

# Tycho CDMA Frequency Reference

## Easy-to-Install Time and Frequency Standard

### The Tycho CDMA Frequency Reference is a cost-effective time and frequency standard designed for easy installation.

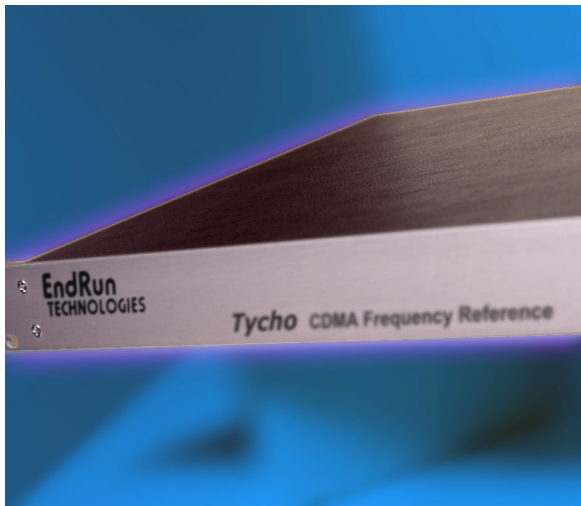
The Tycho includes a proprietary dual-band CDMA Cellular/PCS receiver for synchronization to Universal Coordinated Time (UTC). This permits the convenient installation of a small antenna anywhere a cell phone signal is available, even deep inside buildings, and it eliminates the risk of lightning strike damage to your equipment rack. The Tycho includes a 1 PPS and IRIG-B as outputs and a standard network port supports many protocols including SSH, Telnet and DHCP. The highly-integrated solid state design yields a conservative MTBF of 225,000 hours, giving many years of trouble-free service. The unit can be remotely managed via SNMP, SSH, Telnet, or via a local console on the RS-232 serial port and a Web Interface (HTTPS) is provided for status monitoring using your Internet browser. An OCXO oscillator upgrade is available to improve holdover and short-term stability requirements.

### FEATURES

- CDMA Cellular/PCS synchronization. (No subscriber fees.)
- Frequency accuracy:  $<1 \times 10^{-11}$ .
- 1 PPS output.
- IRIG-B timecode output.
- Network port with Telnet, FTP, SNMP, SSH, DHCP.
- Web Interface lets you monitor status via your Internet browser.

### OPTIONS

- OCXO Oscillator Upgrades.
- 5 & 10 MHz Low-Phase-Noise.
- E1/T1 Telecom Clock Outputs.
- Pulse rates and DC-level-shift timecode outputs.
- More options available.



### CDMA Timing and Frequency Control

The Tycho receives its timing information from the Global Positioning System (GPS) via the CDMA 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. Incorporating a newly-designed dual-frequency receiver with digital cellular (800 MHz) and PCS (1.9 GHz) capability, the Tycho uses the CDMA wireless infrastructure to precisely synchronize itself to UTC to the 10-microseconds level of accuracy. The frequency of the internal oscillator is disciplined to match the frequency of the UTC timescale to parts in  $10^{12}$  level-of-accuracy over 24-hour observation intervals.

### Standard Features

In addition to sourcing a precision 1 PPS timing reference this unit provides a user-selectable timecode output. Choices are IRIG-B, NASA-36 or 2137. The Tycho can be managed via the standard network port or an RS-232 port.

### Secure Network Interface

An ethernet port is provided as a standard feature of the Tycho Frequency Reference with a wide variety of network protocols including HTTPS, Telnet, FTP, DHCP, SSH and SNMP with Enterprise MIB. The incorporation of SNMP v3 and SSH provides the ultimate in network security and allows you to safely perform monitoring and maintenance activities. Security-conscious users can also disable any of the risky protocols such as HTTPS and Telnet. In addition, access via HTTPS, SSH, SNMP and Telnet can be restricted to specific hosts.

### Two-Year Warranty

The Tycho is backed by a full two-year warranty against defects in material and workmanship. Free technical support and software upgrades are available for life.

### Money-Back Guarantee

If your standard Tycho does not meet your time and frequency needs for any reason, simply return it within 60 days for a full refund less shipping fees. See [www.endruntechnologies.com/guarantee.htm](http://www.endruntechnologies.com/guarantee.htm) for details.



No GPS Rooftop Antenna.  
This indoor antenna easily mounts anywhere you want.

# Tycho CDMA Frequency Reference Specifications



## CDMA RECEIVER:

- Digital Cellular Mobile Receive Band - 869-894 MHz.
- PCS Mobile Receive Band - 1930-1990 MHz.
- TIA/EIA IS-95 CDMA Pilot and Sync Channels.

## ANTENNA:

- TNC jack on rear panel,  $Z_{in} = 50\Omega$ .
- Dual Band, 824-896 MHz/1850-1990 MHz, magnetic-base with integral 12 ft. RG-58/U cable and TNC plug.
- Extension cables and preamplifiers are available as options.

## LOCAL OSCILLATOR:

See the [Oscillator Options](#) datasheet for more information.

- TCXO:  $2.5 \times 10^{-6}$  over  $-20^{\circ}$  to  $70^{\circ}$  C.
- MS-OCXO (option):  $4 \times 10^{-9}$  over  $0^{\circ}$  to  $70^{\circ}$  C.
- HS-OCXO (option):  $1 \times 10^{-9}$  over  $0^{\circ}$  to  $70^{\circ}$  C.
- US-OCXO (option):  $5 \times 10^{-10}$  over  $0^{\circ}$  to  $70^{\circ}$  C.

## TIME TO LOCK:

- < 5 minutes, typical (TCXO). < 10 minutes, typical (MS-OCXO).

## 1 PPS CHARACTERISTICS:

- 1 PPS: Positive TTL pulse into  $50\Omega$  or optional RS-422 levels.
- User-Selectable Width: 20 us, 1 ms, 100 ms, 500 ms.
- User Calibration:  $\pm 500$  us, 1 ns resolution.
- Accuracy: < 10 microseconds to UTC typical when locked.
- Stability: TDEV < 50 ns,  $\tau < 10^4$  seconds.

## TIMECODE CHARACTERISTICS:

- Signal: Amplitude-modulated (AM), 3:1 ratio, 1 kHz carrier.
- Drive: 1 Vrms into  $50\Omega$ .
- User-Selectable Format: IRIG-B120 (IEEE-1344), IRIG-B122, IRIG-B123, NASA-36, or 2137.

## NETWORK I/O:

- Rear-panel RJ-45 jack
- AMD PC-Net Fast III 10/100 Base-T Ethernet.

## SUPPORTED NETWORK PROTOCOLS:

- SSH server with "secure copy" utility, SCP.
- SNMP v1, v2c, v3 with Enterprise MIB.
- HTTPS (Web Interface).
- TELNET client/server.
- FTP and DHCP clients.
- TIME and DAYTIME server.
- SYSLOG.
- IPv4, IPv6 and IPv4/IPv6 Hybrid.

## SERIAL PORT I/O:

- RS-232 serial I/O on rear panel DB9M jack for secure, local terminal access.
- Parameters fixed at 19200 baud, 8 data bits, no parity, 1 stop bit.

## SYSTEM STATUS INDICATORS:

- Sync LED: Green LED pulses to indicate lock status.
- Network LED: Amber LED indicates network activity.
- Alarm LED: Red LED indicates a serious fault condition.

## FIRMWARE UPGRADES:

- Software is field-upgradeable and provided free-of-charge.

## POWER:

- 90-264 VAC, 47-63 Hz, 0.5A Max. @ 120 VAC.
- 110-370 VDC, 0.5A Max. @ 120 VDC.
- 3-Pin IEC 320 on rear panel, 2-meter cord included.

## SIZE:

- Chassis: 1.75"H x 17"W x 10.75"D.
- Weight: < 5 pounds.
- Antenna: 14" high x 2" diameter at base.

## ENVIRONMENTAL:

- Temperature:  $0^{\circ}$  to  $+50^{\circ}$  C.
- Humidity: 0 to 95%, non-condensing.

## COMPLIANCE:

- CE, FCC.

## OPTIONS:

Refer to the [Tycho CDMA Options](#) datasheet for more information on listed options.

- Medium-Stability, High-Stability, and Ultra-Stable OCXOs. See [Oscillator Options](#) datasheet.
- 5 & 10 MHz Low-Phase-Noise Frequency Outputs. See [LPN Option](#) datasheet.
- 1, 5 & 10 MHz Sine Wave Outputs.
- Alarm Output (Open Collector).
- Test-Range Timecodes (AM and DC Level Shift).
- User-Selectable Pulse Rate Outputs (1PPS, 10PPS, 100PPS, 1KPPS, 10KPPS, 100KPPS, 1MPPS, 5MPPS, 10MPPS).
- User-Selectable DDS Outputs (1 PPS - 10 MPPS @ 1 PPS resolution).
- Telecom Clock Outputs. See [Telecom Clock Option](#) datasheet.
- ASCII Once-Per-Second Output on Second Serial Port.
- Buffer Module to Provide Additional Outputs.
- +12, -48, +24/28, +125 VDC Inputs.

Other options are available. Call us with your requirements.

