GPS Timing Board
Model TSAT-cPCI

The TSAT-cPCI provides high-accuracy timing functions on a plug-in board for the Compact PCI computer bus. The board has an on-board clock, which is kept in sync to an external timecode input. Several timing functions are derived from the on-board clock, including a programmable periodic pulse rate output ("heartbeat"), a programmable start/stop output ("match"), a selectable frequency output ("oscillator out," 1 kHz, 1, 5, or 10 MHz), and a time-stamping input ("time-tag").

The TSAT-cPCI includes an externally-mounted GPS antenna and 100-foot of antenna cable. The GPS satellites provide Coordinated Universal Time (UTC) accurate to within 1 micro-second, and also give position in latitude, longitude, and elevation. The board automatically syncs its on-board clock to the time transmitted by the GPS satellites. The board outputs a timecode signal, in IRIG-B format, which conveys the day, hour, minute, and seconds, and also has a 1 kHz carrier referenced to the on-board oscillator.

The TSAT-cPCI can be used as a stand-alone timecode generator. The computer programs the day, hour, minute and second. The board then continues to count from that time, using the on-board oscillator as the timebase reference. This is called “freewheeling.”

The host computer communicates to the board through a set of memory-mapped registers. When the computer boots up, the board identifies itself to the Compact PCI bus by specifying the unique Subsystem Vendor ID. The host computer can then read the instantaneous time, command the board to set time, and/or to provide an interrupt at a periodic rate, at a specified time, and/or when a time-tag event occurs.
### Specifications

**Timecode Input**
- **Code Format (Autodetect)**
  - IRIG-A (A132), IRIG-B (B122), NASA36
- **Amplitude** 1.2 Vp-p min, 8.0 Vp-p max
- **Polarity** Detected automatically
- **Modulation Ratio** 2:1 min, 3:1 typ, 4:1 max
- **Input Impedance** >10K Ohms
- **Timing Accuracy** Better than 25 ppm (not suitable for tape playback)
- **Common Mode Voltage** Differential input, ±100 V max

**Timecode Output**
- **Code Format (Autodetect)** IRIG-B (B122)
- **Amplitude (Adjustable)** 4.0 Vp-p typical (0 V–20 Vp-p) into > 600 Ohm load
- **Modulation Ratio (Adjustable)** 3:1
- **Output Impedance** 50 Ohms

**On-Board Clock**
- **Resolution** 1 μS

**Propagation Delay Correction**
- −999 μS through +999 μS (1 μS resolution)

**Stability**
- Disciplined to timecode: 2 x 10⁻⁷
- Undisciplined: 1 x 10⁻⁶

**Accuracy** ±1 μS max

**Oscillator Output**
- **Frequency** 1 kHz, 1 MHz, 5 MHz, 10 MHz or Off (software selectable)
- **Type** RS-422

**Differential Output Voltage**
- 2.5 Vp-p (1 MHz) 1.8 Vp-p (10MHz) into 120 Ohms

**Timebase Accuracy**
- Same as on-board clock

**Time-Tag Input**
- **Input Voltage**
  - −0.1 V min, +0.4 V max for logic 0
  - +2 V min, +5.1 V max for logic 1
- **Tags rising edge**

**Input Current**
- −600 μA for logic 0
- 100 μA for logic 1

**Rise/Fall Time**
- 150 nS max

**Repetition Rate**
- 2000 events per second maximum

**Timing Resolution**
- 1 μS

**Heartbeat Output**
- **Output Voltage**
  - High: 2.4 V min at 2.5 mA
  - Low: 0.4 V max at –2.5 mA

**Wave Shape**
- Pulse

**Pulse Width**
- 100 nS, 330 nS, 1 μS, 1 ms

**Pulse Polarity**
- Software selectable

**Power-on Default Rate**
- Off

**Match Input**
- **Output Voltage**
  - High: 3.8 V min at 6 mA
  - Low: 0.3 V max at –6 mA

**Settability**
- 1 μS

**In-Sync Flag Output**
- **Type**
  - Open Collector
  - External Pullup
- **Voltage**
  - +27 VDC max

**Current**
- −20 mA max

**Polarity**
- Conducts to ground when board is synced to GPS or timecode.

**Bus Interface**
- **Interface** PICMG 2.0 compliant

**I/O Address**
- 64 bytes

**General**
- **Size**
  - (H) 100 mm x (L) 160 mm (3.94” x 6.30”)

**Power (from cPCI bus)**
- +5 VDC @ 425 mA max
- +12 VDC @ 225 mA max
- –12 VDC @ 50 mA max

**Operating Temperature**
- 5°C to +50°C (41°F to +122°F)

**Storage Temperature**
- −40°C to +85°C (-40°F to 185°F)

**Connectors**
- **Timing** – DB15
- **GPS Antenna** – HDB15

**GPS Receiver/Antenna**
- **Number of Satellites** 12
- **Acquisition Time** <50 seconds
- **Reacquisition Time** <2 seconds
- **Sync to UTC**
  - Within ± 1.0 μS max

**Position**
- Horizontal: <9 m
- Altitude: <18 m

**Size**
- 95 mm Dia., 72.5 mm H (3.74” Dia., 2.85” H)

**Pole Mount**
- 1.00” I.D., 14 turns/inch straight (not tapered)

**Operating Temperature**
- −40°C to +85°C (-40°F to +185°F)

**Storage Temperature**
- −55°C to +105°C (-67°F to +221°F)

**Antenna Cable**
- **Length** 30.5 m ±0.2 m (100’ ± 8”)
- **Maximum Length** 92 m (300’)

**Cable Size**
- 9 mm (0.35”) O.D.

**Connector Size**
- 20 mm (0.79”) (antenna end)
- 46 mm (1.80”) (board end and extension cable)

**Drivers**
- Major operating systems are supported.

### Ordering Information
- **Model** TSAT-cPCI (+ option #)
- **Options**
  - TRIM-CAB-D-D-100
    - 100’ extension cable for GPS antenna
  - GPS Optic Isolator
    - -6U: 6U bracket (no charge)

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