zti
Communications

z510M & z510C

z510M
(Master)

PTP/IEEE 1588 Grandmaster Clock and NTP Time Server with high accuracy GPS receiver for Static Applications

z510C
(Client)

IEEE 1588 / PTP Client with pulse generator, IRIG output, and event input.

Revision 6

This document describes the z510M (Master) product in part #1

and the z510C (Client) product in part #2.

Part #1: z510M - PTP/IEEE 1588 Grandmaster Clock & NTP Time Server

The z510M PTP IEEE-1588 Grandmaster Clock / NTP Time server with GPS clock has been designed to provide accurate timing information through an Ethernet link (using Precision Time Protocol), for Network synchronization and measurement applications, without the need to be connected to external Network, hence preserving your Network insulation.

This product is based on a high performance 14 channels GPS chipset with very high accuracy, and TRAIM algorithm. GALILEO, GLONASS and BEIDOU constellations are also available as an option.

It enables also fast start-up times in very hard environmental conditions, as only one satellite is enough at power-up to generate a precise timestamp (static applications).

Precision Time Protocol (IEEE1588) has been implemented, for applications that need **microsecond synchronization** (Grand Master Clock).
The PTP V2 implementation of z510M is fully compliant to the IEEE 1588-2008 standard (two steps clock) and provides PTP management messages for monitoring and configuration (also available on HTTP server).

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.

If the satellites signals are completely lost, the **hold-over mode** enables the module to keep sending accurate Ethernet frames, with very low drift thanks to the **OCXO** oscillator.

A **web server** with secure access allows you to configure the z510M and monitor its status (GPS satellites strength signals, Ethernet connections, alarms, input/outputs…).

Automatic **E-mails** can be sent periodically or when alarms appear. This function is fully configurable via the http server.

An isolated event input allows you to **timestamp events from external systems**, with very high accuracy. The timestamp information is reported through RS232, SNMP trap, E-mail, or Broadcast frame.

Alarm relay is available for driving your external systems in case of failure of the z510M.

Alarms are displayed through **SNMP** traps (Ethernet interface) or through RS232. SNMP can also be used to configure z510M parameters (instead of http web server).

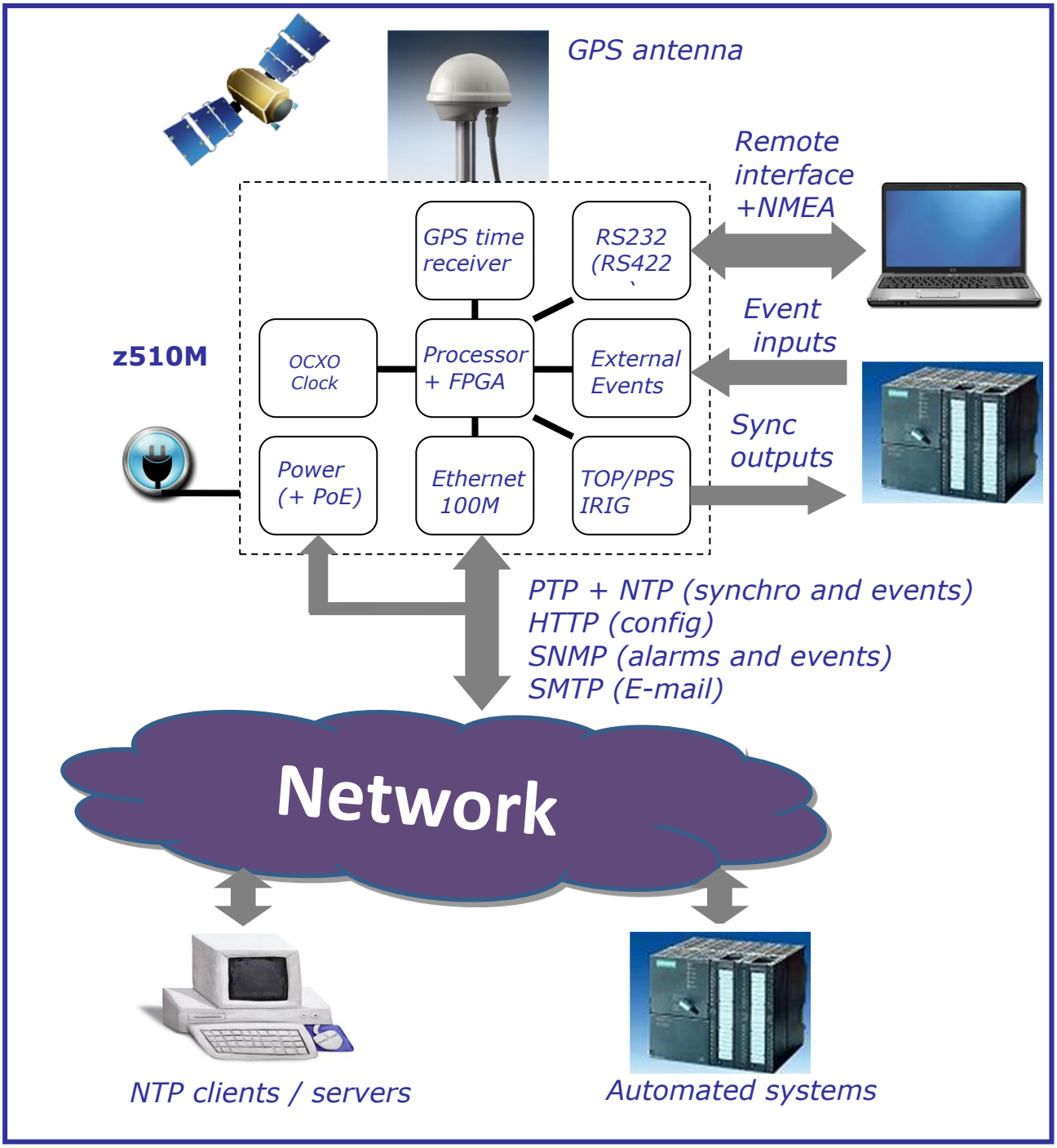
A highly accurate **PPS** (**TOP**) signal is available on SUB-D9 or I/O connector (polarity, period, length, and delay compensation are configurable by user). It is also available with optional 1500V isolated static relay.

Option: IRIG-B003 and A003 output available in RS422 or TTL level.

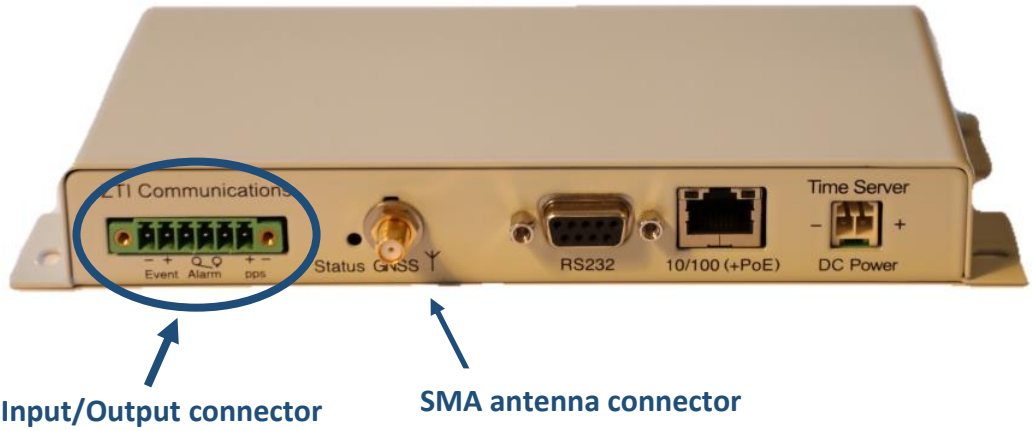
A RS232 (or RS422 on request) serial port can be accessed for remote control and monitoring (with NMEA protocol output).

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

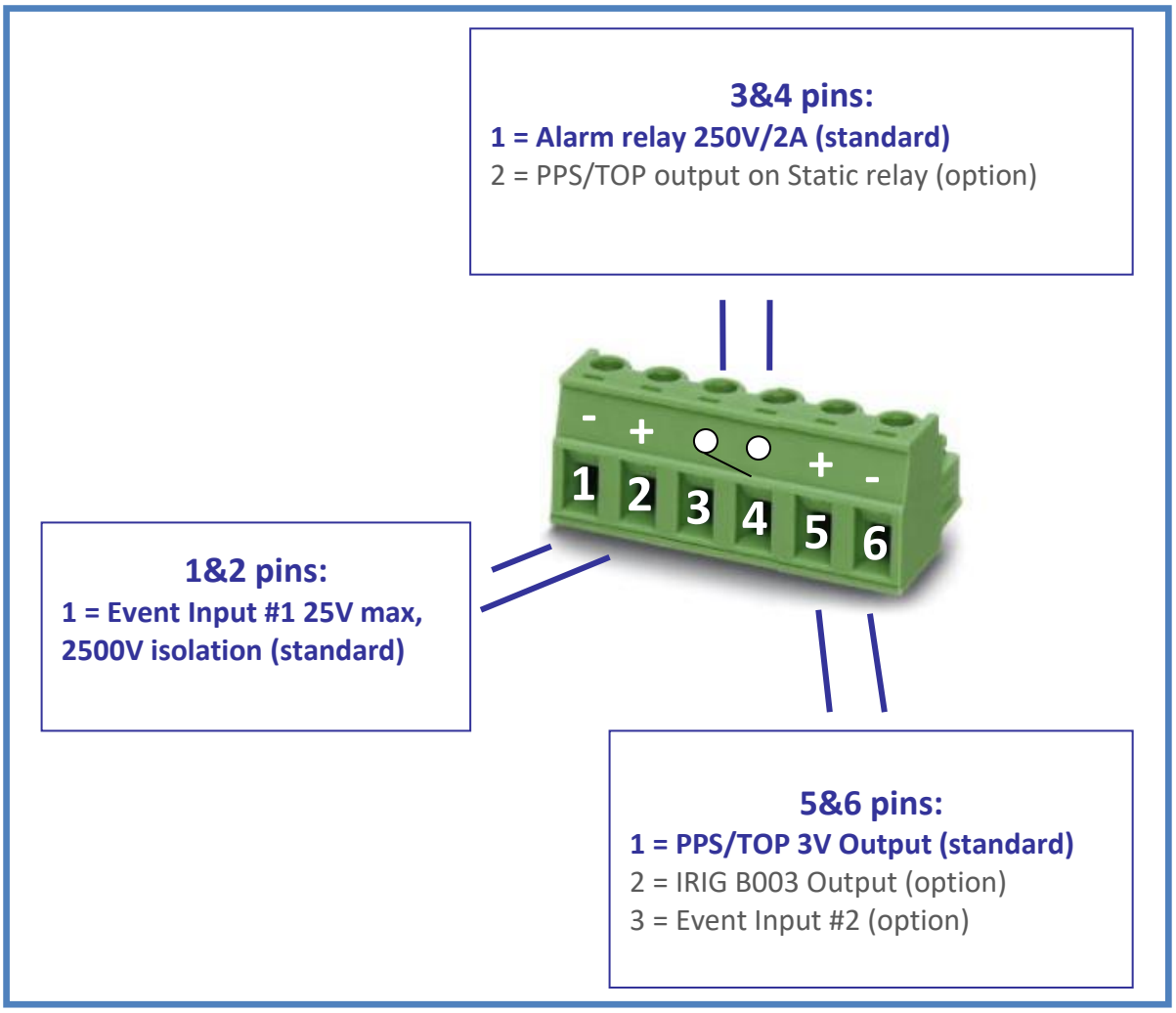
The **Power-over-Ethernet** option enables installation of the z510M without the need for additional cables to provide power.



z510M 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 ±100ns accuracy (notification via RS232, Email or NTP broadcast frame). The pulse level can be up to ±25V (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) (±100ns 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 z510M (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 200µs, 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 8µs).

Specifications

GPS Receiver	Type	14 channels
	Sensitivity	-160dBm (tracking)
	Overdertermined clock mode (self survey)	24 hours
	Time Accuracy (PPS)	±15 ns rms (1σ)
	Time to First Fix (Cold start)	<45 seconds (90%)
	Warm up time	<15 minutes for full accuracy
	Active antenna voltage	5V or 3V configurable
Timing Generator	Timing Ethernet protocol	SNTP V4, NTP Broadcast/Unicast (200 requests per second maximum), 200 000 NTP Clients @ 1024s
PTP Interface		PTP IEEE1588-2008: - UDP/IPv4 - Addressing mode: Multicast & Unicast - Delay Mechanism: End-to-End - Operation: One step or Two Step Clock - Sync & Announce Intervals: 1, 2, 4, 8, 16, 32, 64 seconds - Priority 1&2: 0 to 255 - Domain Number: 0 to 4 - Announce Receipt Timeout Multiplier: 2,3,4,5,6,7,8,9,10 PTP Management Messages for monitoring and configuration PTP Signalling Messages for unicast addressing mode
OCXO Characteristics		Frequency Stability: ± 500µs / day (constant temperature)
Power supply	Input Voltage	Power-over-Ethernet: compliant with IEEE 802.3af. Auxiliary: 8 to 36VDC (without PoE) 12 to 48VDC (with PoE)
	Power consumption	7W
Interfaces	Auxiliary DC Power Supply	2.54mm header, anti-extraction
	GPS Active antenna	SMA
	Ethernet link	RJ45, 10/100Mbps + POWER
	Remote RS232	SUB-D9, 38400/8/No/1
	PPS output	RS232, or fast static relay output. on SUB-D9 or I/O connector (3.81mm)
	Alarm Relay	2A/250V. 2500V isolation
	Event input	25V max peak voltage (add resistor if higher), 2500V isolation, ±100ns accuracy
Environmental	Operating Temperature	-40°C (-40°F)/ +70°C (+158°F)
	Storage Temperature	-40°C (-40°F) / +85°C (+185°F)
	Humidity	90% non-condensing
	Dimensions	201 x 95 x 26 (mm)

Weight	340 grams

- According to CE directive, the z510M unit 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).

RoHS compliant 2002/95/EC

The z510M product is RoHS (lead free) compliant.

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

ORDERING PART NUMBER

The factory standard part number is:

z510M-C / P10µs -DC -I/O = 1 1 1

The unit is delivered with a RS232 serial port (RS422 available on request).
Changing the GPS receiver to a GNSS receiver is possible on request.
A DIN rail mounting plate is available on request.

However, you can request several options as described hereafter.

Options: **z510M-C / P10µs** **– DC** **– I/0 = 1 X Y**

- PTP accuracy: **P10µs** (standard)
  P1µs
- Power: DC
  DC/PoE: DC + Power-over-Ethernet
- 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

5 & 6 pins options:
1 = PPS/TOP 3V Output (standard)
2 = IRIG B003 Output
3 = Event Input #2

- Antenna connector: SMA
- Power: 8 to 36VDC (version without PoE)
  12 to 48VDC (version with PoE)

Part #2: z510C - IEEE 1588 / PTP Client with pulse generator, IRIG output, and event input

The z510C module is a **PTP client station** able to synchronize automated systems and timestamp events in an industrial environment.

As the Z510C doesn't integrate a GPS antenna, you can install it anywhere in your system (it is just necessary to connect it to your LAN, so it can synchronize to an external PTP server – z510M GPS PTP master clock for example).

Using the Precision Time Protocol (IEEE1588), the z510C can be synchronized with 1µs accuracy to PTP master clock.
The PTP V2 implementation of the z510C is fully compliant to the IEEE 1588-2008 standard (two steps clock) and provides PTP management messages for monitoring and configuration (also available on HTTP server).

If the connection to the PTP master clock is lost, the **hold-over mode** enables the module to keep an accurate internal clock, with very low drift thanks to the **OCXO**.

A **web server** with secure access allows you to configure the z510C, and monitor its status at a glance (GPS satellites strength signals, Ethernet connections, alarms, input/outputs…).

Automatic **E-mails** can be sent by the z510C, periodically or when alarms appear. This function is fully configurable via the http server.

An isolated event input allows you to **timestamp events from external systems**, with very high accuracy (±100 nanoseconds from local clock).

The timestamp information is reported through RS232, SNMP trap, E-mail or Broadcast frame.
Alarm relay is available, for driving your external systems in case of failure of the z510C.
Alarms are displayed through **SNMP** traps (Ethernet interface) or through RS232.

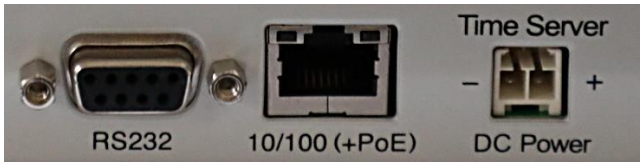
SNMP can also be used to configure z510C parameters (instead of http web server).
A highly accurate **PPS** (**TOP**) signal is available on SUB-D9 or I/O connector (polarity, period, length, and delay compensation are configurable by user). It is also available with optional 1500V isolated static relay.

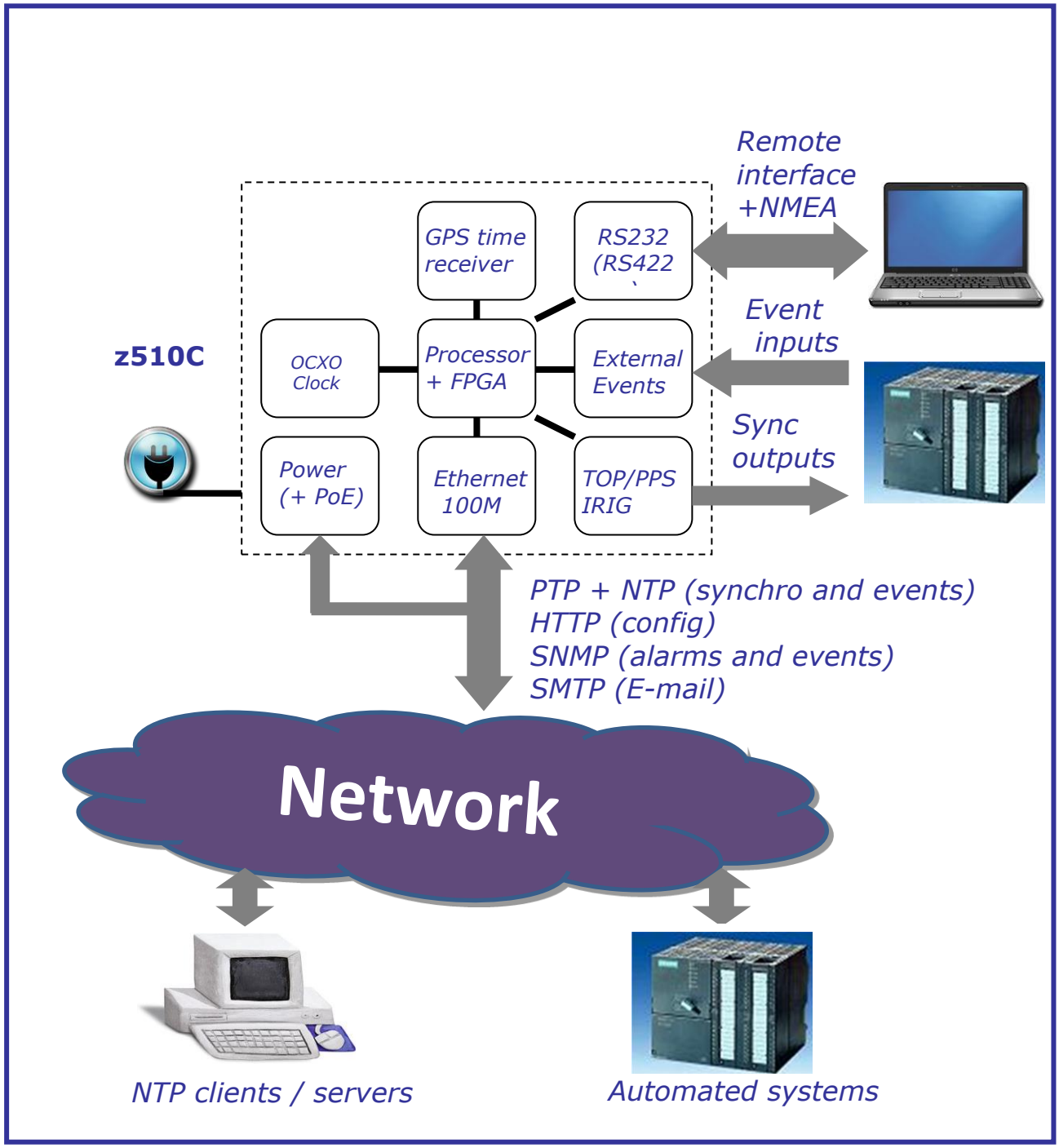
IRIG-B003 output is available in option on the I/O connector.

A RS232 (RS422 on request) serial port can be accessed for remote control and monitoring (with NMEA protocol output).
In option, an internal RTC powered by a lithium battery can provide timing information if no PTP master clock is available at power-up.

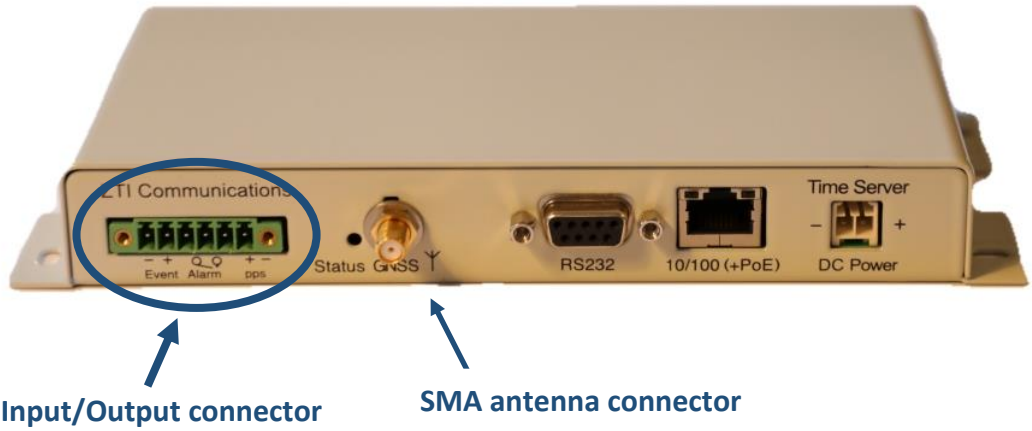
Historic data can be backed-up to an EEPROM (over 8000 status records).

The **Power-over-Ethernet** option enables installation of the z510C without the need for additional cables to provide power.

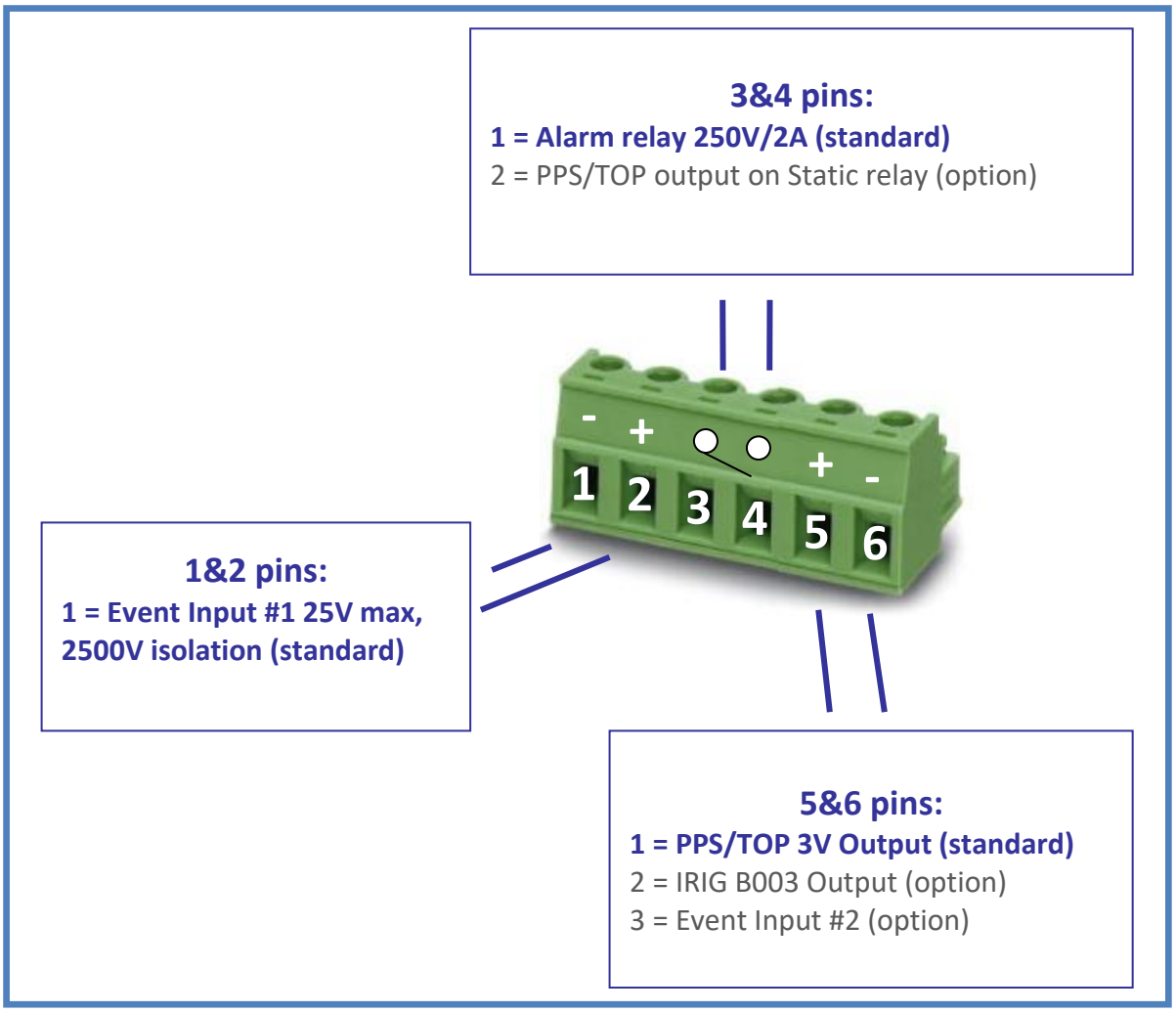




z510C Synoptic and external links



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 ±100ns accuracy (notification via RS232, Email or NTP broadcast frame). The pulse level can be up to ±25V (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.

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Specifications

PTP synchronization	Timing Ethernet Protocol	PTP IEEE1588-2008: - UDP/IPv4 - Addressing mode: Multicast & Unicast - Delay Mechanism: End-to-End - Operation: Two Step Clock - Sync & Announce Intervals: 1, 2, 4, 8, 16, 32, 64 seconds - Priority 1&2 : 0 to 255 - Domain Number: 0 to 4 - Announce Receipt Timeout Multiplier: 2,3,4,5,6,7,8,9,10 PTP Management Messages for monitoring and configuration PTP Signalling Messages for unicast addressing mode
	Configuration/monitoring	HTTP server
	Absolute timestamp error (Refer to Master Clock)	1µs (constant temperature)
	Timestamp drift when synchronization is lost	500µs/day (constant temperature)
Power supply	Input Voltage	Power-over-Ethernet: compliant with IEEE 802.3af. Auxiliary: 8 to 36VDC (without PoE) 12 to 48VDC (with PoE)
	Power consumption	4W
Interfaces	Auxiliary DC Power Supply	2.54mm header, anti-extraction
	GPS active antenna	Not used
	Ethernet link	RJ45, 10/100Mbps + POWER
	Remote RS232	SUB-D9, 38400/8/No/1
	PPS output	RS232, or fast static relay output. on SUB-D9 or I/O connector (3.81mm)
	Alarm Relay	2A/250V. 2500V isolation
	Event input	25V max peak voltage (add resistor if higher), 2500V isolation, ±100ns accuracy
Environmental	Operating Temperature	-40°C (-40°F)/ +70°C (+158°F)
	Storage Temperature	-40°C (-40°F) / +85°C (+185°F)
	Humidity	90% non-condensing
	Dimensions	201 x 95 x 26 (mm)
	Weight	340 grams

- According to CE directive, the z510C unit has passed the following tests:
  - EN55022/55011 class B: conducted and radiated emissions.
  - EN61000-4-2: Immunity to electrostatic discharges.

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- 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 z510C product is RoHS (lead free) compliant.

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ORDERING PART NUMBER

The factory standard part number is:

z510C-C / P10µs -DC (no I/O connector)

The unit is delivered with a RS232 serial port (RS422 is available on request).
A DIN rail mounting plate is available on request

However, you can request several options as described hereafter.

Options: **z510C-C / P10µs** **– DC** **– I/0 = 1 X Y**

- PTP accuracy: P100ns
  P10µs (standard)
  P1µs
- Power: DC
  DC/PoE: DC + Power-over-Ethernet
- I/O connector:

1 & 2 pins:
1 = Event Input #1 (standard)

3 & 4 pins options:
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- Antenna connector: SMA
- Power: 8 to 36VDC (version without PoE)
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