

TSync Time Code Processors

PCIe, cPCI, PCI-104, PMC, VPX



- **Rugged timing board**
- **GNSS sync options (GPS, GLONASS)**
- **SAASM GPS option**
- **Auto-detects and prioritizes references**
- **IRIG time code input and output**
- **1PPS input and output**
- **Multiple external event time capture/interrupt**
- **Programmable periodic output/interrupt (1 Hz–10 MHz)**
- **Programmable time match output/interrupt**
- **Optional OCXO internal clock**
- **Ruggedized conduction cooled ready (thermal frame option)**
- **CE and RoHS Compliant**

Spectracom TSync time code processors are complete synchronized time code reader/generator packages offering flexibility and easy integration for mission critical embedded applications. PCI Express, Compact PCI, PCI-104, PMC, and VPX form factors are supported. Others are available upon request. Each board's onboard clock/oscillator is phase-locked to a wide variety of external timing references and provides 5 ns resolution to the time-keeping hardware. Typical reference signals include GPS+GLONASS, SAASM GPS, IRIG and 1 PPS. The user can prioritize multiple external references so if one reference is lost the unit will automatically switch to the next.

The oscillator can be its own reference when it "freewheels" in the absence of a valid external synchronization source. For applications where accuracy in this "holdover" conditional is essential, an upgrade to an ovenized crystal oscillator (OCXO) is available. Some models offer an optional rugged OCXO oscillator that has been tested for shock and vibration according to MIL-STD-810F.

Four user-programmable time tag inputs may be used for multiple event capture at a rate higher than 10,000 events per second. Additionally, four programmable time match/frequency outputs are provided. Other features include two unique time code outputs, multiple programmable square waves or "heartbeats," multiple programmable "alarm" time match start/stop time outputs, a 10 MHz sine wave output, and a 1 PPS output.

Key to the TSync functionality is the ability to generate interrupts. Using a Spectracom driver package available for the latest versions of popular operating systems, you may configure your board using interrupt-driven algorithms to support your unique applications.

Spectracom TSync boards offer a high degree of customization and field upgradeability. If a new application or change in deployment requires a different feature set, we can usually accommodate it.

Internal Time-Keeping Disciplined On-board Clock

- Frequency: 200MHz
- Resolution: 5 ns
- Sync Sources: GPS, GLONASS, IRIG, 1 PPS inputs

Reference Inputs

GNSS Reference

- Frequency: GPS L1 (1575.42MHz), GLONASS L1 (1602MHz)
- Satellite Tracking: 1 to 32, GPS T-RAIM satellite error management
- Synchronization Time: cold start < 4 minutes (includes almanac download), warm start < 2 seconds (90%, assumes almanac download)
- Sensitivity: -136dBm (acquisition), -141 dBm (tracking)
- 1 PPS Accuracy (1-sigma): <15 ns (stationary mode), <45 ns (mobile mode)

Internal GNSS Receiver Option

- Front Panel Connector: SMA jack (+5V at 30mA max supplied to power antenna pre-amp)
- Antenna sold separately
- SMA to Type N adapter cable included

External GNSS Receiver/Antenna Option (PCIe and cPCI Only)

- Size: 45mm dia., 72.55mm H (3.74" dia., 2.85" H)
- Pole mount included
- Operating Temperature: -40°C to 85°C (-40°F to +185°F)
- Cable: 30.5M (100') included, 92M (300') max., 9mm (0.35" dia.); Connectors: 20mm (0.79") at antenna end, DB15 at board end, with adapter cable

SAASM GPS Receiver Option (cPCI and VPX Only)

- Antenna sold separately
- SMA to Type N adapter cable included with convection cooled models
- See table for specs

IRIG

Code Format (AM or DCLS)
IRIG A, IRIG B, IRIG G, NASA36 (auto-detect), IEEE 1344/C37.118 (selectable)

AM

- Amplitude: 500mV p-p min, 10V p-p max
- Modulation Ratio: 2:1 min, 6:1 max
- Input Impedance: >10K Ohms
- Common Mode Voltage: ±150V DC max
- Input Stability: Better than 100ppm

DCLS (Differential or Single Ended)

- Differential Amplitude: 200mV p-p min, 5V p-p max - 7V to +12V DC max common mode voltage (RS-485 compatible)
- Single Ended Amplitude: +1.3V V_{LL} min, +2V V_{HH} max (TTL compatible)

1PPS Input

- Amplitude: 0V to +5.5V, +0.8V V_{LL}, +2.0V V_{HH}
- 1 Hz Pulse, Rising Edge or Falling Edge Active (selectable)
- 100 ns minimum pulse width
- Input Impedance: <150pF capacitive

General Inputs (x4)

Event Time-Tag Input

- Amplitude: 0V to +5.5V, +0.8V V_{LL}, +2.0V V_{HH}
- Polarity (selectable): Positive or negative
- Pulse Width: 50 ns min
- Repetition Rate: More than 10,000 events per second
- Resolution: 5 ns

Outputs

IRIG

Code Format (AM or DCLS)

RIG A, IRIG B, IRIG E, IRIG G, NASA36, IEEE 1344

AM

- Amplitude (adjustable): 500mV p-p min, 6V p-p max into 50 ohms
- Modulation Ratio: 3:1
- Output Impedance: 50Ohms

DCLS

- Differential Amplitude: 1.5V p-p min, 3.3V p-p max, ±1.5V min, 1.8V max common mode voltage (RS-485 compatible)
- Single Ended Amplitude: (100 Ohm Load) +0.5V V_{OL} max, +2.5V V_{OH} min (TTL compatible)

1PPS

- Signal Level: TTL compatible, 4.3V minimum, base-to-peak into 50Ω (for PCIe only: TTL compatible, 2.2V minimum, base-to-peak into high impedance)
- Pulse Width: Configurable Pulse width (200ms by default)
- Rise Time: < 10 ns
- Accuracy: See table

General Outputs (x4)

Periodic Output

- Amplitude: TTL compatible, 4.3V minimum, base-to-peak into 50 Ω (for PCIe only: TTL compatible, 2.2V minimum, base-to-peak into high impedance)
- Period: 100 ns min, 60s max in 20ns steps (10MHz – 0.17Hz)
- Pulse Width: 20ns min, 999ms max in 20ns steps
- Polarity (selectable): Positive or negative

Internal SAASM GPS Reference (cPCI and VPX Only):

	Value
SAASM GPS Receiver	MPE-S Type II GB-GRAM
Frequency	L1 (1575.42MHz) and L2 (1227.6MHz) simultaneous L1- C/A, P(Y) L2 - P(Y)
Satellite Tracking	1 to 12
TTF - Time to First Fix (Synchronization Time)	Cold Start (with almanac download): 15 minutes Cold Start (no almanac download): 5 minutes Warm Start 90 seconds Hot Start: 10 seconds
TTSF - Time to Subsequent Fix (Reacquisition Time)	< 20 seconds, Off or Stby < 15 minutes < 25 seconds, Off or Stby < 60 minutes < 70 seconds, Off < 60 minutes
Antenna Connector	Convection Cooled: SMA Jack (+3.3V @ 9mA to 60mA) Conduction Cooled: MMX Jack (+3.3V @ 9mA to 60mA)
1 PPS Accuracy	±100 ns
Key Fill	DS102 standard, DS101 optional
Backup Battery	SAASM I/O connector or P1-VBAT, VPX P1 connector

1 PPS Output:

	TCXO	OCXO	OCXO Rugged Option (cPCI & VPX only)
Accuracy to UTC (1-sigma locked to GPS)	±50 ns	±50 ns	±25 ns
Holdover (constant temp after 2 weeks of GPS lock)			
After 4 hours	12 μs	3 μs	1 μs
After 24 hours	450 μs	100 μs	25 μs

10 MHz Frequency Output:

	TCXO	OCXO	OCXO Rugged Option (cPCI & VPX only)
Accuracy (average over 24 hours when GPS locked)	1x10 ⁻¹¹	5x10 ⁻¹²	2x10 ⁻¹²
Medium Term Stability (without GPS after 2 weeks of GPS lock)	1x10 ⁻⁸ /day	2x10 ⁻⁹ /day	5x10 ⁻¹⁰ /day
Phase Noise (dBc/Hz)			
@1 Hz	—	-90	—
@10 Hz	—	-113	-120
@100 Hz	-110	-120	-135
@1 KHz	-135	-140	-135
@10 KHz	-140	-150	-145
Signal Waveform & Levels: +13 dBm ±3 dB into 50ohm, BNC			

Time-Match/Alarm Output

- Amplitude: TTL compatible, 4.3V minimum, base-to-peak into 50 Ω 2.2V minimum, base-to-peak into high impedance)
- Range: 100 days in 5 ns steps

10 MHz Output (Sine Wave)

- Harmonics: <-40dBc
- Spurious: <-70dBc
- Other specifications: See table

10 MHz LVDS Clocks via P2

Connector (VPX only)

- Four (4) LVDS differential pairs
- Impedance: 100ohm
- Duty Cycle: 50%
- Rise Time: < 10 ns

General

PCIe Specifications

- Full-height mounting bracket provided
- Bus Interface: Low-profile PCIe x1, Rev 1.1

PMC Specifications

- Single Size CMC (Common mezzanine Card) 149 mm x 74 mm
- Bus Interface: Universal Signaling Voltage 3.3V/5V
- Bus Speed: 32bit address @ 33/66MHz

cPCI Specifications

- 3U Compact PCI (cPCI) Compliant to PICMG 2.0 r3.0 100mm x 160mm (3U card size)
- Bus Interface: Universal Signaling Voltage 3.3V/5V
- Bus Speed: 32bit address @ 33/66MHz

VPX Specifications

- 3U VPX form-factor Compliant to VITA-46
- 3.9" x 6.3" (100mm x 160mm)
- Connectors to VITA 46.0 for P0, P1, and P2
- Bus Interface: PCIe x1, Rev 1.1

PCI-104 Specifications

- Compliant to PCI-104 spec, rev 1.1
- Compliant to PCI spec, rev 2.2
- DIP switch selectable PCI-104 stack level
- Bus Interface: Universal Signaling Voltage 3.3V/5V
- Bus Speed: 32bit address @ 33/66MHz

Conduction Cooling (cPCI and VPX only)

- Per ANSI/VITA 30.1-2002 (cPCI)
- Per VITA 46/IEEE 1101.2 (VPX)
- Thermal frame available by request
- Component elevations available for custom thermal frame design

Power

See table below.

Environmental Temperature

- Operating: -40°C to 80°C (-40°F to +176°F) at card edge with conduction cooled frame
- Storage: -40°C to 85°C (-40°F to +185°F)

Humidity

- Operating & Storage: 95% RH at 60°C for 5 cycles of 48 hours/ cycle

Physical

Weight (base configurations)

- PCIe: 4.3 oz/122 g
- PMC: 3.1 oz/88 g
- cPCI: 6.1 oz/173 g (without thermo frame), 11.4 oz/323 g (with thermo frame)
- VPX: 6.3 oz/179 g (without thermo frame), 1.6 oz/329 g (with thermo frame)
- PCI-104: 3.4 oz/96 g

Safety & EMI

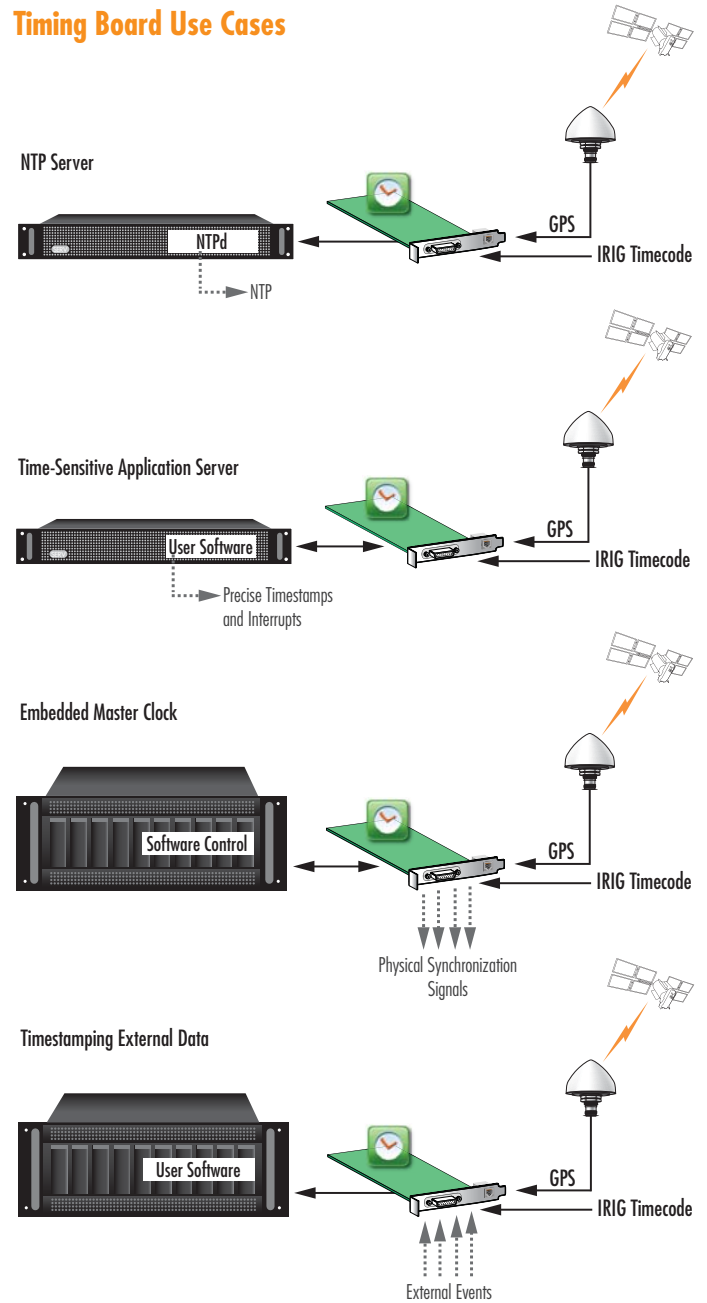
Certifications: RoHS, CE, FCC Class A

Drivers

Linux* 64/32 bit, Windows 7 64/32 bit, Windows Embedded

*Contact sales for specific kernel versions

Timing Board Use Cases



Power:

	+5 VDC	+3.3 VDC	+12 VDC	-12 VDC
PCIe	—	±5% @ 0.7A typ	±8% @ 0.2A typ	—
PMC	±5% @ 1.4A typ	±5% @ 0.7A typ	±8% @ 0.2A typ	±5% @ 0.2A typ
cPCI	±5% @ 1.4A typ	±5% @ 0.7A typ	±8% @ 0.2A typ	±5% @ 0.2A typ
PCI-104	±5% @ 1.4A typ	±5% @ 0.7A typ	±8% @ 0.2A typ	±5% @ 0.2A typ
VPX	Vs3: +5%/-2.5% @ 0.4A typical TCXO, OCXO options @ 0.6A typical rugged OCXO option @ 1.4A maximum rugged OCXO option warm-up	Vs2: +5%/-2% @ 0.85A typ	Vs1: ±5% @ 0.2A typ	12V_AUX: ±5% @ 0.2A typ



TSync-PCIe



TSync-PMC



TSync-cPCI



TSync-VPX



TSync-PCI-104

Ordering Information*

Spectracom's TSync timing boards come in several configurations depending on the bus-type/form factor. Variations include the precision of internal timekeeping, synchronization to external references and interconnections to external devices.

Model Number

TSync-AAAA-X-Y-Z

AAAA = Form Factor
 X= Custom Options
 Y=Internal Oscillator
 Z=External Reference

Options

Premium Breakout Cable Upgrade:

Replaces basic breakout cable for all available inputs and outputs.

*For more information about external connections (adapters, breakout cables, antennas, etc.) please see the TSync Configurations & Ordering Information datasheet.

Form Factor/ Bus Type (AAAA)	Custom Options (X)		Internal Options (Y)			External Reference (Z)			
	1=TF	3=CC	0=TCXO	1=OCXO	2=Rugged OCXO	0=IRIG or Other	1=Internal GPS/GNSS	2=External GPS/GNSS	3=SAASM GPS
PCIe (PCI Express)		x	x	x		x	x	x	
PMC (PCI mezzanine card)		x	x	x		x	x		
cPCI (compact PCI)	x	x	x	x	x	x	x	x	x
VPX	x	x	x	x	x	x	x		x
PCI-104		x	x	x		x	x		

TF = Thermal Frame
 CC = Conformal Coating