



GPS Timing Board

Model TSAT-PC104



- **GPS-synchronized timecode generator**
- **GPS, IRIG-A, IRIG-B, NASA36 timecode reader**
- **IRIG-B timecode generator**
- **Time-Tag input**
- **Programmable periodic output (pulse/squarewave) and interrupt**
- **Programmable start/stop time output and interrupt**

The TSAT-PC104 is a complete system package that includes the GPS receiver/antenna (housed in a common enclosure), a 100-foot antenna cable, and a circuit card assembly for the PC104 bus.

The board synchronizes its on-board clock to Coordinated Universal Time (UTC). Other features include a time-tag TTL input, a programmable "heartbeat" pulse or squarewave output (with interrupt capability), and a programmable "match" start/stop time output (with interrupt capability).

In the unlikely event that reception of the satellite signals is lost, the board continues to increment time ("freewheel"). When the signals are re-established, the board resumes synchronization automatically.

The GPS satellites provide Coordinated Universal Time (UTC) accurate to within one microsecond. They also provide position (longitude, latitude, and elevation).

A programmable time offset allows for compensation for cable delays.

PC104 Interface

The board occupies 16 consecutive addresses in I/O (not memory) space. Jumpers on the board allow for selection of base address and the interrupt level. All board functions can be used without interrupts, if desired.

TSAT-PC104 functions can be accessed using 8-bit transfers. In addition, the time can be read with four 16-bit transfers. Binary-coded decimal (BCD) format is used for setting and reading the time.



Specifications

Timecode Input

Code Format (Autodetect): IRIG-A (A132), IRIG-B (B122), NASA36

Amplitude: 1.2 V_{p-p} min, 8.0 V_{p-p} max

Polarity: Detected automatically

Modulation Ratio: 2:1 min, 3:1 typ, 4:1 max

Input Impedance: >10K Ohms

Input Time Accuracy:

Better than 100 ppm (not suitable for tape playback)

Common Mode Voltage: Differential input, ±100 V max

Timecode Output

Code Format: IRIG-B (B122)

Amplitude (Adjustable): 4.0 V_{p-p} typical (0 V–20 V_{p-p})

Modulation Ratio (Adjustable): 3:1

Output Impedance: 600 Ohms

Settability: 1 μs

On-Board Clock

Resolution: 1 μs

Range: 366:23:59:59:999999

Date Format: Integer (001–366)

Propagation Delay Correction:

–1000 μs through +8999 μs (1 μs resolution)

Propagation Delay Setting: Programmed over bus

Stability:

Disciplined to timecode: 2 x 10⁻⁷

Undisciplined: 1 x 10⁻⁶

Time-Tag Input

Input Voltage:

–0.5 V min, +0.8 V max for logic 0

+2.0 V min, +5.5 V max for logic 1

Tags rising edge

Input Current: <5 mA for logic 0 and logic 1

Heartbeat Output

Output Voltage:

High: 3.8 V min at 6 mA

Low: 0.4 V max at –6 mA

Wave Shape: Pulse or squarewave (programmable)

Pulse Width: 150 nS, 450 nS max

Pulse Polarity: Negative

Squarewave: 45% to 55%

Timing: Falling edge on-time (pulse or squarewave)

Range: 1.000 μs to 21.845 μs in 1 μs increments

Power-on Default Rate: 100 PPS (pulse)

Match Output

Output Voltage:

High: 3.8 V min at 6 mA

Low: 0.4 V max at –6 mA

Settability: 1 μs

Bus Interface

I/O Addresses: 16 consecutive addresses

I/O Base Address: 003-3F0 (jumper selected)

Interrupt Level: IRQ 2–7, 10–12, 14, 15 (jumper selected)

Bus Speed: 16 MHz maximum

Time Between Accesses: 100 μs minimum

Necessary Accesses:

4 (read time, 16-bit mode)

14 (read time, 8-bit FIFO mode)

12 (read time-tag, 8-bit FIFO mode)

11 (set time, heartbeat, or match)

DMA Transfers: None

General

Size: H 107 mm, L 168 mm

Power (from ISA bus):

+5 VDC @ 0.7 mA max

+12 VDC @ 175 mA max

–12 VDC @ 20 mA max

Operating Temperature: –30° to +70° C (–22° to +158° F)

Operating Temperature: –40° to +80° C (–40° to +176° F)

Connectors: BNC and DB15 depending on input/output

GPS Receiver/Antenna

Number of Satellites: 12

Acquisition Time: <50 seconds

Reacquisition Time: <2 seconds

Frequency: 1575 MHz (receive only) (L1 band, C/A code [SPS])

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° to +85° C (–40° to +185° F)

Storage Temperature: –55° to +105° C (–67° to +221° F)

Antenna Cable

Length: 30.5 m ±0.2 m (100')

Maximum Length: 92 m (300')

Cable Size: 9 mm (0.35") O.D.

Connector Size: 20 mm (0.8") (antenna end)

Industry standard DB-15 (board end and extension cable)

Drivers

Major operating systems are supported.

Ordering Information

Model TSAT-PC104 (+ option #)

Options

–HB1PPS: Extended frequency range for heartbeat output

–FXB: RS-422 driver for the heartbeat output (includes option –HB1PPS)

TRIM-CAB-D-D-100: 100' extension cable for GPS antenna

GPS Optic Isolator

–M: Sync to 1 PPS input instead of timecode

–LOR1: Three outputs (1MHz, 1 PPS, GND)