GPS Referenced Portable
Precision Time Measurement, Analysis and Logging Instrument

AS9100D Certificate Number : C0210021-AS3
TIMESPY ELITE - PORTABLE PRECISION TIME MEASUREMENT

Product Overview

The TimeSpy Elite is a highly flexible, mains and rechargeable battery based portable precision time measurement and signal generation unit, designed for use in a broad range of timing application. The unit derives an accurate time reference through an internal or external C/A Code GPS antenna synchronisation which is then maintained by an internally disciplined oscillator (Quartz or Rubidium).

Once synchronised, with an absolute accuracy of < 30ns to UTC, the unit becomes a local portable time reference unit able to measure relative timing to UTC with <1 ns resolution on a wide range of standard time interfaces and time codes including: PTP (IEEE 1588v2), NTP (RFC 1305), 1PPS, IRIG (DCLS or AC), DCF77, NMEA, ASCII: RS232/422/485 and HaveQuick.

The unit is especially useful where time of day information is distributed from a central master clock to sub-master clocks or user systems over large distances via serial data links or packet networks. Such systems often exhibit substantial time delays due to high levels of network traffic or long physical distances between the master clock and the user; hence to quantify and/or qualify such systems, a local UTC reference and comparison instrument is highly advantageous.

In network applications, commercial software algorithms aim at reducing timing errors but unless such errors are accurately and independently measured at the point of use, the user cannot be certain of the accuracy and/or variance of the system time source in the application.

The TimeSpy seamlessly combines high accuracy time measurement circuitry with data analysis and logging functionality to deliver a full statistical breakdown measurement of the UTC time error of the measured signal or signals. This is perfect for network analysis (PTP, NTP) or for free running clocks and timing systems which are synchronised from untraceable sources, such as television, radio broadcasts, electrical power lines and the Internet.

Measurement result logs are easily stored and retrieved locally via the front panel USB port or maybe collected over Ethernet via the built in web server facility.

In addition to measurement, the unit also provides reference signal outputs as 1PPS and 10MHz sine wave for synchronising external equipment to the internal reference.

The TimeSpy Elite can optionally interface to Portable Expansion Modules (PEM), expanding the input signal analysis and measurement capability while also facilitating multi-output, multi-format signal generation based on the TimeSpy reference. PEM units are generally produced and configured to customer specific requirements which can be discussed with the sales department.

Key Feature Summary

- Graphical display of the difference between input time signal and UTC
- Measurement of a wide variety of classic and network time signal inputs
- SFP connection to alternative media (SFP module not supplied)
- Gigabit Ethernet connection for analysis and logging
- Laboratory standard 1PPS & 10MHz outputs can be used as a time reference.
- Timing resolution of better than 1 ns and absolute accuracy of up to 30ns to UTC
- Automatic identification and analysis of Modulated Carrier Timecodes
- Frequency measurement range 40Hz to 50MHz
- GOOSE and Sampled Values measurement capability for IEC61850
- Full colour touch-screen with user-friendly Window operating system
- Front panel USB port for easy access downloads for subsequent data analysis
- Robust, portable design with internal rechargeable battery in addition to mains operation
- Choice of time reference performance accuracy - Quartz or Rubidium
TIMESPY ELITE - PORTABLE PRECISION TIME MEASUREMENT

Oscillator Options

<table>
<thead>
<tr>
<th>Oscillator</th>
<th>Frequency Reference Stability</th>
<th>Frequency Aging without GPS</th>
<th>Loss of Time Accuracy without GPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCXO</td>
<td>$1 \times 10^{-12}$ over 100s</td>
<td>$3 \times 10^{-9}$ per month</td>
<td>±700ns per hour</td>
</tr>
<tr>
<td>Rubidium</td>
<td>$3 \times 10^{-12}$ over 100s</td>
<td>$3 \times 10^{-11}$ per month</td>
<td>±30ns per hour</td>
</tr>
</tbody>
</table>

Interface Specifications

**TimeSpy Elite Specifications**

<table>
<thead>
<tr>
<th>Output Interface</th>
<th>Connector</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm Relay Output</td>
<td>9 way D-Type NO/NC/COM Volt free contacts - 0.3A at 25VAC ; 1A 30VDC</td>
<td></td>
</tr>
<tr>
<td>RS232 User port</td>
<td>9 way D-Type RS232 port for diagnostics</td>
<td></td>
</tr>
<tr>
<td>1 PPS Output</td>
<td>50 Ohm BNC 0V to 5V pulse from 50 Ohms</td>
<td></td>
</tr>
<tr>
<td>1 PPS Output RS-422</td>
<td>Twin BNC 0V to 5V RS422 pulse output</td>
<td></td>
</tr>
<tr>
<td>1 PPM Output*</td>
<td>50 Ohm BNC 0V to 5V pulse from 50 Ohms</td>
<td></td>
</tr>
<tr>
<td>10MHz Output</td>
<td>50 Ohm BNC 0V to 5V square wave from 50 Ohms</td>
<td></td>
</tr>
<tr>
<td>Time Code AC</td>
<td>50 Ohm BNC 1 KHz modulated Timecode output : 6V pk-pk frkm 50 Ohms</td>
<td></td>
</tr>
<tr>
<td>Time Code DCLS : TTL</td>
<td>50 Ohm BNC 0V to 5V DCLS Timecode output from 50 Ohms</td>
<td></td>
</tr>
<tr>
<td>1 PPS Ref Signal</td>
<td>50 Ohm BNC Nominal Input : 0V to 2.5V</td>
<td></td>
</tr>
<tr>
<td>10 MHz Ref Signal</td>
<td>50 Ohm BNC Low 0 - 0.9V / High 1.4V - 5.0V Input Impedance - 1.2K Ohms</td>
<td></td>
</tr>
</tbody>
</table>

Environmental

| Temperature | Instrument : -10°C + 50°C |
| Humidity    | 95 % non condensing |
| Power       | 85VAC - 265VAC 50/60Hz Internal rechargeable battery with 3 hour battery life with 4 hour recharge time - A Ground stud is also provided |
| Physical    | 350mm(W) X 180(H) x 305(D) Weight : 9 Kg |
| Compliance  | CE Approved |

* 1ppm is set as default - pulse width & output interval (or output time of day) can be set by the user
## TimeSpy Elite Measurement Specifications

<table>
<thead>
<tr>
<th>Measurement Interfaces</th>
<th>Connector</th>
<th>Input measurement Accuracy versus GPS</th>
<th>Input Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Time (1 σ)</td>
<td>Resolution</td>
</tr>
<tr>
<td><strong>PULSE :</strong></td>
<td>Fibre ST</td>
<td>25ns</td>
<td>0.2ns</td>
</tr>
<tr>
<td>1 PPS /</td>
<td>Differential Twin BNC</td>
<td>25ns</td>
<td>0.2ns</td>
</tr>
<tr>
<td>1 PPM /</td>
<td>TTL 50 Ohm BNC</td>
<td>25ns</td>
<td>0.2ns</td>
</tr>
<tr>
<td>1 PPH</td>
<td>Relay / Opto-Isolator Twin BNC</td>
<td>25ns</td>
<td>0.2ns</td>
</tr>
<tr>
<td></td>
<td>Fibre ST</td>
<td>25ns</td>
<td>0.2ns</td>
</tr>
<tr>
<td><strong>1 KHz AC Timecode</strong></td>
<td>50 Ohm BNC</td>
<td>1μs</td>
<td>100ns</td>
</tr>
<tr>
<td><strong>DCLS Have Quick</strong></td>
<td>Fibre ST</td>
<td>25ns</td>
<td>0.2ns</td>
</tr>
<tr>
<td><strong>DCF77</strong></td>
<td>Differential Twin BNC</td>
<td>25ns</td>
<td>0.2ns</td>
</tr>
<tr>
<td><strong>DC Timecodes</strong></td>
<td>TTL 50 Ohm BNC</td>
<td>25ns</td>
<td>0.2ns</td>
</tr>
<tr>
<td><strong>Network Connections</strong></td>
<td>NTP / RJ-45</td>
<td>70ns</td>
<td>20ns</td>
</tr>
<tr>
<td></td>
<td>SFP</td>
<td>30ns</td>
<td>8ns</td>
</tr>
<tr>
<td><strong>RS422/RS485 Serial</strong></td>
<td>9 Pin D type 100ns</td>
<td>0.2ns</td>
<td>Common Mode -7V - +12V Differential threshold -0.3V - +0.3V Input Impedance - 22 K Ohms</td>
</tr>
<tr>
<td><strong>Start &amp; NMEA plus Pulse</strong></td>
<td>China Mobile 1PPP + TOD</td>
<td>100ns</td>
<td>0.2ns</td>
</tr>
<tr>
<td><strong>RS422/RS485 Serial</strong></td>
<td>9 Pin D type 1μs</td>
<td>0.2ns</td>
<td>Common Mode -7V - +12V Differential threshold -0.3V - +0.3V Input Impedance - 22 K Ohms</td>
</tr>
<tr>
<td><strong>Start &amp; NMEA plus Pulse</strong></td>
<td>China Mobile 1PPP + TOD</td>
<td>1μs</td>
<td>0.2ns</td>
</tr>
<tr>
<td><strong>Frequency measurement</strong></td>
<td><strong>Range</strong></td>
<td><strong>Connector</strong></td>
<td><strong>Input Specifications</strong></td>
</tr>
<tr>
<td><strong>TTL Input</strong></td>
<td>40Hz - 50MHz</td>
<td>50 Ohm BNC</td>
<td>Nominal Input 0V - 2.5V Low : 0 - 0.9V; High 1.4V - 5V Input Impedance : 1.2 K Ohm</td>
</tr>
<tr>
<td><strong>Differential Input</strong></td>
<td>40Hz - 25MHz</td>
<td>Twin BNC</td>
<td>Nominal Input 0V - 2.5V Low : 0 - 0.9V; High 1.4V - 5V Input Impedance : 1.2 K Ohm</td>
</tr>
<tr>
<td><strong>Rear 10MHz Input</strong></td>
<td>40Hz - 50MHz</td>
<td>50 Ohm BNC</td>
<td>100mV RMS min</td>
</tr>
<tr>
<td><strong>Fibre Input</strong></td>
<td>ST</td>
<td></td>
<td>820nm -7.6dBm max (or 1300nm - 11dBm - to special order)</td>
</tr>
</tbody>
</table>

* TimeSpy reads and identifies the following DCLS & AC timecodes:
  - IRIG-B (IEEE:1344), IRIG-B(200-04), IRIG B, AFNOR (NFS87-500), NASA 36, 2137, XR3

** IEEE1588 (PTP) supported : PTPv1 (Multicast); PTPv2 (Multicast) UDP; PTPv2 Unicast UDP, PTPv2 Unicast L2 (Ethernet); PTPv2 Peer-delay
Satisfied customers include:

- ABB Singapore
- Airbus Defence & Space
- ASM Technologies Ltd
- Atkins
- Babcock International
- BAE Systems
- BBC
- BP
- CMC Engineering Malaysia
- EDF Energy
- Indian Navy
- Jakarta Metro
- Leonardo Electronics Defence And Security
- London Stock Exchange
- London Underground
- MBDA Ltd
- MTPE Hong Kong
- National Air Traffic Services
- NASA
- NEC
- Network Rail
- Northrop Grumman Park Air Systems Ltd
- Qinetiq Ltd
- Raytheon Systems Ltd
- Rockwell Automation
- SBS Transit Singapore
- Siemens Transportation
- Singapore Stock Exchange
- Talent Technology Services Limited
- Tegent
- Thales UK
- Transport For London
- Viacom

Sales Contacts and Global Representatives

**TFS UK Head Office**

Mrs Laura Cain  
Sales Coordinator  
TFS, Witham, CM8 3AL, UK  
Tel: +44 (0) 1376 514114  | Fax: +44 (0) 1376 516116  
Email: laura.cain@timefreq.com

**Europe, Middle East, Africa, Australia**

Mr David Wright  
Director of Sales, Europe, Middle East,  
Australia, Australia  
Tel: +44 (0) 1694 722891  
dwight@timefreq.com

**Asia, China, India, Japan**

Mr Neil Pitman  
Director of Sales - Asia  
China, India, Japan  
Mobile: +44 (0) 7973 859342  
neil.pitman@timefreq.com

**Austria, Germany & Switzerland**

Semic RF Electronic GmbH  
Contact: Wolfgang Grüner  
Tel: +49 04 99 61 15 20  
Email: sales@semic.de  
Web: www.semic.de

**Australia & New Zealand**

Unitronix  
Contact: Tim Marshall  
Tel: +61 31 4977 3511  
Email: sales@unitronix.com.au  
Web: www.unitronix.com.au

**Brazil**

Sigtron Instrumentos e Servicos Ltda  
Contact: Eduardo Samitari  
Tel: +55 11 15 931 3789  
Email: eduardo@sigtron.com.br  
Web: http://sigtron.com.br/

**China, Hong Kong & Macau**

Spectrum & Master Comms. Technologies  
Contact: Mr William Li  
Tel: +852 2529 1111  | Mobile: +852 9378 9271

**Indochina (Vietnam, Laos, Cambodia)**

Hanova JSC  
Contact: Mr Ha Le  
Tel: +84 91 351 4905  
Email: ha.le@hanova.vn  
Web: www.hanova.vn

**India**

PDAC Microsystems Pvt Ltd  
Contact: Mr Pradeep Dhar  
Tel: +91 40 6024 7626  | Mobile: +91 80082 95670  
Email: pradeep@pdac.in  
Web: www.pdac.in

Janus Trading Co  
Contact: Mr Santosh Kulkarni  
Tel: +91 124 486 6647  
Email: santosh@januscorp.in  
Web: www.januscorp.in

Signowave Solutions Private Limited  
Contact: Santosh Kulkarni  
Tel: +91 40 6717 2366  | Mobile: +91 70327 09060  
Email: santosh.kulkarni@signowave.com  
Web: www.signowave.com

**Israel**

IES Electronics Agencies (1986) Ltd  
Contact: Avi Notaf  
Tel: +972 375 307300  
Email: info@hitoio-ies.com  
Web: www.hitoio-les.com

**Italy**

Millimetrika RF & Microwave Components SRL  
Contact: Abbe Capro  
Tel: +39 011 317 9910  
Email: abbe.capro@millimetrika.it  
Web: www.millimetrika.it

**Japan**

Nacelle Co Ltd  
Contact: Mr Naohi Takadoko  
Tel: +81 011 317 3549  
Email: takadoko@nacelle.co.jp  
Web: www.nacelle.co.jp

**Korea**

Etoob  
Contact: Jaydon Lee  
Tel: +82-2-6677-3409  
Email: jaydon.lee@etoob.co.kr  
Web: www.etoob.co.kr

**Malaysia**

Alam Sieneg Tecknik Sdn. Bhd.  
Contact: Mr HW Chew  
Tel: +60 3 7847 5925  | Mobile: +60 13 5131068  
Email: htcchew@alamengineeringtech.com

**North America : USA & CANADA**

Brandywine Communications Inc.  
Tel: +1 877 367 7962  
Fax: +1 714 755 0175  
Email: info@brandywinecomm.com  
Web: www.brandywinecomm.com

**North Africa, Mauritania, Morocco, Tunisia, Algeria, Libya, Egypt, Chad, Mali**

ProComSat  
Contact: Hussein Al Salmi  
Tel: +971 4 4101 630  
Email: hussien@procomsat.com  
Web: www.procomsat.com

**Spain & Portugal Tecnologia GPS S.A.**

Contact: José Lluís Esteban  
Tel: +34 91 323 72 30  
Email: comercial@tecnogps.es  
Web: www.tecnogps.es

**Philippines**

Imaginet International Inc  
Contact: Mr Blair Duncan  
Tel: +63 2 895 9755  | Fax: +63 2 895 9766  
Email: blair@imaginet.com.ph  
Web: www.imaginet.com.ph

**Singapore**

PROGRESO Networks (S) Pte Ltd  
Contact: Victor Tang  
Tel: +65 6509 9060  | Mobile: +65 9735 1700  
Email: victor@progreso.com.sg  
Web: www.progreso.com.sg

**Thailand**

CSG Solution (Thailand) Company Ltd  
Contact: Mr Chinnaret Aksamtopolphan  
Tel: +66 2 575 2971  | Mobile: +66 94 951 6524  
Email: chinnaret@csgs.co.th  
Web: www.csgs.co.th

**Turkey**

Merit Elektronik  
Contact: Levant Celdebi  
Tel: +90 500 312 472 7495  
Email: levant@meritelektronik.com.tr  
Web: www.meritelektronik.com.tr

**South Africa**

Satellite 2000 Systems International Ltd  
Contact: Fred Joubeert  
Tel: +27 818 399 1978  
Email: sales@sat-2k.com  
Web: www.sat-2k.com

**U.A.E.**

Zener Fire & Security LLC  
Contact: Ranjith Rambhar  
Tel: +0021321548818  
Email: ranjith@zenerfire.com  
Web: www.zenerfire.com

**Europe**

Viacom  
Tel: +44 (0) 7973 859342  
Email: dwight@timefreq.com

**Transport For London**  
Contact: Mr Neil Pitman  
Director of Sales - Asia  
China, India, Japan  
Mobile: +44 (0) 7973 859342  
neil.pitman@timefreq.com