

# TX320

## High Data Rate GOES Transmitter



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

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. Data transmission rates of 100, 300, and 1200 bps are supported. 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.

A significant feature of the TX320 is that it has an extremely stable clock. The clock can operate up to 28 days between GPS fixes. This ability allows more reliable operation in areas with poor GPS reception.

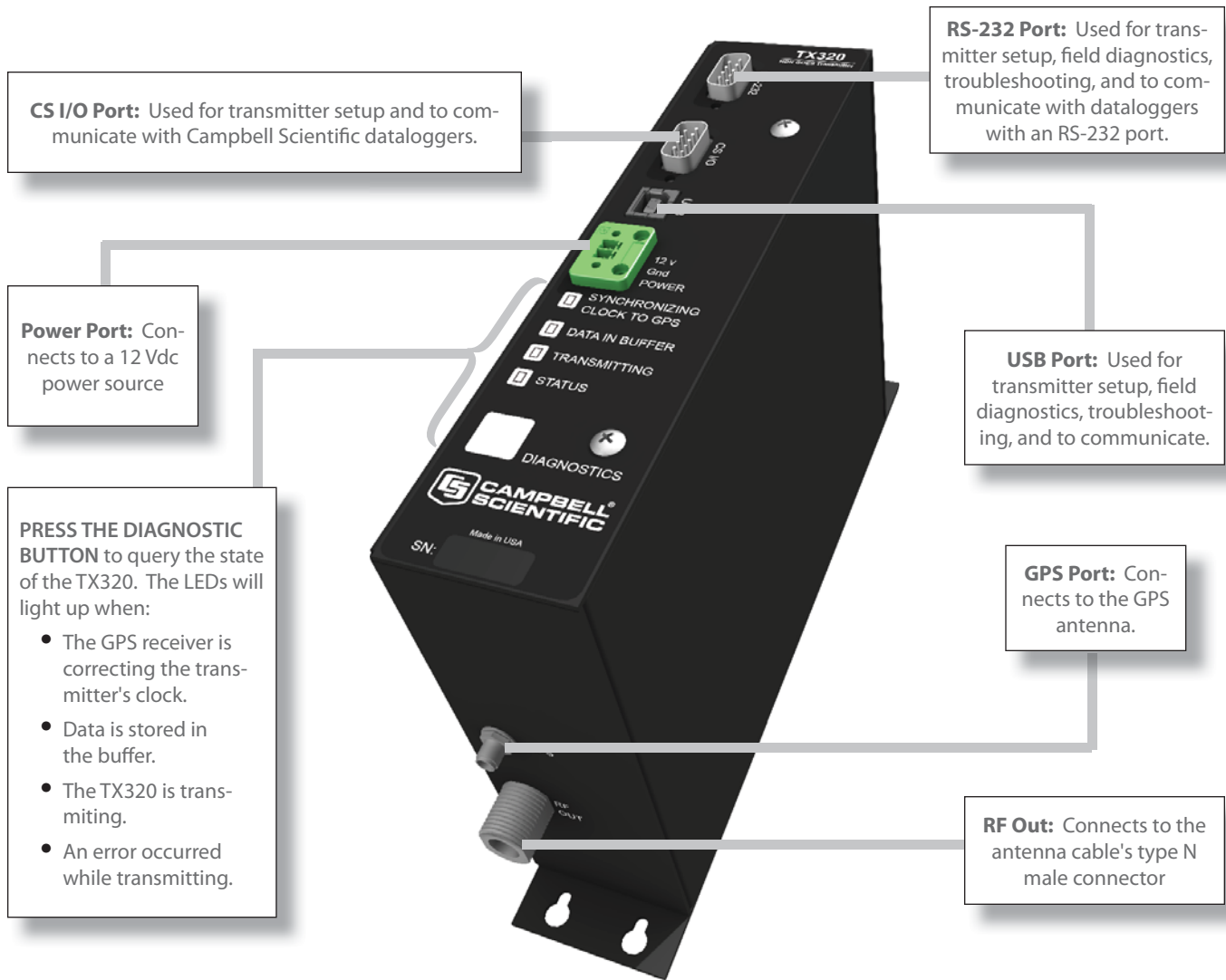
### Advantages

- USB port that allows connection with PCs for setup and diagnostics
- Automatic GPS correction of clock and oscillator
- Very stable clock that provides up to 28 days of operation between GPS fixes for more reliable operation in areas with poor GPS reception
- Low quiescent power draw allowing system to use a smaller power supply
- Transmission rates of 100, 300, and 1200 bps
- Simple ASCII interface command set
- Drop in replacement for existing Campbell Scientific HDR GOES transmitters (can use the same data-logger, program, antennas, and power supply)
- Environmental testing of every unit to ensure the unit functions within specifications
- Independent self-timed and random data buffers
- Available on GSA (GSA MAS Contract Number GS-07F-9255S; US only)



▲ The TX320 GOES transmitter is a convenient telemetry option for remote DCPs in the Western Hemisphere.

## LEDs/Ports



PRESS THE DIAGNOSTIC BUTTON to query the state of the TX320. The LEDs will light up when:

- The GPS receiver is correcting the transmitter's clock.
- Data is stored in the buffer.
- The TX320 is transmitting.
- An error occurred while transmitting.

## Specifications

<b>Operating Voltage:</b>	+10.8 to +16 Vdc	<b>CS I/O Port</b>	
<b>Supply Current @ 12 Vdc</b>		<b>Signal Levels:</b>	TTL
<b>Idle or Sleep:</b>	5 mA	<b>Interface Protocol:</b>	Campbell Scientific Synchronous Device Communication (SDC)
<b>During GPS Fix:</b>	80 mA for 15 minutes/day	<b>Command Protocol:</b>	ASCII Command Protocol <sup>1</sup> or Binary Command Protocol <sup>2</sup>
<b>Transmission:</b>	2.6 A	<b>RS-232 Port</b>	
<b>Channel Bandwidth</b>		<b>Signal Levels:</b>	RS232C
<b>100 bps Transmission Rate:</b>	1.5 kHz	<b>Connector:</b>	DB9F
<b>300 bps Transmission Rate:</b>	1.5 kHz	<b>Command Protocols:</b>	ASCII Command Protocol <sup>1</sup> or Binary Command Protocol <sup>2</sup>
<b>1200 bps Transmission Rate:</b>	3.0 kHz	<b>Transmission Data Rates:</b>	100, 300, and 1200 bps
<b>USB Port</b>			
<b>Connector:</b>	USB type B		
<b>Command Protocols:</b>	ASCII Command Protocol <sup>1</sup>		

Notes:

<sup>1</sup>ASCII command protocol is described in "G5 ASCII Command Protocol (Doc # 700-G5-CMND-ASCII)".

<sup>2</sup>Binary packet protocol is described in "G5 Binary Command Protocol (Doc # 700-G5-CMND-BIN)".

## Specifications (continued)

<b>Output Power:</b>	Complies with NESDIS DCPRS Certification Standards, Section 4.
<b>For 1200 bps:</b>	Has a nominal EIRP of 51 dBm and a maximum EIRP of 53 dBm, assuming appropriate antenna.
<b>For 100/300 bps:</b>	Has a nominal EIRP of 48 dBm and a maximum EIRP of 50 dBm, assuming appropriate antenna.
<b>Example output power:</b>	11.2 W @ 1200 bps transmission rate
<b>Timekeeping</b>	
<b>Setting Accuracy:</b>	±100 µs synchronised to GPS
<b>Drift:</b>	±10 msec/day over -40° to 60°C
<b>GPS Schedule:</b>	1 fix on power up, 1 fix per day afterwards
<b>Transmission Continuation without GPS Fix:</b>	28 days
<b>Frequency Range:</b>	401.7 MHz to 402.1 MHz
<b>Frequency Stability</b>	
<b>Initial Accuracy:</b>	±20 Hz disciplined to GPS
<b>Short Term Drift:</b>	±0.04 Hz/seconds
<b>Aging:</b>	±0.1 PPM/year
<b>Vcc + Temperature:</b>	±0.1 PPM
<b>Temperature Range</b>	
<b>Operating:</b>	-40° to 60°C
<b>Storage:</b>	-55° to 70°C
<b>25316 Transmit Antenna</b>	
<b>Gain:</b>	11 dBi
<b>Type:</b>	Right hand circular polarization Yagi
<b>Connector:</b>	Type N female
<b>Wind Load:</b>	~100 knots
<b>17992 GPS Antenna:</b>	
	3.3 V active, <20 mA, jam resistant
<b>Gain:</b>	30 dBi
<b>Connector:</b>	TNC
<b>Weight:</b>	2.25 lb. (1.02 kg)
<b>Dimensions</b>	
<b>Height:</b>	6.2 in. (15.8 cm)
<b>Length:</b>	9.8 in. (24.9 cm)
<b>Width:</b>	2.1 in. (5.3 cm)

## GOES, NESDIS, and Transmit Windows

The TX320 transmitter sends data via Geostationary Operational Environmental Satellites (GOES). GOES satellites have orbits that coincide with the Earth's rotation, allowing each satellite to remain above a specific region. 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>3</sup>

GOES satellites cover the Western hemisphere.<sup>4</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/htmlfiles/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.

Notes:

<sup>3</sup>See <http://noaasis.noaa.gov/DCS/> for more information about the authorization procedure.

<sup>4</sup>For applications outside GOES coverage area or users who don't qualify for using the GOES system, transmitters that support Argos, METEOSAT, and INMARSAT-C are available; contact Campbell Scientific for more information.

## 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, CR5000). 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 16-in. x 18-in. enclosure. Order the 19332 and 19336 Antenna Cable/Bulkhead accessories to have Campbell Scientific punch a special bulkhead hole in the enclosure and install 17-in. cables for the Yagi and GPS antennas.
- Power supply<sup>5</sup> consisting of Campbell Scientific's BP12 12-Ahr, BP24 24-Ahr, or BP84 84-Ahr battery pack, CH200 or CH100 regulator, and SP10 10-W or SP20 20-W solar panel.
- 16981 Surge Suppressor Kit (optional)

## Retrieving Data from the Ground Receiving Station

Choose one of the following methods:

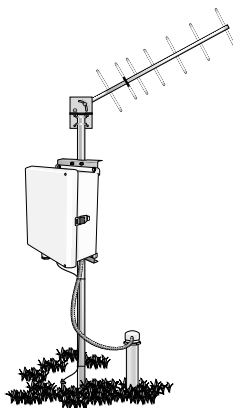
- Internet (see NESDIS for requirements)
- Domsat
- LRGS
- DRGS (Direct Readout Ground Station)
- Phone modem with MNP level 4 error correction (most Hayes-compatible modems contain this error-checking protocol; check the operator's manual for your modem) and user-supplied communication software (e.g., Procomm Plus, Crosstalk).

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



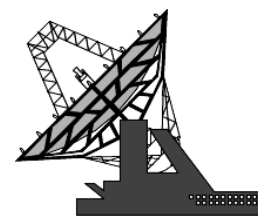
## Typical System

DCP equipment: sensors and an environmental enclosure that houses the TX320 GOES transmitter, datalogger, and power supply



*Data Collection Platform (DCP)*

*GOES Satellite*



*Ground Receiving Station*

<sup>5</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 down-loaded from our website: [www.campbellsci.com](http://www.campbellsci.com)

