TX320

High Data Rate Version 2 GOES Transmitter

CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

Campbell Scientific's TX320 transmitter provides communications, via GOES satellites, from a Data Collection Platform (DCP) to a receiving station. Data transmission rates of 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

- Certified as High Data Rate version 2 compliant[1]
- 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 300 and 1200 bps
- Simple ASCII interface command set
- Drop in replacement for existing Campbell Scientific HDR GOES transmitters (can use the same datalogger, program, transmission antenna, and power supply)
- Independent self-timed and random data buffers

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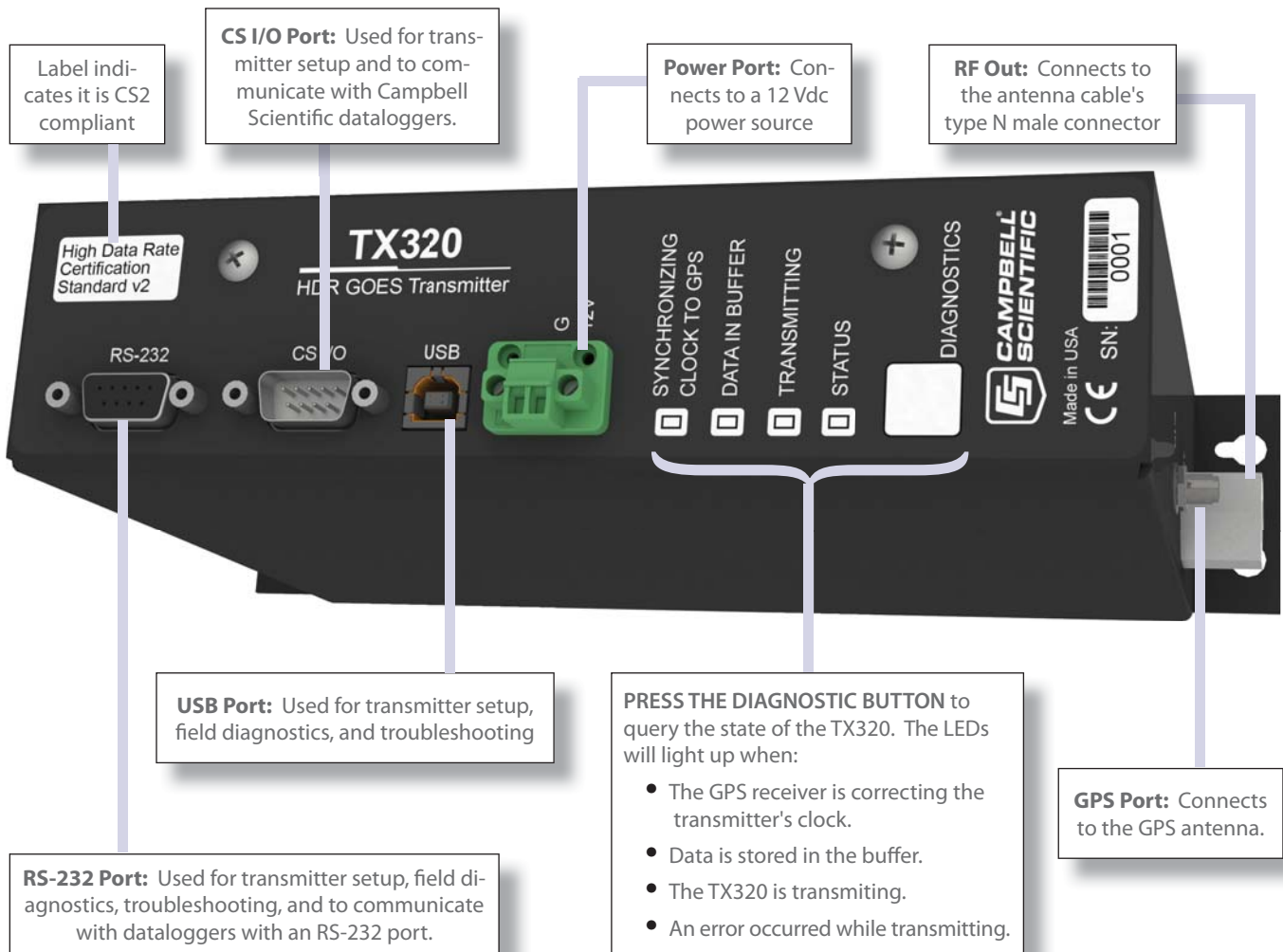

The TX320 GOES transmitter is a convenient telemetry option for remote DCPs in the Western Hemisphere.

Notes:
[1]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.

LEDs/Ports

Label indicates it is CS2 compliant

CS I/O Port: Used for transmitter setup and to communicate with Campbell Scientific dataloggers.

Power Port: Connects to a 12 Vdc power source

RF Out: Connects to the antenna cable's type N male connector

USB Port: Used for transmitter setup, field diagnostics, and troubleshooting

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 transmiting.
- An error occurred while transmitting.

GPS Port: Connects to the GPS antenna.

RS-232 Port: Used for transmitter setup, field diagnostics, troubleshooting, and to communicate with dataloggers with an RS-232 port.

Specifications

Operating Voltage:	+10.8 to +16 Vdc
Supply Current @ 12 Vdc	
Idle or Sleep:	5 mA
During GPS Fix:	80 mA for 15 minutes/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[1]

CS I/O Port	
Signal Levels:	TTL
Interface Protocol:	Campbell Scientific Synchronous Device Communication (SDC)
Command Protocol:	ASCII Command Protocol[1] or Binary Command Protocol[2]
RS-232 Port	
Signal Levels:	RS232C
Connector:	DB9F
Command Protocols:	ASCII Command Protocol[2] or Binary Command Protocol[3]
Transmission Data Rates:	300 and 1200 bps

Notes:
[2]ASCII command protocol is described in "G5 ASCII Command Protocol (Doc # 700-G5-CMND-ASCII)".
[3]Binary packet protocol is described in "G5 Binary Command Protocol (Doc # 700-G5-CMND-BIN)".

Specifications (continued)

Output Power: Complies with *NOAA/NESDIS, GOES DCPRS Certification Standards at 300 bps and 1200 bps, version 2.0*[3]

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 dBmi, assuming appropriate antenna.

For a 1200 bps link: DCPRS shall operate with an EIRP of 43 to 47 dBmi, assuming appropriate antenna.

Example output power: 11.2 W @ 1200 bps transmission rate

Timekeeping
Setting Accuracy: ±100 µs synchronised to GPS
Drift: ±10 msec/day over -40° to 60°C
GPS Schedule: 1 fix on power up, 1 fix per day afterwards

Transmission Continuation without GPS Fix: 28 days

Frequency Range: 401.7 MHz to 402.1 MHz

Frequency Stability
Initial Accuracy: ±20 Hz disciplined to GPS
Short Term Drift: ±0.04 Hz/seconds
Aging: ±0.1 PPM/year
Vcc + Temperature: ±0.1 PPM

Temperature Range
Operating: -40° to 60°C
Storage: -55° to 70°C

25316 Transmit Antenna
Gain: 11 dBi
Type: Right hand circular polarization Yagi
Connector: Type N female
Wind Load: ~100 knots

17992 GPS Antenna: 3.3 V active, <20 mA, jam resistant
Gain: 30 dBi
Connector: TNC

Weight: 2.25 lb. (1.02 kg)

Dimensions
Height: 6.2 in. (15.8 cm)
Length: 9.8 in. (24.9 cm)
Width: 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[5]

GOES satellites cover the Western hemisphere.[6] 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

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:

[4] *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
[5] *See http://noaasis.noaa.gov/DCS/ for more information about the authorization procedure.*
[6] *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[6] 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)

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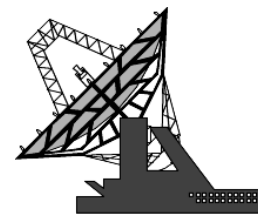
Typical System

GOES Satellite

DCP equipment: sensors and an environmental enclosure that houses the TX320 GOES transmitter, datalogger, and power supply
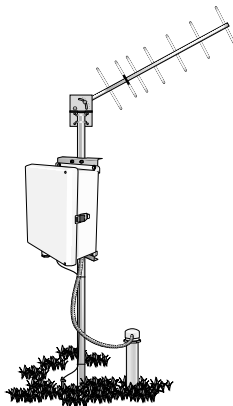
Data Collection Platform (DCP)

Ground Receiving Station

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[6]*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*