



# TX320

High Data Rate Version 2 GOES Transmitter



## Overview

Campbell Scientific's TX320 is a high data rate (HDR) transmitter that provides communications, via GOES satellites, from a Data Collection Platform (DCP) to a receiving station. It is compatible with most Campbell Scientific dataloggers and offers a convenient telemetry option for remote DCPs in the Western Hemisphere.

Because clock accuracy is critically important for GOES satellite telemetry, the TX320 includes a robust, temperature-compensated-oscillator (TCXO) based clock and a GPS receiver. The real-time clock's precision allows independent operation for up to 28 days without GPS correction.

## Benefits and Features

- › Incorporating the G5-STD-2, certified as High Data Rate version 2<sup>a</sup>
- › Automatic GPS correction of clock and oscillator drift
- › Very stable clock that provides up to 28 days of operation between GPS fixes for more reliable operation in areas with poor GPS reception
- › Transmission rates of 300 and 1200 bps
- › USB port for connecting PCs to setup and perform diagnostics
- › Non-volatile setups configured with Windows-based software
- › Drop in replacement for existing Campbell Scientific HDR GOES transmitters (can use the same datalogger, program, transmission antenna, and power supply)
- › Low quiescent power draw allowing system to use a smaller power supply
- › Simple ASCII interface command set
- › Independent self-timed and random data buffers



The TX320 transmitter offers reliable GOES communications for remote gaging stations.

*<sup>a</sup>Campbell Scientific started shipping High Data Rate Version 2 compliant devices in June 2012. A label on the transmitter indicates that it is version 2 compliant. Users with older TX320 transmitters or TX312 transmitters can upgrade them to be version 2 compliant by sending them to Campbell Scientific (requires an RMA). The procedure for upgrading the transmitter will include a firmware update and a recalibration.*

questions & quotes: 435.227.9000

[www.campbellsci.com/tx320](http://www.campbellsci.com/tx320)



## Specifications

- › Operating Voltage Range: 10.8 to 16 Vdc
- › Transmission Data Rates: 300 and 1200 bps
- › Frequency Range: 401.7 MHz to 402.1 MHz
- › Height: 15.8 cm (6.2 in)
- › Length: 24.9 cm (9.8 in)
- › Width: 5.3 cm (2.1 in)
- › Weight: 1.02 kg (2.25 lb)

### Supply Current at 12 Vdc

- › Idle or Sleep: 5 mA
- › During GPS Fix: 80 mA for 15 minutes per day
- › Transmission: 2.6 A

### Channel Bandwidth

- › 300 bps Transmission Rate: 750 Hz
- › 1200 bps Transmission Rate: 2250 Hz

### USB Port

- › Connector: USB type B
- › Command Protocols: ASCII Command Protocol

### CS I/O Port

- › Signal Levels: TTL
- › Interface Protocol: Campbell Scientific Synchronous Device Communication (SDC)
- › Command Protocol: ASCII Command Protocol<sup>b</sup> or Binary Command Protocol<sup>c</sup>

### RS-232 Port

- › Signal Levels: RS232C
- › Connector: DB9F
- › Command Protocol: ASCII Command Protocol<sup>b</sup> or Binary Command Protocol<sup>c</sup>

### Output Power

- › Complies with NOAA/NESDIS, GOES DCPRS Certification Standards at 300 bps and 1200 bps, version 2.0<sup>d</sup>
- › For a 300 bps link: When transmitting to the GOES-13 or later satellites, the DCPRS shall operate with an effective EIRP of 37 to 41 dBm, assuming appropriate antenna
- › For a 1200 bps link: DCPRS shall operate with an EIRP of 43 to 47 dBm, assuming appropriate antenna
- › Example output power: 11.2 W at 1200 bps transmission rate

### Timekeeping

- › Setting Accuracy:  $\pm 100 \mu\text{s}$  synchronised to GPS
- › Drift:  $\pm 10 \text{ ms/day}$  over  $-40^\circ$  to  $60^\circ\text{C}$
- › GPS Schedule: 1 fix at power up, 1 fix per day afterwards
- › Transmission Continuation without GPS Fix: 28 days

### Frequency Stability

- › Initial Accuracy:  $\pm 20 \text{ Hz}$  disciplined to GPS
- › Short-Term Drift:  $\pm 0.04 \text{ Hz/s}$
- › Aging:  $\pm 0.1 \text{ PPM/year}$
- › Vcc + Temperature:  $\pm 0.1 \text{ PPM}$

### Temperature Range

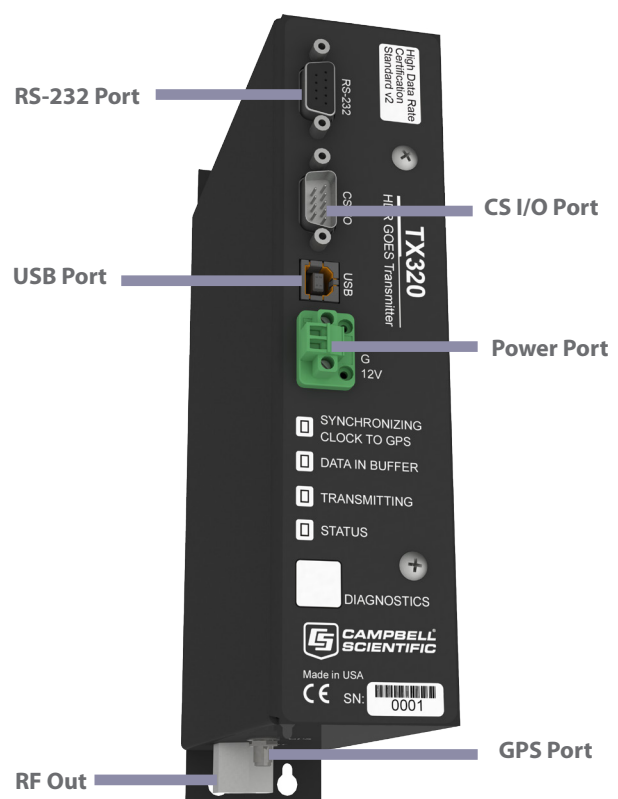
- › Operating:  $-40^\circ$  to  $60^\circ\text{C}$
- › Storage:  $-55^\circ$  to  $70^\circ\text{C}$

### 25316 Transmit Antenna

- › Gain: 11 dBi
- › Type: Right hand circular polarization Yagi
- › Connector: Type N female
- › Wind Load:  $\sim 100 \text{ knots}$

### 17992 GPS Antenna

- › 3.3 V active,  $< 20 \text{ mA}$ , jam resistant
- › Gain: 30 dBi
- › Connector: TNC



<sup>b</sup>ASCII command protocol is described in "G5 ASCII Command Protocol (Doc # 700-G5-CMND-ASCII)".

<sup>c</sup>Binary packet protocol is described in "G5 Binary Command Protocol (Doc # 700-G5-CMND-BIN)".

<sup>d</sup>The "NOAA / NESDIS, GOES DCPRS Certification Standards at 300 bps and 1200 bps, version 2.0" is available at: [www.noaasis.noaa.gov/DCS/docs/DCPR\\_CS2\\_final\\_June09.pdf](http://www.noaasis.noaa.gov/DCS/docs/DCPR_CS2_final_June09.pdf)

## GOES, NESDIS, and Transmit Windows

The TX320 transmitter sends data via Geostationary Operational Environmental Satellites (GOES). The satellites used in the GOES system have orbits that coincide with the Earth's rotation, allowing each satellite to remain above a specific region. GOES satellites cover the western hemisphere.

The GOES system is administered by the National Environmental Satellite Data Information Service (NESDIS). NESDIS assigns addresses, uplink channels, and self-timed/random transmit time windows. Self-timed windows allow data transmission only during a predetermined time frame. Random windows are for applications of a critical nature (e.g., flood reporting) and allow transmission immediately after a threshold has been exceeded.

## GOES System Authorization Procedure<sup>e</sup>

GOES satellites cover the Western hemisphere.<sup>f</sup> Non-U. S. government agencies and research organizations must have a sponsor from a U.S. government agency. Prospective GOES users must receive formal permission from NESDIS, by doing the following:

1. Fill out the System Use Agreement (SUA) application form, which is available at:

<http://noaasis.noaa.gov/DCS/htmfiles/appnewsua.html>

The form can be submitted online or sent to:

GOES DCS SUA Processing Unit NOAA,  
Satellite Services Division  
4231 Suitland Road, Rm 1646  
Suitland Federal Center Suitland, MD 20746

Tel: 301-817-4563

Fax: 301-817-4569

Email: [Letecia.Reeves@noaa.gov](mailto:Letecia.Reeves@noaa.gov)

2. Following approval, NESDIS sends a Memorandum of Agreement (MOA). The MOA must be signed and returned to NESDIS.
3. After the MOA is approved, NESDIS will issue a channel assignment and an ID address code.
4. NESDIS must be contacted to coordinate a start-up date.

## Data Collection Platform (DCP) Equipment

- › TX320 GOES satellite transmitter (includes an SC12 cable)
- › 17992 GPS antenna and the 18017-L cable. The GPS antenna mounts to the end of a crossarm via the 7623 ¾-in. threaded pipe and a 1049 NU-RAIL fitting or CM220 Mount.
- › Datalogger (CR295X, CR800, CR850, CR1000, CR3000). Several retired dataloggers are also compatible; the CR10 requires a special PROM (#14150).
- › 25316 11 dBi Right-Hand Circular Polarized (RHCP) Yagi antenna with mounting hardware.
- › COAXNTN-L RG8 antenna cable
- › ENC16/18, ENC24/30, or ENC24/30S environmental enclosure. Order the enclosure with the 19332 and 19336 Antenna Cable/Bulkhead accessories to allow the Yagi and GPS antennas to be connected without opening the enclosure door.
- › Power supply<sup>g</sup> typically consisting of Campbell Scientific's BP12 12 A h or BP24 24 A h battery pack, CH200 or CH100 regulator, and SP10 10 W or SP20 20 W solar panel
- › 31329 Surge Suppressor Kit (optional)

## Retrieving Data from the Ground Receiving Station

Choose one of the following methods:

- › Internet (see NESDIS for requirements)
- › Domsat
- › LRGS
- › DRGS (Direct Readout Ground Station)

At right is the 17992 GPS antenna attached to a crossarm via the 7623 threaded pipe and a CM220 Mounting Bracket.



<sup>e</sup> See <http://noaasis.noaa.gov/DCS/> for more information about the authorization procedure.

<sup>f</sup> For applications outside GOES coverage area or users who don't qualify for using the GOES system, transmitters that support Argos, Inmarsat-BGAN, Iridium, and METEOSAT are available; contact Campbell Scientific for more information.

<sup>g</sup> Information on analyzing your system's power requirements is provided in Campbell Scientific's Power Supply product brochure. For a more thorough explanation, request the Power Supplies Application Note 5-F. The product brochure and application note can be downloaded from our website.



# National Environmental Satellite, Data, and Information Service

Certificate Number  
0311-0002

Certifies that High Data Rate Data Collection Radio Set (DCPR)  
Platform Transmitter Model G5-STD-2  
Model \_\_\_\_\_

Has been type tested and meets the requirements for use in the  
Geo-stationary Operational Environmental Satellite Data Collection System.

Condition

If design changes or modifications are made that affect its technical performance as specified in the certification standards for this type of equipment, recertification of this model shall be required before placing in operation.

\*In accordance with Version 2.0 GOES Domestic Random operations for 300bps and 1200bps data rates

In Director, Office of Systems Development

*Mark J. Michaelson*

Signature

31 March 2011

Date

NOAA Form 83-1  
(6-80)

GOES/RADIO SET CERTIFICATION

U.S. Department of Commerce  
National Oceanic and Atmospheric Administration