Time & Frequency Solutions

TimeSpy

Network Time Analyser with Precision Time Measurement

TimeSpy precisely measures the accuracy of a wide range of classic and network timing inputs against an internal precision GPS-controlled oscillator.

Also available:

TimeSpy Elite

with Gigabit Ethernet capability & SFP connection

Features

- Graphical display of the difference between input time signal and UTC
- Capable of measuring a wide variety of classic and network time signal inputs
- Timing resolution of better than 1 ns and absolute accuracy of up to 30ns to UTC
- Automatic identification and analysis of Modulated Carrier Timecodes
- Laboratory standard 1pps & 10MHz inputs can be used as a time reference
- Frequency measurement range 40Hz to 50MHz
- GOOSE and Sampled Values measurement capabilty 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 for all industrial applications
- Choice of time reference performance accuracy

Ease of Use

The unit is portable and battery powered, and can easily be synchronised outside by using the integrated GPS antenna.

Alternatively, synchronisation can take place inside if connected to an external GPS antenna, with further flexibility to use AC mains power.

Signal Inputs:

Selectable via front panel touch-screen:

- Network Time Protocol (NTP) to RFC1305
- Precise Time Protocol (PTP) IEEE1588v2
- Pulse (1pps, pp2s, 1ppm, 1pph)
- Modulated timecode onto a 1kHz carrier
- Timecode DC level shift
- ASCII Serial time message at RS232, or RS422 or RS485 levels
- NMEA message plus Pulse (1pps & pp2s)
- DCF77 timecode
- HaveQuick

Timespy Applications

TimeSpy is invaluable where time of day information is distributed from a central master clock to sub-master clocks or user systems via serial data links or packet networks.

Substantial delays can occur due to high levels of network traffic or even due to the long distance between the master clock and the user. Some commercially available software algorithms can reduce these errors but, unless they are accurately and independently measured at the point of use, the user cannot be certain of the accuracy of his time source in this type of application.

The high accuracy of the TimeSpy means that it can also precisely measure the time error of free-running clocks and timing systems which are synchronised from untraceable sources, such as television and radio broadcasts, electrical power lines and via the internet.

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TimeSpy Specifications

Measurement Reference Source:

- Internal C/A Code GPS Receiver with case-mounted antenna
- Time Accuracy (1σ) 30ns over 24hrs with GPS reception
- Internal Time Interval Measurement: 0.2ns resolution with built-in self-calibration
- Optional connection to external GPS Antenna

Time Measurement Specification

Measurement Interfaces		Connector	Input Measurement Accuracy Against GPS		Input Specifications
			Time (1σ)	Resolution	
Pulse (1pps / 1ppm / 1pph)	Fibre	ST	25ns	0.2ns	820nm -7.6dBm max (or 1300nm -11dBm max - to special order)
	Differential	Twin BNC	25ns	0.2ns	Common mode -7V+12V
					Differential threshold -0.3V min +0.3V max
					Input Impedance 22k min
	TTL	50Ω BNC	25ns	0.2ns	Nominal Input 0V to 2.5V
					Low: 0- 0.9V; High: Min 1.4V-5V
					Input Impedance 1.2kohm
Relay / optoisolator		Twin BNC	25ns	0.2ns	Isolated inputs. TimeAcc connects 1.2kohm from +5V to contacts from isolated supply
1kHz AC Timecode*		50Ω BNC	1 µs	100ns	Nominal Input: 10Vpp
					Peak to Peak Min / Max: 2.5Vpp /12Vpp
					Input Impedance: 60kohm
DCLS/ Have Quick/ DCF77/ DC Timecodes*	Fibre	ST	25ns	0.2ns	820nm -7.6dBm max (or 1300nm -11dBm max - to special order)
	Differential	Twin BNC	25ns	0.2ns	Common mode -7V+12V
					Differential threshold -0.3V min +0.3V max
					Input Impedance 22k min
	TTL	50Ω BNC	25ns	0.2ns	Nominal Input 0V to 2.5V
					Low: 0- 0.9V; High: Min 1.4V-5V
					Input Impedance 1.2kohm
Network Connections	NTP / SNTP / PTP**	RJ-45	70ns	20ns	100Base-T Ethernet
RS422/RS485 Serial Message Start and NMEA plus Pulse; China Mobile 1pps +TOD		9-pin D-type	100ns	0.2ns	Common mode -7V+12V
					Differential threshold -0.3V min +0.3V max.
					Input Impedance 22k min
RS232 Serial Message Start and NMEA plus Pulse		9-pin D-type	1 µs	0.2ns	Input Voltage Range ±30V max
					Low threshold 0.8V max; High threshold 2.4V
					Input impedance 3kohm min 7kohm max

*TimeSpy reads and identifies the following DCLS and 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 Multicast L2 (Ethernet); PTPv2 Unicast UDP; PTPv2 Unicast L2 (Ethernet); PTPv2 Peer-delay

Frequency Measurement Specification

Parameter	TTl Input	Fibre Input	Differential Input	Rear 10MHz Input
Frequency Range	40Hz to 50MHz	40Hz to 50MHz	40Hz to 25MHz	40Hz to 50MHz
10MHz	50Ω BNC	Low: 0-0.9V; High: 1.4V-5V input impedance 1.2kohm User termination recommended	Differential threshold -0.3V min +0.3V max. Common mode -7V+12V Input impedance 22k min	100mVrms min

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TimeSpy Specifications *continued*

Laboratory Reference (optional)

Optional Laboratory Reference Signal	Connector	Input Specification
1pps	50ohm BNC	Nominal Input 0V to 2.5V
		Low: 0- 0.9V; High: Min 1.4V-5V
		Input Impedance 1.2kohm
10MHz	50ohm BNC	Min 1.4V. Input Impedance 1.2kohm)

Outputs

Output interface	Connector	Output Specification
Alarm relay output	9-pin D-type	NO/NC/COM Voltage Free Contacts 0.3A at 125VAC; 1A at 30VDC
RS232 User port	9-pin D-type	RS232 Port for diagnostics
1pps output	50 Ohm BNC	0V to 5V pulse from 50ohms
1pps output RS422	Twin BNC	0V to 5V RS422 pulse output
1ppm output*	50 Ohm BNC	0V to 5V pulse from 50ohms
10MHz output	50 Ohm BNC	0V to 5V square wave from 50ohms
Timecode AC	50 Ohm BNC	1kHz modulated Timecode output; 6V peak to peak from 50ohms
Timecode DCLS; TTL	50 Ohm BNC	0V to 5V DCLS Timecode output from 50ohms

* 1ppm is set as default - pulse width and output interval (or output time of day) can be set by the user

Additional Service connections

- USB Port for printer /data logger/removable memory
- Internal and external antenna [BNC connector]
- Remote access via VNC

TimeSpy Model Selector

Model	Oscillator	Frequency Reference Stability	Frequency Ageing without GPS	Loss of Time Accuracy without GPS
TimeSpy-Q	Quartz OCXO	$1x10^{-12}$ over 100s	3×10^{-9} per month	±700ns per hour
TimeSpy-R	Rubidium	$3x10^{-12}$ over 100s	3×10^{-11} per month	±30ns per hour

Physical / Environmental

Power:	90V-264V AC; Internal rechargeable battery, nominal 3-hr battery life with 4-hr time to recharge; A Ground Stud is also provided
Mechanical:	Portable Instrument Case: Dimensions: 350mm(W) x 180(H) x 305(D) Weight: 9kg
Environmental (Operation & Storage):	Temperature: 0°C to +40°C Humidity: Up to 95% RH (non-condensing); EMC: CE Compliant

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