GEODAQ

R2D3 Datasheet

Identify Movement and Reduce Risk

AUTOMATED MONITORING SOLUTIONS

www.geodaq.com

The R2D3 remote monitoring station measures absolute displacements in 3 directions (XYZ) as well as rotational movements in 2 horizontal directions. Centimeter-level displacement precision is achieved using streaming GNSS correction data and R2D3 software algorithms operating in a feedback loop. A two-axis high-performance tilt sensor measures rotational movements below 0.005 degrees.

Technical Features

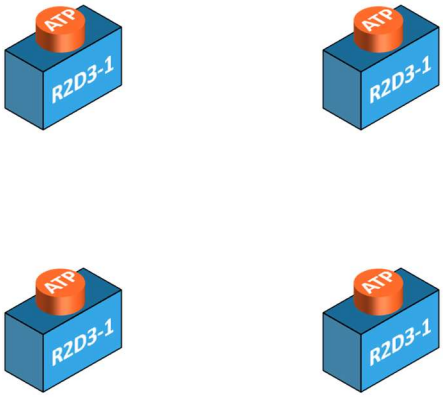
- High-Precision GNSS Receiver
- 3D Movements at up to 8 Target Locations
- Subcentimeter-Level Precision
- Low-Cost Active Target Points (ATP)
- Integrated 4G LTE Modem and Wi-Fi
- High-Resolution Rotational Movements
- 8 High-Speed Analog Sensor Inputs
- 16 Vibrating Wire Inputs (Optional)
- Compact and Battery Operated
- Rugged Waterproof Enclosure

Monitor displacement and rotation in 3 dimensions (XYZ) in real-time with the GNSS based R2D3 station running on our powerful new GCM8 controller module with integrated WIFI and 4G LTE cellular communication. Externally mounted Active Target Points (ATP) provide a low-cost alternative when multiple monitoring points are needed. The GCM8 includes multi-channel high-speed data acquisition for external vibrating wire and analog sensors. Monitor seismic motion, ground water pressure, stress-strain, force, vibrations and distances. Applications include landslides, earth retaining structures, cut slopes, embankments/levees, pipelines and existing structures.

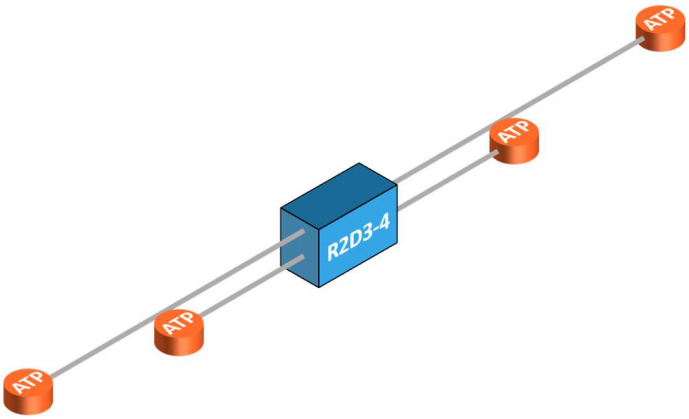
MODEL	DESCRIPTION
R2D3-1	Monitoring station with one externally mounted ATP module
R2D3-4	Monitoring station with 1 to 4 externally mounted ATP modules
R2D3-8	Monitoring station with 1 to 8 externally mounted ATP modules
R2D3-X-VW	Monitoring station with X ATP and 16 vibrating wire inputs

Multiple Monitoring Points

One R2D3 station can network up to 8 externally mounted low-cost ATP nodes (Active Target Points) adding multiple precision measurement points to each station which greatly expands the coverage area. This allows one R2D3 station to track movements with centimeter-level accuracy at up to 8 ATP locations significantly lowering cost per monitoring point. The R2D3-1 station has one internally mounted ATP and can be installed in locations where running cable is cost prohibitive. The R2D3-4 and R2D3-8 stations multiplex several ATP locations and work well for locations where running cable is feasible.



Single ATP Network



Multiple ATP Network

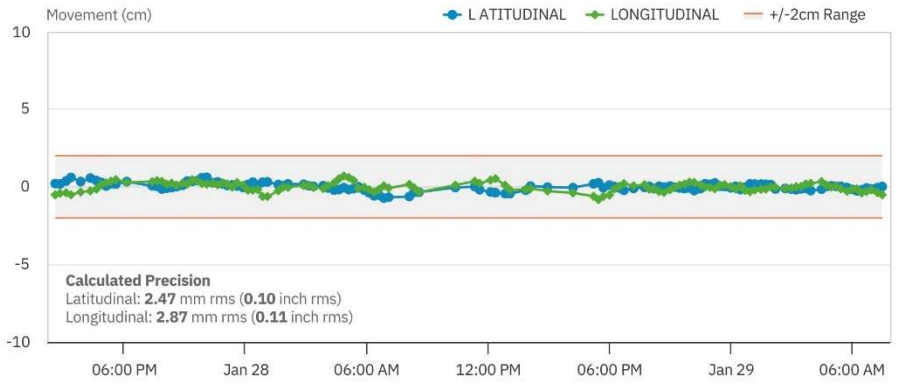
Whether you are monitoring existing structures, earth retention systems, pipelines, landslides, embankments, dams, levees or cut slopes, the R2D3-4 or -8 can cover up to 8 monitoring points spread out over long linear features or star-type configurations. Installation of each ATP above the ground surface is recommended whenever possible because it improves signal reception, but it is not required.

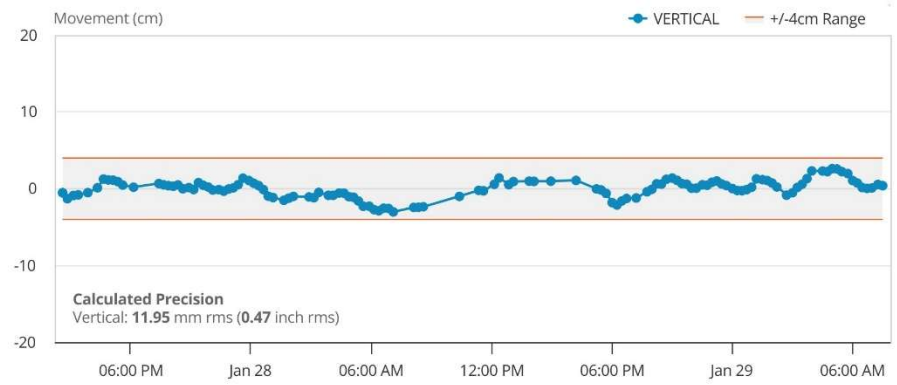
R2D3 Remote Monitoring Station with ATP, Battery and Solar

Performance Results

Horizontal and Vertical Movement

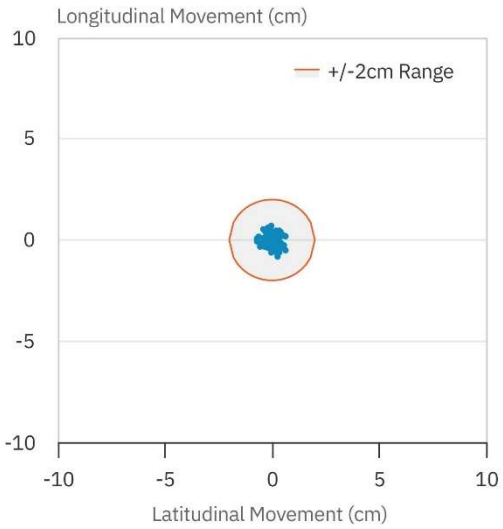
R2D3 field performance results show movement precision in both horizontal directions of 3mm rms, and vertical movement performance of less than 20mm rms. Performance testing was conducted with the ATP maintained in a fixed position to evaluate relative movement accuracy and precision. Typical test results are shown below and were conducted at a baseline distance of about 30km with relatively clear-sky view conditions and low ionospheric index values.





Directional Movement

In addition to horizontal and vertical movement trends over time, the Geodaq Web Application also presents directional movement as shown below for the same dataset described above.



Monitor Additional Sensors

The GCM8 embedded in the R2D3 has significant additional monitoring capability derived from two JETDAQ modules providing 16 vibrating wire inputs and 8 static or dynamic analog voltage inputs. Each JETDAQ module has 8 analog input channels accommodating unipolar or bi-polar inputs, variable input ranges with a programmable gain amplifier (PGA), and sample rates up to 30,000 samples per second per channel on all 8 inputs. Add piezometers, displacement transducers, strain gauges, accelerometers, geophones or any other vibrating wire or voltage output sensor to compliment the GNSS absolute 3-dimensional translation and rotation movements.

JETDAQ Module

AST Analog Strain Gauge/Accelerometer

Performance Specifications

Parameter	Specification
GNSS Constellations	GPS, Galileo, GLONASS, Bidou plus SBAS and QZSS satellites
Frequencies	GPS L1/L2; GLONASS L1/L2; BEIDOU B1/B2; GALILEO E1/E5; QZSS L1/L2
Cellular	Global Cellular Coverage and Carrier Agnostic
ATP Capacity	8 external ATP inputs (1 to 8 differential GNSS measurement points)
Horizontal Precision[1]	3mm rms with differential gnss correction service
Vertical Precision[1]	15mm rms with differential correction service
Rotation Direction	3-Axis XYZ directions
Rotation Resolution	+/- 0.005 degrees
Rotation Range	+/- 90 degrees each axis
Vibrating Wire Sensor Inputs (optional)	2 banks of 8 simultaneously sampled channels (total 16 vibrating wire sensors with thermistor)
Analog Sensor Inputs	8 bi-polar analog inputs, 16-bit resolution, programmable gain PGA, aggregate sample rate of 500k samples per second, input overvoltage protection +/- 20V
Internal Health Monitoring	Supply voltage, current draw, temperature and humidity
Sample Interval	5 minutes to 24 hours
Power	10V to 14V DC unregulated supply
Environmental	Polycarbonate NEMA 4X IP66
Operating Temperature	-40 to +85 degrees Celsius
R2D3 Dimensions	6 inches x 8 inches x 4 inches or 10 inches x 8 inches x 6 inches
ATP Dimesnions	6 inch diameter and 2.7 inch height

(1) Accuracy and precision based on measurements with clear sky view and low ionospheric index