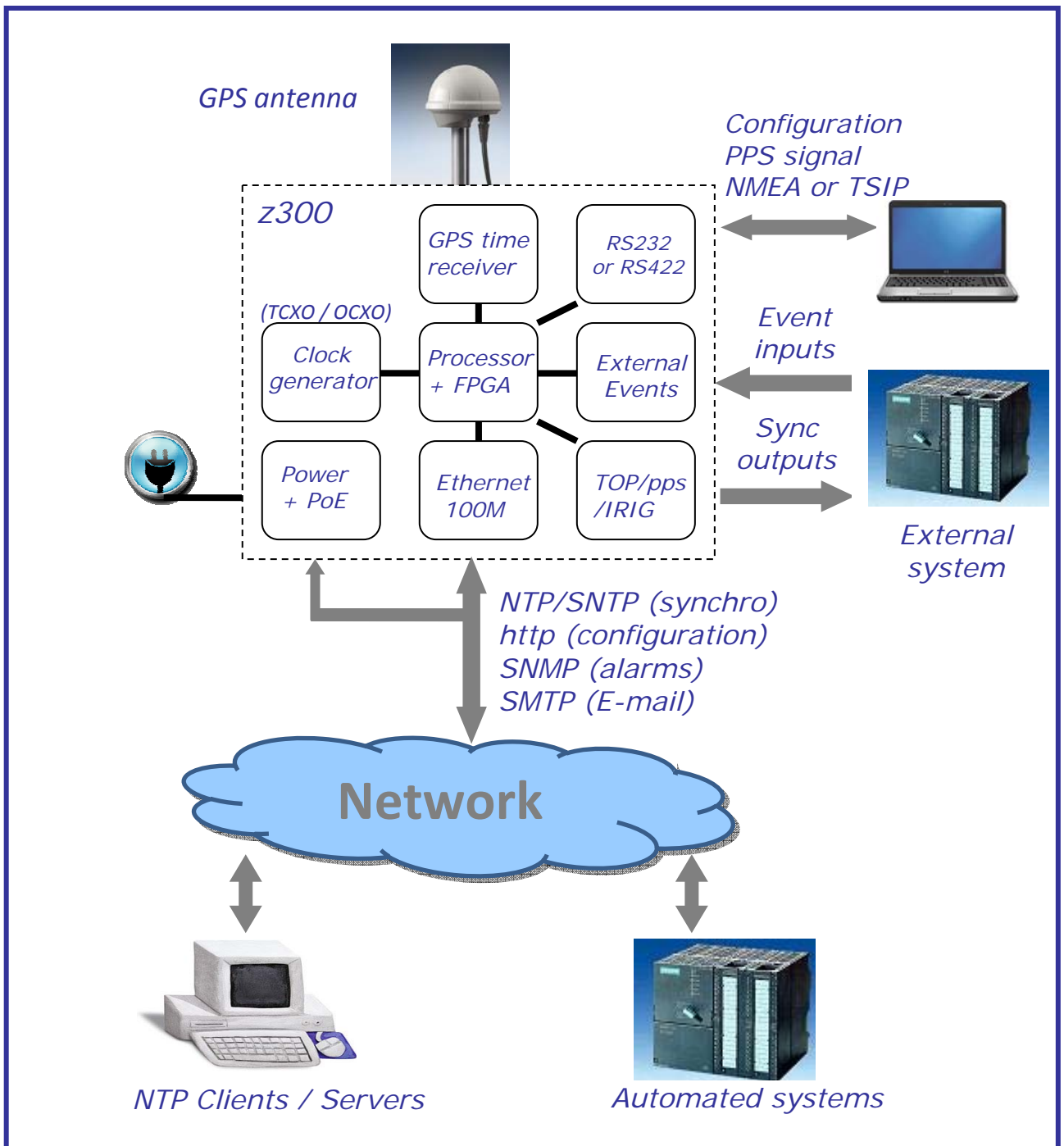
An RS232 or RS422 serial port can be accessed for remote control and monitoring (NMEA protocol output).

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

The **Power On Ethernet** enables installation of the z300 without the need for additional cables to provide power.

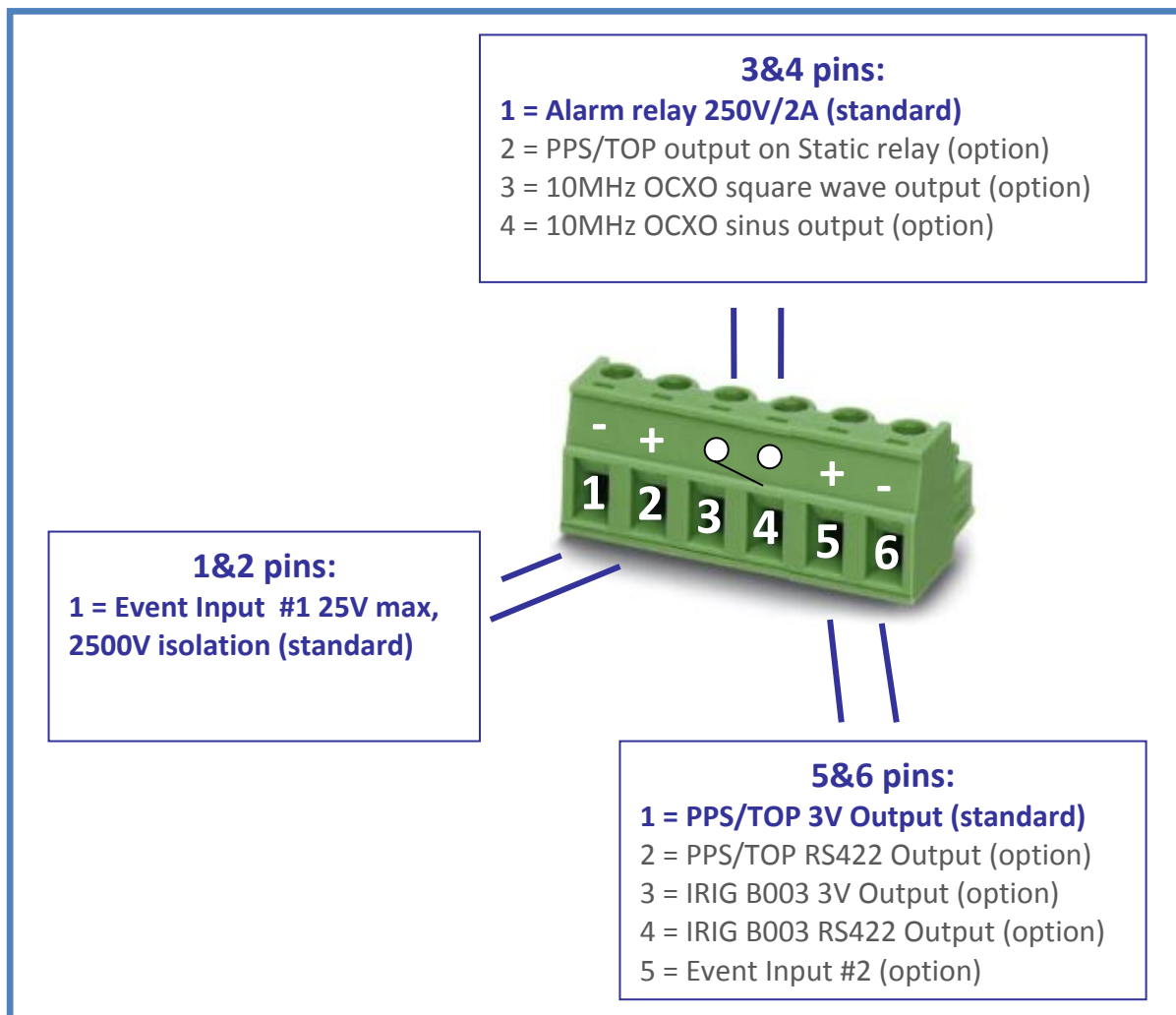


z300 is available in 2 different **metal housings**, either compact (**z300-C**) or 19" rack (**z300-R**) mounted form factor. The rack unit displays status and timing information on a LCD module.



**z300 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 employment of external systems. When synchronization is lost (user-configurable threshold), or when power is removed, the relay switches from Open to Close. It is possible to disable Relay activity and select the threshold level by configuration.
- Highly accurate PPS (TOP) signal ( $\pm 100\text{ns}$ ) is available on SUB-D9 or an I/O connector for which 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 where there are long cables or slow detection components.

**NOTE:** Static Relay option for z300 (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	-155dBm/-185dBw	
	Position Accuracy	<5 meters	
	Time Accuracy (PPS)	±40 ns	
	Cold start (Time to First Fix)	< 45 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	TCXO standard: 100µs/hour OCXO option: less than 100µs/day with 10°C temperature variation	
<b>OCXO output (option)</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 (z300-C) or 110/250VDC (z300-R) 47/63Hz	
	Power Consumption	4W (z300-C), 6W (z300-R) +3W with OCXO option	
<b>Interfaces</b>	Auxiliary DC Power Supply	2.54mm header, anti-extraction	
	GPS Active Antenna	z300-C: 'SMA' connector z300-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	0°C / +50°C
		Storage Temperature	-30°C / +75°C
Humidity		90% non-condensing	
Dimensions (z300-C)		180 x 90 x 27 (mm)	
Weight (z300-C)		340 grams	
Dimensions (z300-R)		1U - 482.6 mm (19") - depth with SMA connector 130 mm - depth with N connector 150 mm	
Weight (z300-R)		1,85 Kg	

- In accordance with the **CE** directive, the z300 module has successfully completed testing against the following standards:
  - 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 z300 product is RoHS (lead free) compliant.

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

### MECHANICAL DRAWINGS

#### z300-C (Compact) Front View



Input/Output Connector

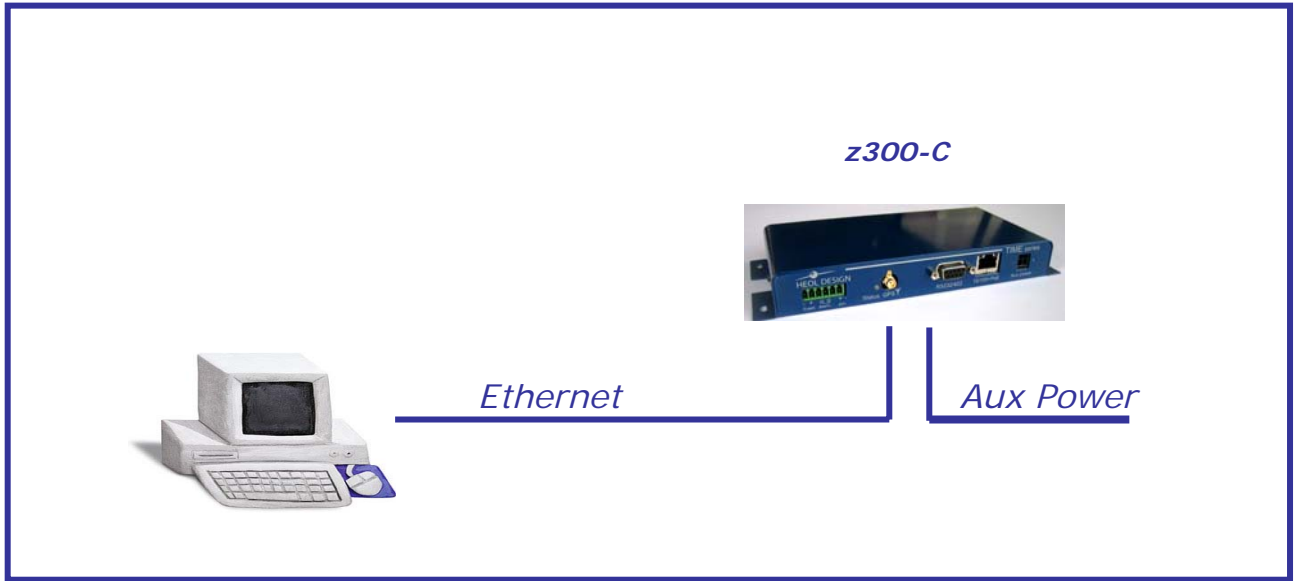
#### z300-R (19" Rack) Front View



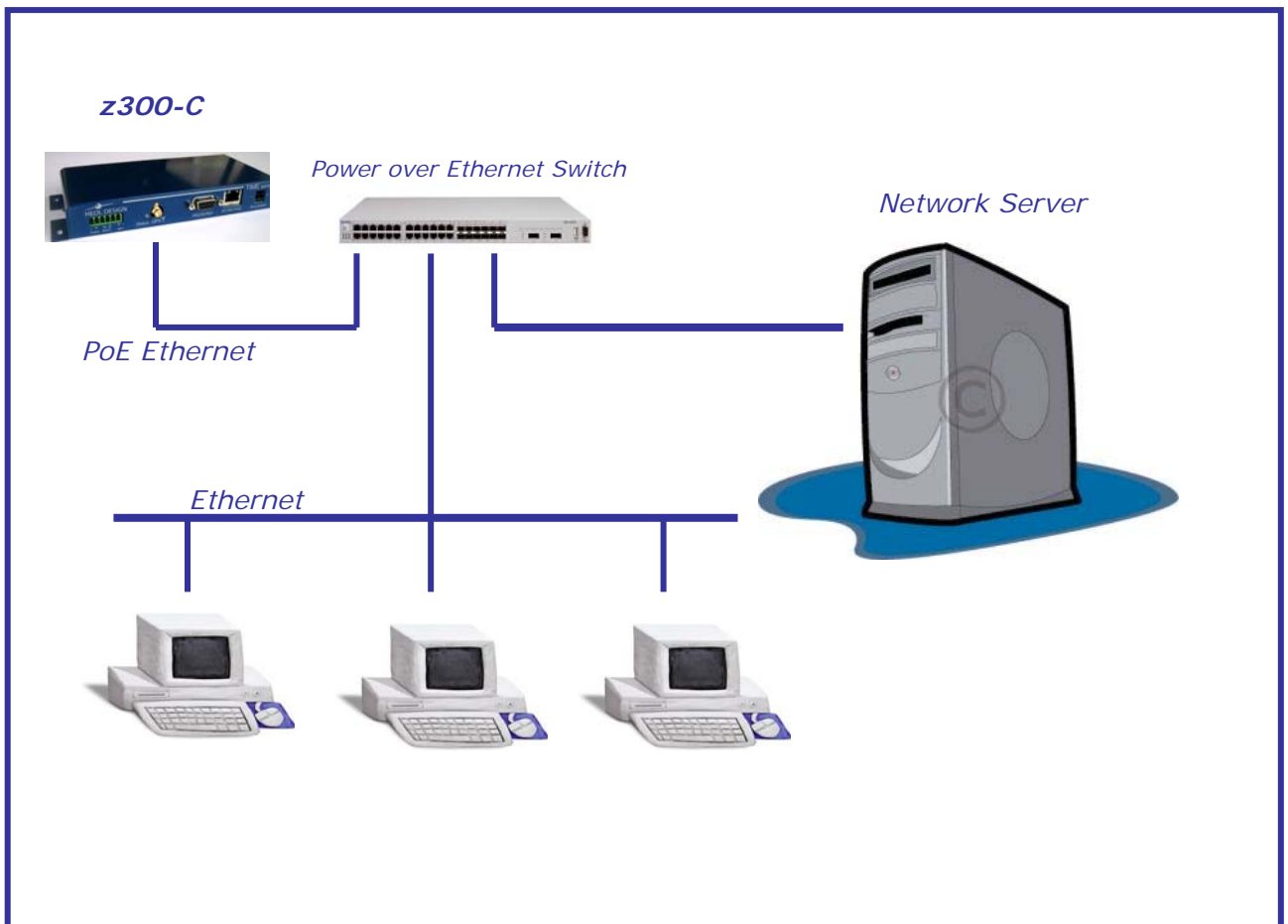
#### z300-R (19" Rack) Rear View (with 'N' antenna connector)



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:

**z300-C / P10 $\mu$ s -232 -I/O = 1 1 1** (Compact Version)

or **z300-R / P10 $\mu$ s -232 -A -DC -I/O = 1 1 1** (Rack Version)

However, several other options are available as follows:

### Compact Version:

**z300-C / P10 $\mu$ s -O -232 -I/O=1 X Y**

- Timestamp accuracy: P100 $\mu$ s  
**P10 $\mu$ s** (standard)  
P1 $\mu$ s
- Oscillator: blank (standard) (TCXO)  
-O (OCXO)
- 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 = **z300-C / P10 $\mu$ s -232 -I/O = 1 1 1**

**19" Rack housing: z300-R / P10 $\mu$ s -O -232 -A -DC -I/O=1 X Y**

- Timestamp accuracy: P100 $\mu$ s  
**P10 $\mu$ s** (standard)  
P1 $\mu$ s
- Oscillator: blank (standard) (TCXO)  
-O (OCXO)
- 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 = **z300-R / P10 $\mu$ s -232 -A -DC -I/O = 1 1 1**