

Early Warning and monitoring system For Landslides & Snow Avalanches

ELPAM Electronics Ltd. provided a system to warn residents of tsunamis, earthquakes, floods, avalanches and other natural disasters.



The Israeli company ELPAM Electronics offers a comprehensive solution for early warning and monitoring system for Landslides & Snow Avalanches

ABOUT ELPAM ELECTRONICS LTD.:

The Company's range of operation expended to cover both the domestic and international markets, introducing major electronics technological developments to meet the homeland security challenges, search & rescue, detection and other situations both in Israel and worldwide.

The Company's engineering capabilities range include designing, maintenance, installation, consulting and manufacturing specialized sophisticated electronic devices and systems covering the fields of Public Warning, Alarm and Control Systems.



In the hilly terrain (as India including the Himalayas and North East India), landslides have been a major and widely spread natural disasters that often strike life and property and occupy a position of major concern.

Avalanche is river like speedy flow of snow or ice descending from the mountain tops.

Avalanches are very damaging and cause huge loss to life and property.

Elpam System can be installed a warning system on the hazardous areas to detect avalanches, warn approaching motorists, and alert maintenance personnel working in the area

Avalanche triggers:

- Snowstorms dump thick snow packs over surface hoar (increased weight)
- Vehicles or skiers increase weight on pack
- Surface heating (sunshine, warm airmass) weakens snowpack
- Gravitational creep
- Shaking (seismic, explosives), but rarely low noise (shouts, aircraft overhead)

Elpam's warning and information systems use in avalanches early warning and announcing outdoor systems by the EL3000 high power electronic sirens offered by ELPAM Electronics Ltd.

Also used Tv&Radio, indoor receivers and SMS.



System Description:

The Elpam System enables measuring network avalanche warning service.

The controller monitors sensor status, records sensor data, and activates warning systems via radio when the onset of an avalanche is detected.

The avalanche warning service provided by ELPAM is responsible to gather basic meteorological data as well as the snow depths for the assessment of the snow and avalanche situation in the mountains. The data is centrally administered and analysed. Diverse meteorological information as well as avalanche alert levels is given out for the ski areas, the road operators at mountain passes as well as for the wide public to prevent drastic avalanche accidents caused by themselves.

The avalanche warning system is comprised of a sensor assembly, a radio communication system and a controller

It can be deployed very sensitive seismic sensors in alpine environments to continuously record ground vibrations. To monitor avalanche activity, we can installed seismic sensors in or near avalanche start zones and can be detect ground vibrations produced by avalanches in a range of about 2 km² The range of the system strongly depends on the size and type of avalanches. Large avalanches can be detected when they are quite far away, whereas small avalanches cannot be detected, unless they pass directly above the sensors. To improve the range, it is needed to reduce the signal to noise ratio. Therefore we anchor the geophones to rocks.

Solution & Implementation:

To fulfil the task and to correctly assess the actual snow and weather situation any time, ELPAM has to build up and operate a network of measurement stations.

This automatic weather stations, collect and monitor meteorological parameters such as air temperature, humidity, precipitation, and snow depth or wind speed and wind direction.

Diverse measurement data are recorded by the weather stations and transferred to a central data collection. The main controller of the avalanche warning service combine the records of the meteorological measuring network with the information taken from snow profiles and reports to the general weather situation for the local situation.

System Components:

Automatic weather station to record the snow data.

The station is equipped with various sensors like snow depth, snow surface temperature, snow and air temperature, wind, humidity, radiation, etc.

The station equipped with solar power for autonomous operation in high alpine regions, with data logger and remote data transmission. The automatic weather station can be integrated in existing measuring networks, display of the data in a web browser.

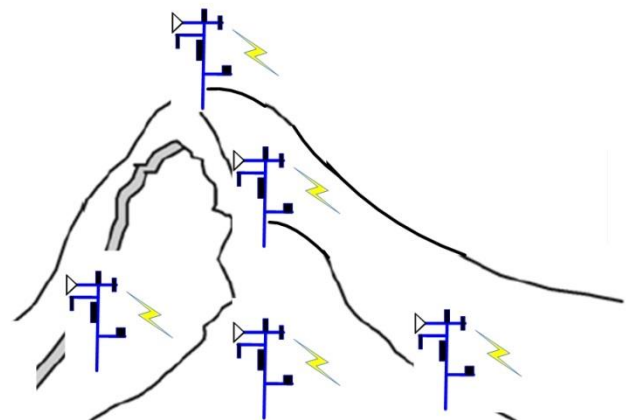
The station is operated automatically and includes everything that is automatic weather station: robust materials and design especially for the recording of snow data.



All the information and measurement data is recorded, log and display on a PC screen.

For use in of decentralized stations, these stations are linked with the central data system by radio or GSM/GPRS. The measurement data is therefore available online via the Internet (web browser) at all times.

Placing weather stations in areas and danger zones.



Sensor and measuring devices:

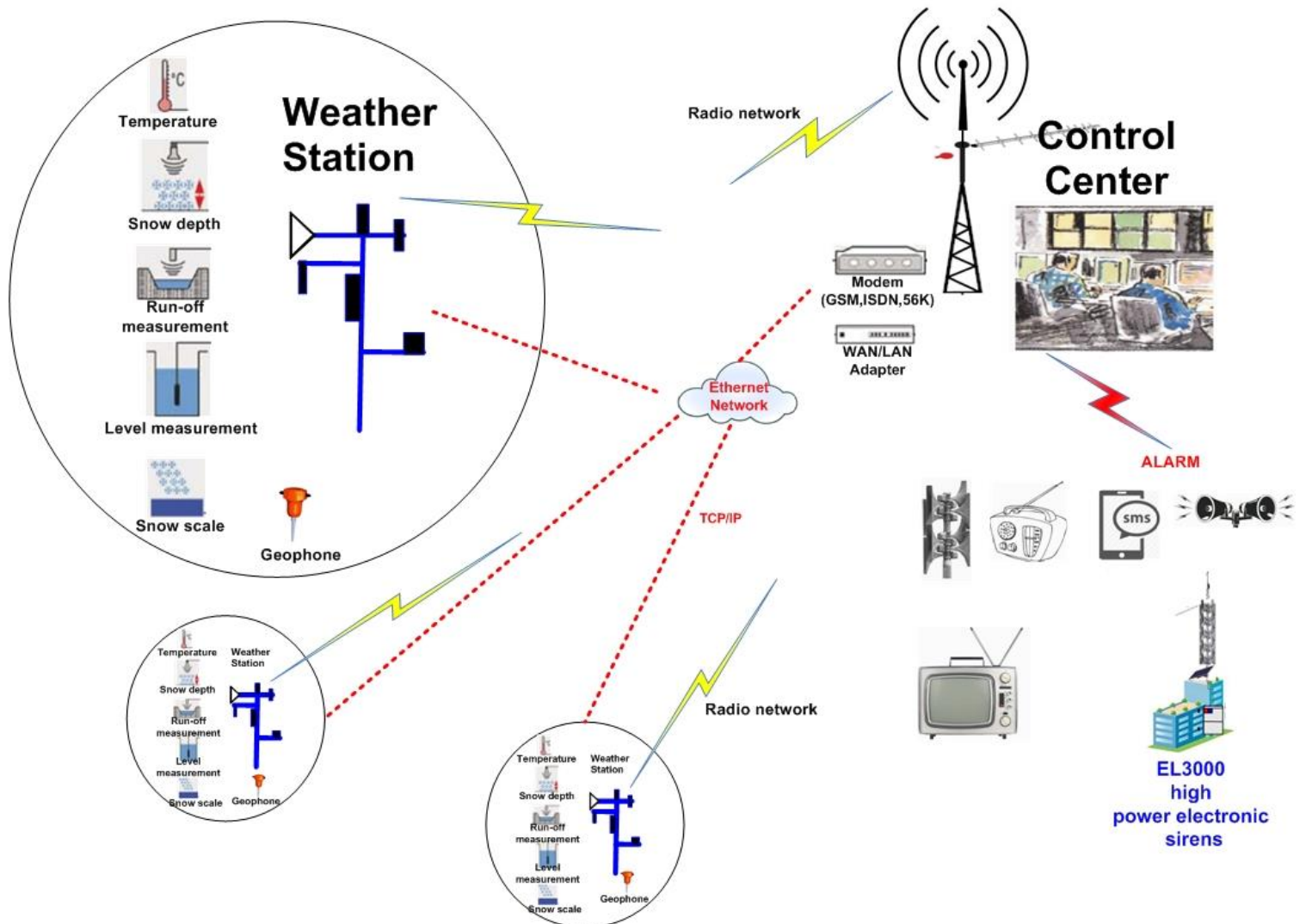
- **Sensor for Measurement of Snow Depth**
Ultrasonic sensor for the precise, continuous, and non-contact recording of snow depths.
- **Sensor for Recording the Progress of Snowmelt (Run-off forecast)**
The Snow Melt analyzer constitutes the ideal measuring solution for the analysis of snowmelt and for ascertaining the water run-off for flood forecasts or for water management. Measuring device which measures the snow water equivalent of the snow pack with a high level of precision and reliability.
- **Sensor for recognizing the Sliding Movement of the Snow**
The sensor for measurement of sliding snow movement, whereby deductions can be derived regarding the association between the condition of the surface of the slope, the inclination of the slope and the snow packs.
- **Sensor for measuring the Temperature of the Snow Surface**
The infrared sensor provides the exact and non-contact measurement of the snow surface temperature.
- **Sensor for generating a Snow Temperature Profile**
The sensor carries out several independent temperature measurements in the snow pack with which an exact temperature profile can be generated.
- **Sensor with tilt switch enclosed in galvanized steel pipes.**
The pipes are hung on weighted wire ropes attached to a 3/4-inch (19-mm) diameter cable, this is strung across the slide path.
The cable is suspended roughly 8 feet (2.5 meters) above the ground and anchored to steel posts embedded in concrete.
- **Seismic Sensors - Geophones**
Can detect ground vibrations produced by avalanches

Auxiliary equipment:

Recording Multiple Snow Parameters

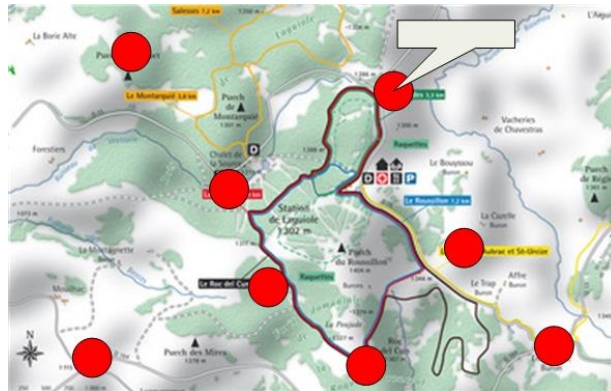
The Snow Pack Analyzer System records all important parameters of the snow pack.

System Layout:



Control Center Components

- Data Logger
Collect data for environmental monitoring, process and storing of measurement data
The data logger includes a comprehensive alarm management via modem by phone call, Radio, Internet, outdoor siren system or SMS.
- Data Service
The data service consists of tools for the management of the measuring station and the visualization of the measured data. All functions of the data service are controlled via a web browser, meaning that the user requires no installation of an additional program for the graphic depiction and analysis of data.
The consistent application of the web technology allows the user to access and analyze measured data everywhere and at all times.
 - ✓ Measuring station and user management
 - ✓ Graphic depiction of measured data
 - ✓ Comparative graphic depiction of a station's measured data
 - ✓ Station overview via map
 - ✓ Linking of current measured data graphics to external web sites, for example a homepage.
 - ✓ Export of the measured data in CVS format for further processing
- Station overview via map, with details of a measuring station



When a geographic position has been defined for a measuring station, it appears clearly via Google Maps with the familiar zoom functions, maps and satellite image.

By clicking on a station on the map, a window with the current actual values, general information and link to a graphic display. The relevant station can be zoomed in on the map via the selection menu.