**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 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
- **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 Vp-p typical [0 V–20 Vp-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

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:** –40º to +85º C (–40º to +185º F)
- **Storage Temperature:** –55º to +105º C (–67º to +221º 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)

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

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