

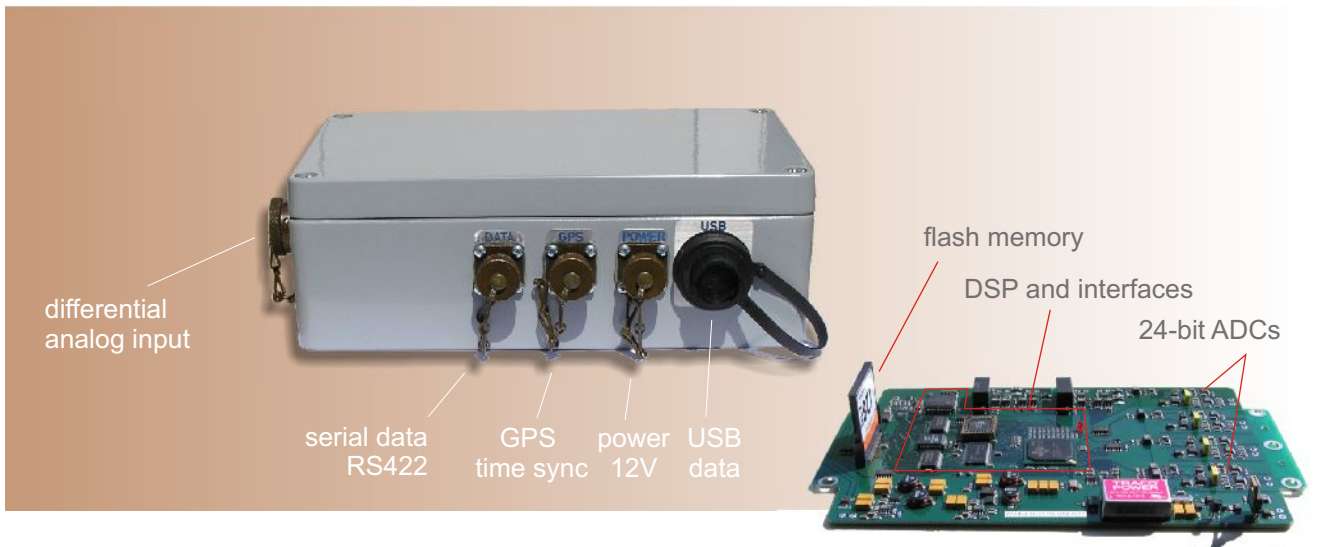
Wave24 digital recorder

technical data

Wave24 is 24-bit digital recorder which uses state-of-the-art technology to provide high-resolution data for seismic applications. Wave24 is versatile device - it can be used as a stand-alone system, in connection with other Wave24 devices to provide network features or multichannel recorder or can be connected to computer and provide real-time seismic station.

solutions for the real world

SEISMOLOGY



Analog inputs

Wave24 provides four differential analog input channels with high dynamic range - 135 dB at 20 sps. Three optional factory LSB values are available - 100, 200 or 500 nV (other LSB values are available according to user request).

Digital outputs

Input signals are simultaneously sampled at 20kHz and then filtered and decimated by three-stage filtering to desired frequency. The technique reduces noise and provides wide range of output frequencies ranging from 1 Hz to 600 Hz.

Communication

Wave24 supports standard communication interfaces RS422 and USB for configuration, maintenance and data retrieval. Several Wave24 can be connected on a single RS422 line and provide data to the single device (computer or master Wave24) to perform as a multichannel recorder. Wave24 converters can be spread to the distance of ~1km in this mode. GPS board, state-of-health extension board and built-in LCD display share RS485 line which enables to extend the distance between modules up to ~1km as well as sharing of modules by several Wave24 recorders.

Recording and Data format

Data are recorded on removable CompactFlash card in data-only SEED format with Steim2 compression. The standard storage capacity is 1GB which is sufficient for approximately four weeks of recording at 100 sps. Wave24 supports both continuous and triggered recording modes. In triggered mode, event oriented and time oriented algorithms are available.

Timing

Wave24 uses precise clock locked to GPS pulses for timing. Independent GPS module WaveGPS is supplied with Wave24 recorder. The module contains GPS antenna as well as receiver. It provides data using RS485 line which enables to deliver information to long distances as well as to share GPS module by several Wave24 recorders. The GPS pulses from the module can be delivered up to 1km distance.

System state monitoring

Wave24 monitors its internal state and state of GPS module (signal quality, fix type). Additionally, WaveEXT module can provide 8 additional analog input channels for sensor state monitoring as well as control signals for sensor remote maintenance (autozero, period switching, locking).

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Built-in display

Wave24 is equipped with LCD graphical display with touchscreen providing the user with state-of-health information as well as with configuration functions. The system state information includes internal test results, information on free memory on the card, GPS state information as well as information on sensor state if WaveEXT is used in the system. The configuration functions make it possible to fully configure Wave24 without any additional device and use it as truly independent stand-alone system.

Housing

Wave24 digital recorder and its modules are supplied in water-proof IP66 cases with military standard water-proof connectors.

Identification

Wave 24 digital recorder

Input channels

Number:	4
Type:	differential
Sensitivity:	100 nV, 200 nV or 500 nV optionaly
Noise level (RMS):	~ 1 LSB@20sps

Digitizer

Dynamic range:	135 dB@20sps
Internal sampling frequency:	20 kHz
Output sampling frequencies:	600, 480, 240, 200, 100, 120, 80, 60, 50, 40, 30, 20, 10, 5, 1 Hz

Interfaces, clock, environmental monitoring

Communication interfaces:	USB, RS 422, RS 232
GPS time synchronization:	RS 485
Precise Internal Clock Timing:	(10 ⁻⁷)

Recording and Data Format

Continuous, triggered:	SEED
Compact flash capacity:	1 GB (up to 4 GB)

Power

Voltage:	9 V - 15 V
Consumption:	< 4 W

Mechanical

Dimensions:	258x170x87mm
Weight:	2234 g

Environmental

Operating temperature range:	-40 °C ...+ 70 °C
Water-proof aluminium case:	IP 66 (EN 60529/10.91)/NEMA 4

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WaveGPS

WaveGPS module contains GPS antenna and GPS receiver. The interfaces are designed to be capable to provide data and pulses to the Wave24 to the distances up to 1 km. RS485 line used for GPS data enables sharing of the WaveGPS module by several Wave24 recorders. WaveGPS can be used as an internal board as well as an external module.



GPS outputs

Pulse per second:	width 20, 40, 60, 80 or 100 ms, software selectable
GPS data - RS485 interface:	2400,4800,9600,19200 baud, software selectable
GPS data format:	NMEA

Power

Power input:	10 - 15 V DC
Power output:	12V
Consumption:	0,7 W in continuous operation

WaveEXT

WaveEXT is an extension board for Wave24 digital recorder providing sensor monitoring and maintenance functions. It provides 8 additional analog inputs and sensor maintenance control signals. WaveEXT is connected to the Wave24 using RS485 line shared with WaveGPS. It can be used as an internal board as well as an external module.



Number of channels:	8@12 bit
Inputs Single ended:	+/- 10V
Calibration signal:	square wave, frequency and amplitude adjustable
Control signals:	automatic centering, period switching, sensor locking
Consumption:	0,1 W

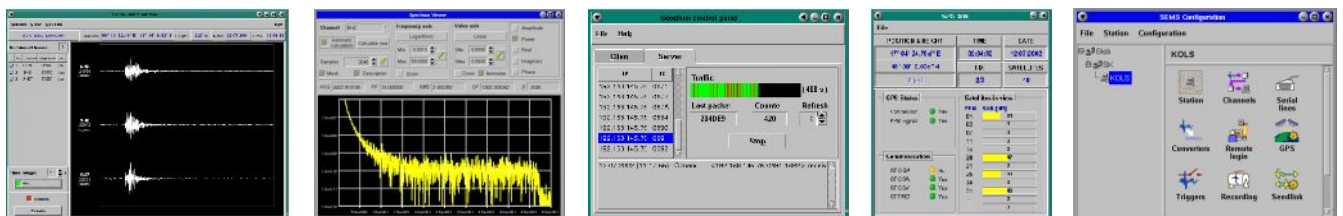
WaveCOM

WaveCOM is communication computer and recorder. It uses RS422 interface to communicate with Wave24 digital recorders. Data exchange is based on TCP/IP protocols and can be realized on different physical layer types - ethernet, dialup-up or leased-line modem connection, radio link or VSAT connection. WaveCOM supports both SeedLink and AutoDRM protocols for data exchange.



WaveCOM provides additional storage capacity to Wave24. Data can be recorded in SEED or GSE formats. WaveCOM supports both continuous and triggered recording modes.

Graphical user interface of WaveCOM makes configuration, system monitoring and maintenance easy and straight forward. WaveCOM supports remote configuration and maintenance using SEMS data acquisition center utilities.



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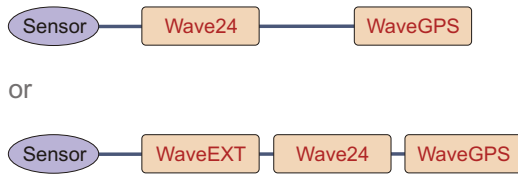
Wave24MS

Mobile station Wave24MS includes Wave24 digital recorder, WaveGPS and WaveCOM in one case. It provides complete seismological station with data exchange capabilities and user friendly graphical interface in a single case. Optionally, the WaveEXT module can be built into the case to provide sensor state monitoring and maintenance functionality.

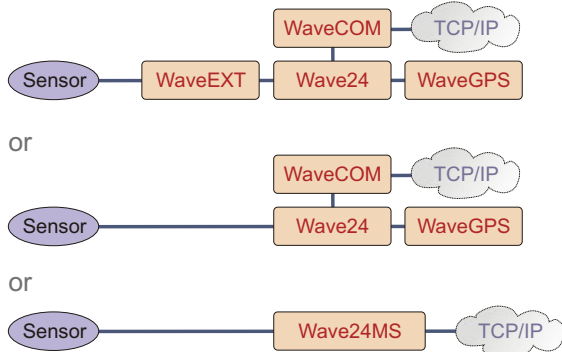


How to use Wave24...

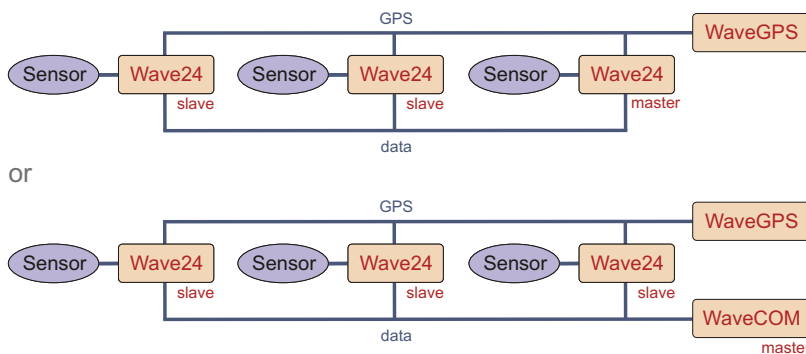
...as standalone seismic station



...as seismic station with data exchange capabilities



...as multichannel recorder or seismic array



Wave24 can be used as a stand-alone system recording data to the CompactFlash card. The WaveGPS is connected for time synchronization. Power to the whole system can be supplied through Wave24 as well as through WaveGPS. The distance between the two modules can reach 1km. Additionally, WaveEXT can be used for sensor monitoring and maintenance.

Communication computer WaveCOM can be used if data exchange is required. WaveCOM is connected to the Wave24 digital recorder, obtains data from it and provides them to other systems using TCP/IP based protocols. Whole configuration can be replaced by single mobile station Wave24MS, where all the modules are packed together in one case.

Communication interfaces of Wave24 make it possible to connect several recorders on a single line and share single WaveGPS time reference module. The data can be collected to one of the Wave24 recorders or to connected computer. This way, Wave24 can be a multichannel recorder or provide array features.