

# Præcis II CDMA Timing Module

## Second-Generation Time and Frequency Reference

**The Præcis II can synchronize your computer platform to UTC, or it can act as a frequency reference by providing an accurate 1 PPS and 10 MPPS to your instrumentation equipment.** It does so by harnessing the reliability and accuracy of the GPS satellite system via the CDMA cellular telecommunications network used by many cell phones. For time and frequency applications, CDMA base stations act as GPS repeaters, boosting the signal level and making indoor reception possible.



### Indoor Antenna

Since CDMA signals can be received inside buildings, Præcis II saves installation, labor and leasing costs inherent in traditional GPS timing systems. The unit's small size and convenient packaging, coupled with its integrated helical antenna (shown in photo), allow it to be located wherever it is needed. A magnetic-mount antenna with 12 feet of cable is also provided and can easily be mounted on top of your equipment rack.

### CDMA Timing and Frequency Control

CDMA system time and frequency synchronization is slaved to GPS and must be reliably maintained in order for the CDMA telecommunications system to operate properly. Præcis II uses this CDMA infrastructure to synchronize itself to UTC. It precisely aligns its 1 PPS and phase locks its internal oscillator to the CDMA base station carrier transmissions. Because of this, Præcis II can establish

UTC time to the 10-microsecond level of accuracy and provide a frequency output that matches that of UTC to less than  $10^{-11}$ .

### Features

In addition to sourcing precision 1 PPS timing and 10 MPPS frequency signals via SMA connectors, the Præcis II also provides an RS-232 interface for control, status and timing. ASCII strings with time-of-day information and RS-232 level timing signals are available on this serial port. These features are needed for computer network synchronization via the Network Time Protocol (NTP). The format of the ASCII time string is user-selectable and emulates several industry-standard formats. For high precision applications, Præcis II can timetag the transition of the Clear To Send (CTS) signal with 32 nanosecond precision and transmit it in a format compatible with an existing, public-domain driver.

### Where To Use It

The Præcis II synchronizes to the CDMA telecommunications infrastructure and can operate around the world in areas such as North America, Brazil, China, Japan, Korea, India, Hong Kong and elsewhere. It can use either the cellular (824-895 MHz) or PCS (1850-1990) frequency band in any CDMA IS-95 coverage area. In general, if your CDMA cell phone can obtain even a marginal signal, then the Præcis II will work properly there. Note: A special configuration is required for operation in Japan (860-875 MHz).

### Second Generation

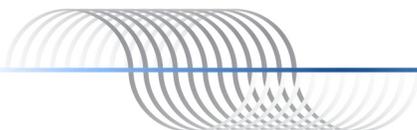
Præcis II is a second generation product that takes advantage of over a decade of experience with CDMA timing modules and includes the ability to synchronize to CDMA PCS frequencies. Older generation products (Præcis Cf & Præcis Ct) could only synchronize to CDMA cellular frequencies which restricted the locations where they could operate. Adding the CDMA PCS frequencies greatly expands the range of locations where the Præcis II can be used. The Præcis II replaces both the Præcis Cf and Præcis Ct by combining their functionality and is backwards compatible.

### OCXO Upgrade Option

During periods of CDMA signal outage the Præcis II timing outputs will slowly drift away from "perfect" time. With the standard TCXO oscillator the Præcis II will drift up to 10 milliseconds in the first 24 hours. With the optional OCXO oscillator the drift will be much less, up to 1 millisecond. The OCXO also offers more than an order-of-magnitude of improvement in temperature stability and improved ageing.

### FEATURES

- Indoor antenna.
- 1 PPS output.
- 10 MPPS output.
- Serial port.
- Event timetagging.
- RS-232 timing signals for NTP synchronization.
- Oscillator upgrade option.
- One-year warranty.
- Syncs to CDMA cellular and CDMA PCS signals - no cell phone subscription required.
- Second generation product replaces Præcis Ct and Præcis Cf.



# Præcis II Specifications



## CDMA RECEIVER:

- Cellular Mobile Receive Band - 869-894 MHz.
- PCS Mobile Receive Band - 1930-1990 MHz.
- Japanese Cellular Mobile Receive Band - 860-875 MHz (optional configuration).
- TIA/EIA IS-95 CDMA Pilot and Sync channels.

## HELICAL ANTENNA:

- SMA plug,  $Z_{in} = 50 \Omega$ .
- Dual Band, 824-896 MHz/1850-1990 MHz.
- Shown in photo above.

## MAGNETIC-MOUNT ANTENNA:

- SMA plug,  $Z_{in} = 50 \Omega$ .
- Dual Band, 824-896 MHz/1850-1990 MHz.
- Magnetic-base monopole with integral 12 ft. RG-58/U cable and SMA plug.
- Extension cables and low-noise amplifiers are available as options.

## LOCAL OSCILLATOR:

- TCXO. OCXO (option).

## TIME TO LOCK:

- < 5 minutes, typical.

## 1 PPS OUTPUT:

- Signal: TTL levels @  $50 \Omega$ .
- Pulse Width: User-selectable, 1 to 999 milliseconds wide or bit width of serial port baud rate.
- Accuracy: < 10 microseconds to UTC typical when locked. Fringe area reception may degrade the absolute timing accuracy due to increased propagation delay.
- Stability:  $TDEV < 50 \text{ ns}$ ,  $t < 10^4 \text{ seconds}$ .
- Connector: SMA jack.

## 10 MPPS OUTPUT:

- Signal: Squarewave. TTL levels @  $50 \Omega$ . Rising edge on-time.
- Accuracy: Typically <  $10^{-11}$  to UTC for 24 hour averaging times when locked.
- Stability:  $\alpha_y(\tau) < 10^{-9}$  for  $\tau < 10^2 \text{ seconds}$ ,  $\alpha_y(\tau) < 10^{-7}/\tau$  for  $\tau > 10^2 \text{ seconds}$ .
- Connector: SMA jack.

## SYSTEM STATUS INDICATORS:

- Lock LED: Green indicator that pulses to indicate the current CDMA acquisition and lock status.
- Alarm LED: Red indicator that illuminates when a serious fault condition exists.

## SERIAL PORT I/O:

- Serial I/O: RXD, TXD at RS-232 levels on RJ-45 jack.  
9600 to 57600 baud; 7 or 8 data bits; odd, even or no parity; 1 or 2 stop bits.
- DCD: 1 PPS output at RS-232 levels, falling edge is on-time. Compliant with RFC 1589 (Kernel Model for Precision Timekeeping) and RFC 2783 (Pulse-Per-Second API for UNIX-like Operating Systems).
- CTS: Input at RS-232 levels, rising edge is captured in event timetagging circuit.
- Time-of-Day: ASCII string via serial i/o port. Seconds through years in GPS, UTC or Local Time.
- RJ-45 to DB-9F cable assembly is included.

## INTERFACE TO NTP:

- Præcis II emulates several existing GPS and WWV clocks for which public domain Network Time Protocol (NTP) drivers are available at: <http://www.ntp.org>.

## EVENT TIMETAGGING:

- Compatible with existing public-domain drivers for NTP.
- RS-232 levels. Rising edge of CTS can be captured with 32 nanosecond resolution.
- Accuracy: < 10 microseconds to UTC typical when locked. Fringe area reception may degrade the absolute timing accuracy due to increased propagation delay.
- Re-Arm Delay: 1 millisecond (the first event during any millisecond will be timetagged).
- Buffering: No events are buffered. Events occurring at a rate higher than 10 Hz will be discarded.

## FIRMWARE UPGRADES:

- Maintenance upgrades provided free-of-charge.

## POWER:

- On 3.5mm phone jack.
- 6 VDC @ 400 mA.
- Universal AC.
- AC wall adapter is included.

## SIZE:

- Case: 4.84"L x 2.68"W x 1.18"H.
- Helical Antenna: 4.25"L x 0.40" diameter.
- Mag-Mount Antenna: 2" diameter at base by 14" H.

## WEIGHT:

- 1/2 pound (270 g).

## ENVIRONMENTAL:

- Temperature: 0° to +70° C.
- Humidity: 0 to 95%, non-condensing.

## COMPLIANCE:

- FCC Part 15 Subpart B Class A.

## WARRANTY:

- One-year parts and labor warranty.
- Free technical support and firmware upgrades for life.

## OCXO OPTION:

- Temperature Stability:  $7.5 \times 10^{-8}$ .
- Temperature Range: -20° to +70° C.
- Ageing Rate/Year:  $1 \times 10^{-7}$ .
- Allan Deviation @ 1 second:  $5 \times 10^{-10}$ .

## JAPAN OPTION:

The Præcis II can operate around the world with the standard configuration. To operate in Japan a special configuration is required:

- Japanese Cellular Mobile Receive Band - 860-875 MHz.

