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 analog-digital conversion
- Dual sample rates of up to 5000 sps supports high- and low-frequency applications
- Hot-swap SD media card up to 64 GB for gap-free data retrieval
- Onboard 8 GB memory is field-expandable up to 64 GB by adding an internal SD card
- Support for GNSS (GPS + selectable constellation), PTP (Precision Time Protocol) or NTP time sources and can also act as a timing server
- High accuracy voltage and current source calibration signal generator
- 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

- 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) has built-in hardware authentication of CD-1.1 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

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 kΩ (standard digitizer)
1.8 MΩ (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 ±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

RECORDING (CONTINUOUS)

Formats: MiniSEED
Internal Memory: 8 GB internal memory (32 or 64 GB options available)
Removable Media: SD Card up to 64 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 ±10V to ±5mV
- Current source, 1% accuracy from ±30mA to ±30uA

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 kΩ 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

DATA STREAMING

Continuous: Seismic data and State-of-Health data
Formats: SeedLink (not available when authenticating), Nanometrics NP, 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 µsec (GNSS Always on)
<100 µsec (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.

COMMUNICATIONS (CONT'D)

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: 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 which is 196 mm (L) x 137 mm (W) x 93 mm (H)

CENTAUR WITH AUTHENTICATION MODELS: CTR4-3A, 6A/S

Streaming: CD1.1 format
Digital Signature:
Hardware authentication provides
- Digital Signature Algorithm (DSA, SHA-1) and
- Elliptic Curve Digital Signature Algorithm (ECDSA P-256, SHA-256)
- Authentication on Sensor A only

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

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