

CENTAUR

A TRULY MODERN DIGITAL RECORDER

The best digital recorder on the market just got better

The Centaur is an all-in-one digitizer, recorder, and telemetry instrument with advanced on-board data processing capable of data manipulation and detecting events in the field. Whether your deployment is portable or permanent, standalone or networked, the choice of digital recorder has never been easier.

Exceptional Performance

- Best-in-class dynamic range and low noise, up to 31 bit resolution
- Dual sample rates of up to 5000 sps supports high- and low-frequency applications
- Hot-swap SD media card up to 128 GB for gap-free data retrieval
- Onboard 8 GB memory is field-expandable up to 64 GB by adding an internal SD card
- Multiple high precision time sources including GNSS (GPS + selectable constellation), PTP (Precision Time Protocol) or NTP time sources and can also act as a NTP/PTP timing server
- High accuracy calibration signal generator: voltage and current source
- Records calibration signal generator output as fourth time series channel
- Sensor calibration using fully configurable sine and pseudo random binary waveforms or playback of user defined calibration files

Reliability

- Redundant, fail-safe data archive with field swap capability
- Rugged, waterproof field enclosure for harsh environments, rated for continuous submersion (IP68)
- Excellent protection for ESD & lightning surge

Onboard data processing

- STA/LTA ratio triggers to detect seismic events
- Data backfill in case of communication interruptions
- Fully configurable lowpass, highpass and bandpass digital filtering
- The Centaur with Authentication (models CTR4-3A, CTR4-6A/S, CTR4-6AS/H) has built-in hardware authentication of CD-11 message formats, providing a fully-integrated, compact solution ideally suited for test ban verification regimes
- User configurable onboard 3-D data rotation for orientation correction of Azimuth and tilt rotation



Centaur

CTR4 series

Centaur is ideal for multidisciplinary science involving geophysical sensor applications. Available with 3 or 6 channels, which support sensors such as seismometers, microbarometers, and weather stations.

The extensive configurability is available via a web interface, which also provides real-time state of health and waveform viewing.



*Polar Certified Model
available for operating
temperatures down to -45°C*

TECHNICAL SPECIFICATIONS CENTAUR (CTR4 SERIES)

Specifications subject to change without notice

SENSOR INPUTS

Channels: Available with 3 or 6 channel inputs
Input voltage range (Peak-to-peak differential):

- 40 V, 20 V, 10 V, 4 V, 2 V, 1 V (standard)
- 10 V, 5 V, 2.5 V, 1 V, 0.5 V, 0.25 V (high-gain)

Also compatible with single-ended inputs:

Up to 20 V peak-to-peak (± 10 V)

Input Impedance: 40 k Ω (standard digitizer)

1.8 M Ω (high-gain digitizer)

SENSOR COMPATIBILITY

Sensor Types: Broadband seismometers, short period geophones, and microbarometers

Control Lines: 6 per connector – typically used for calibration enable, mass center, mass lock/unlock, XYZ/UVW select

Sensor Power:

- Supply power pass-through to sensor (9-36 VDC, 1A)
- Over-current and surge protected

Auto Mass Centering: Configurable thresholds, intervals, retries

Serial Interface: Supports digital management of Nanometrics sensors and connectivity to weather stations

DIGITIZER PERFORMANCE & CAPABILITIES

Sampling: Simultaneous on all 3 or 6 channels

Resolution: User selectable bit-depth from 24 to 31 bits per sample

Accuracy: Nominal gain accuracy within $\pm 0.5\%$

Dynamic Range: 142 dB @ 100 sps, 135 dB @ 500 sps (full-scale peak to RMS shorted-input noise)

Preamp Gain:

- Standard: 1x, 2x, 4x, 10x, 20x, 40x
- High Gain: 4x, 8x, 16x, 40x, 80x, 160x

Digital Gain: 0.001 to 100 high precision DSP gain permits choice of any digitizer gain

Sample Rates: 1, 2, 5, 10, 20, 40, 50, 80, 100, 125, 200, 250, 500, 1000, 2000, 5000 sps

Dual Sample Rates: A second sample rate can be selected from the sample rates above

Decimation Anti-Aliasing Filter:

- Selectable linear phase (noncausal) or minimum phase (causal)
- -140 dB (linear phase) or -120 dB (minimum phase) at Nyquist frequency, 0 dB at 80% Nyquist

Digital Filters:

- User-configurable low-pass and high-pass
- 1st to 5th order, 0.1 mHz to Nyquist
- Different filters may be configured for primary and secondary sample rates and Sensor A and B

Orientation Correction: User configurable onboard 3-D data rotation for correcting azimuth and tilt

AVAILABLE MODELS

CTR4-3S: 3 standard channels

CTR4-3H: 3 high gain channels

CTR4-3A: 3 standard channels, Authenticating

CTR4-6S: 6 standard channels

CTR4-6H: 6 high gain channels

CTR4-6A/S: 6 standard channels, 3-channel Authenticating

CTR4-6S/H: 3 standard & 3 high gain channels

CTR4-6AS/H: 3 standard & 3 high gain channels, 3-channel Authenticating

CTR4-3S-XC: 3 standard channels, Polar Certified

CTR4-6S-XC: 6 standard channels, Polar Certified

RECORDING (CONTINUOUS)

Formats: MiniSEED

Internal Memory: 8 GB internal memory (32 or 64 GB options available)

Removable Media: SD Card up to 128 GB

RECORDING (EVENTS)

Triggers: Bandpassed STA/LTA, threshold

Captured Data: MiniSEED, ASCII

Data Products: Peak Ground Motion (i.e. PGA, PGV, PGD) statistics calculated on the instrument

CALIBRATION

Signal Source: 16-bit DAC with 30 ksps output

Calibration Mode

- Voltage source, 1% accuracy from ± 10 V to ± 5 mV
- Current source, 1% accuracy from ± 30 mA to ± 30 μ A

Calibration Signal and Response Recording

- Calibration signal digitized as a fourth 24-bit channel available to be streamed or archived
- Calibration signal and the sensor response can be archived together as an event file

Waveforms: Synthesized sine, step, PRB signals

Playback user defined calibration files

User controllable amplitude, frequency, pulse width, duration, lead-in and lead-out silence

STATE-OF-HEALTH INPUTS

Channels: 3 single-ended inputs, ± 5 V range, 50 k Ω input impedance

Sampling Interval: Configurable from 1 to 3600 seconds

Accuracy: 18 bits effective resolution

DATA RETRIEVAL

File Transfer: Via Ethernet, optional WiFi or

Ethernet-connected DSL, VSAT, cellular, radio

Media Exchange: SD card field-swappable during continuous recording with no loss of data

Response Metadata: Generate and download full digitizer/sensor response files in RESP or Dataless SEED or StationXML format, or access from the SD Archive Media in StationXML format.

DATA STREAMING

Continuous: Seismic data, data products and State-of-Health data

Formats: SeedLink (not available when authenticating), Nanometrics NP, QSCD20, authenticating models have CD-1.1

Events: Triggered event data: email, secure file transfer, other options available

TIMING - GNSS & PRECISION NETWORK TIMING

Timing System: Internal DCXO clock disciplined to selectable timing source

Timing Source: Select from GNSS, PTP (Precision Timing Protocol), NTP or free-running

Timing Server: Serve PTP or NTP time to other Centaur, Titan SMA/EA or Meridian

Timing Accuracy: < 5 μ sec (GNSS Always on) < 100 μ sec (GNSS duty cycled, PTP or local NTP)

GNSS Receiver: Internal 32 channel GNSS receiver

GNSS Constellations: GPS + select one of Beidou, Glonass, Galileo, QZSS

GNSS Power: Selectable: always on, duty cycled or off

LOCAL USER INTERFACE

Removable Media: SD card protected in waterproof media bay

External LEDs: System status, Ethernet link, time quality, media card status, sensor A & B

Buttons: WiFi wakeup, media eject, system shutdown

COMMUNICATIONS

Web-based Graphical UI: Supports standard PC, tablet and mobile devices. Used for waveform and state-of-health monitoring, configuration, maintenance, sensor management and calibration, downloading data and events.

Interfaces: 10/100 Base-T Ethernet, WiFi (optional), Serial via USB (USB unavailable on Authenticating models)

IP Addressing: Static, dynamic (DHCP) or link-local IP

Protocols: WebSocket, UDP/IP unicast/multicast, HTTP data streaming

POWER

Power Supply: 9-36 VDC isolated input

Protection: Electronic resettable fuse design, lightning surge, reverse battery and short circuit protection

Battery Manager: User-configurable low voltage shutdown and restart thresholds

POWER USAGE (TYPICAL)

3 chan. (standard): 850 mW

6 chan. (standard): 1.2 W

Ethernet: Add 0.2 W for 10 Base-T, 0.3 W for 100 Base-T

High Gain: Add 0.2 W for every 3 high-gain channels

Authentication: Authenticating models add 1.2 W if enabled

CONNECTORS

Sensor: 26-pin Mil. circular, shell size 16, female

Power: 3-pin Mil. circular, shell size 8, male

Ethernet: Watertight RJ-45

USB: 2.0 Type A receptacle behind media bay door (USB unavailable on Authenticating models)

GNSS Antenna: TNC (female) with 3.3V supply for active antenna

State-of-Health: 4-pin Mil. circular, shell size 8, female

PHYSICAL CHARACTERISTICS

Housing: Aluminum

Ingress Protection: Rated to IP68 at 2 m for 72 hours when connectors mated or capped

Humidity: 0 to 100%

Operating Temperature:

-20°C to 60°C (Standard Model)

-45°C to 60°C (Polar Certified Model)

Storage Temperature:

-40°C to +70°C (Standard Model)

-60°C to +70°C (Polar Certified Model)

Weight: 2.1 kg (3-channel), 2.2 kg (6-channel), 2.2 kg (CTR4-3A), 2.4 kg (CTR4-6A/S)

Size: 196 mm (L) x 137 mm (W) x 88 mm (H), except CTR4-6A/S and CTR46AS/H which is 196 mm (L) x 137 mm (W) x 93 mm (H)

CENTAUR WITH AUTHENTICATION

MODELS: CTR4-3A, 6A/S, 6AS/H

Streaming: CD-1.1 format

Digital Signature:

Hardware authentication provides

- Elliptic Curve Digital Signature Algorithm (ECDSA P-256, SHA-256)

- Can select Authentication on Sensor A or B

Tamper Detection: Authenticating models have case tamper switch or 3 external switches via SOH connector

Contact a product expert Toll Free: 1 855 792 6776 | sales_mkt@nanometrics.ca



Strategic intelligence fueled by science

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