

# Præcis Cf *Time and Frequency Reference*

*Economical and Easy*

**The Præcis Cf provides a low-cost time and frequency reference for instrumentation equipment.** It does so by harnessing the reliability and accuracy of the GPS satellite system via the CDMA cellular mobile telecommunications network used by many cellular telephones. For time and frequency applications, the CDMA base stations act as GPS repeaters, boosting the signal level and making indoor reception possible. No antenna installation is required with Præcis Cf, so it can be used where installing a GPS antenna is a problem or satellite visibility is poor.



## CDMA Timing and Frequency Control

Præcis Cf uses the existing CDMA wireless infrastructure, whose system timing is slaved to GPS, to precisely synchronize itself to UTC. CDMA system time and frequency synchronization must be reliably maintained in order for the CDMA mobile telecommunications system to operate properly. Præcis Cf precisely aligns its 1 PPS and phase locks its internal 10 MHz temperature-compensated-crystal-oscillator (TCXO) to the PseudoNoise (PN) spreading code waveform that modulates the CDMA base station carrier transmissions.

Since the base stations are stationary and transmission distances typically are short, Præcis Cf can establish UTC time to the 10-microsecond level of accuracy and provide a frequency output that matches that of UTC to less than  $10^{-11}$ . There is no lengthy site survey required and transmissions from a

single base station are all that is needed. Præcis Cf is up and running quickly and can be relocated to a new location without concern.

## Simple Installation

Since CDMA signals at cellular frequencies can be received inside buildings, Præcis Cf saves installation, labor and leasing costs inherent in traditional GPS timing systems. No costly rooftop antenna, window-mount antenna, or cable installation is required. The unit's small size and convenient packaging, coupled with its integrated antenna, allow it to be located wherever it is needed.

## Features

In addition to sourcing precision 1 PPS timing and 10 MHz frequency signals, the Præcis Cf also provides the RS-232 level timing signals that are needed for computer network synchronization via the Network Time Protocol (NTP). The format of the ASCII time-of-day output string is selectable, and emulates several industry standard formats.

## OCXO Upgrade Option

The miniature DIP-OCXO offers more than an order-of-magnitude of improvement in temperature stability relative to the TCXO that is standard with the Præcis Cf. It also offers improved ageing.

## FEATURES

- 1 PPS Output
- 10 MPPS Output
- Serial Port
- Oscillator Upgrade Option



# Præcis Cf Specifications



## CDMA RECEIVER:

- AMPS Mobile Receive Band - 869-894 MHz
- TIA/EIA IS-95 CDMA Pilot and Sync channels

## ANTENNA:

- SMA jack on rear panel,  $Z_{in} = 50 \Omega$ .
- Remote magnetic-mount antenna/cable assembly.

## 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:  $TDEV < 50 \text{ ns}$ ,  $t < 10^4 \text{ seconds}$ .

## 10 MPPS OUTPUT:

- Signal: Squarewave. TTL levels @  $50 \Omega$ .
- 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  $\tau > 10^2 \text{ seconds}$ .

## 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: Output at RS-232 levels, falling edge is on-time, driven by internal 1 PPS.
- CTS: Input at RS-232 levels, positive edge transition 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.

## FIRMWARE UPGRADES:

- Maintenance upgrades provided free-of-charge.

## POWER:

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

## SIZE:

- Case: 4.84"L x 2.68"W x 1.18"H
- Antenna: 3.46"H x 0.43" diameter at base.

## WEIGHT:

- 1/2 pound (270 g).

## ENVIRONMENTAL:

- Temperature:  $0^\circ$  to  $+70^\circ \text{ C}$ .
- Humidity: 0 to 95%, non-condensing

## OCXO OPTION:

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

