

AMTS Optical Monitoring

AMTS optical monitoring involves survey prisms, automated total stations, and processing.

The survey prisms are fixed to critical points on the structure, and the total station is programmed to record angles and distance to each prism. The measurements are transferred to processing software that applies statistically-weighted adjustments and outputs coordinates for each prism.

Successive measurement cycles are performed at regular intervals and processed the same way. Changes in the output coordinates indicate that movement has occurred. The magnitude and direction of the movement is found by comparing current and initial coordinates.

AMTS monitoring systems automate these steps and deliver alerts, plots and reports via a project website.

AMTS System Components

AMTS systems are designed to provide continuous, unattended monitoring. Components of the system include:

Survey Prisms installed at monitoring points and control points.

AMTS Systems consisting of a high-precision robotic total station managed by a controller. Multiple AMTS are deployed at some sites.

Controllers that schedules and direct AMTS measurements and then transmit the recorded data to the internet.

GeoCloud Server that performs quality checks, processes the measurements with MonStar least-squares software, and formats data for a website database.

GeoCloud Website that provides alarms, site views, graphs, and integration with standard geotechnical instrumentation.



AMTS at a project site in Boston

Deploying AMTS

Careful placement of the field components is important for creating strong geometric networks. The AMTS must have unobstructed lines-of-sight to the survey prisms. GEO has developed specialized mounting brackets and towers for this purpose.

Prisms are installed at specified monitoring points on the structure to provide settlement and displacement data. GEO has developed a variety of mounting methods and prism configurations for different structures.

Prisms are also installed at control points that are outside the zone of influence. These points provide data to establish the exact position of the AMTS at each measurement cycle. GEO installs redundant control points to enhance precision and to provide the flexibility to relocate the AMTS as needed.

The AMTS observes all monitoring points and control points at each measurement cycle, recording three pairs of observations for each prism. This ensures a complete and accurate set of measurements for each cycle.

Advantages of AMTS

Automated: Automation provides continuous monitoring and rapid processing of measurements, allowing early identification of any unwanted displacements.

Accurate: Multiple observations from a fixed location and least-squares processing delivers accuracies similar to first-order surveys.

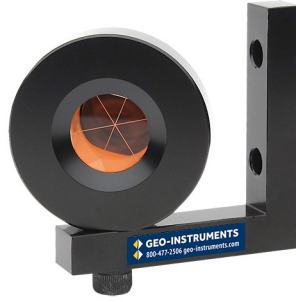
Cost-effective: AMTS systems provide wide-area coverage at a low-cost per monitored point. Unattended operation and automated processing also lower costs and save time.

Compatible: GEO's MonStar software can output data as specified by the customer, suitable to combine with other geotechnical instrumentation or for use with CAD-generated plan views and as-builts.



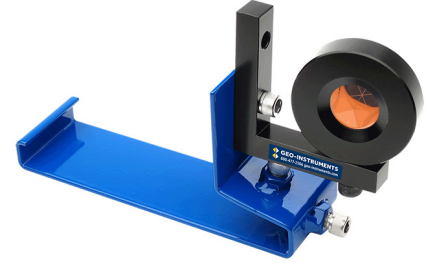
HD Road Prism

Road prisms are installed on road surfaces to monitor for settlement or heave.



L-Bar Mini Prism

Versatile L-Bar mini-prisms are the standard for most applications.



Rail Clip Prism

Rail clip prisms are used for monitoring settlement and lateral displacement of tracks.



Towers

Gravity-base towers provide a stable location for AMTS when walls, columns, and roof tops are not available. Towers are semi-portable and can be relocated as necessary.



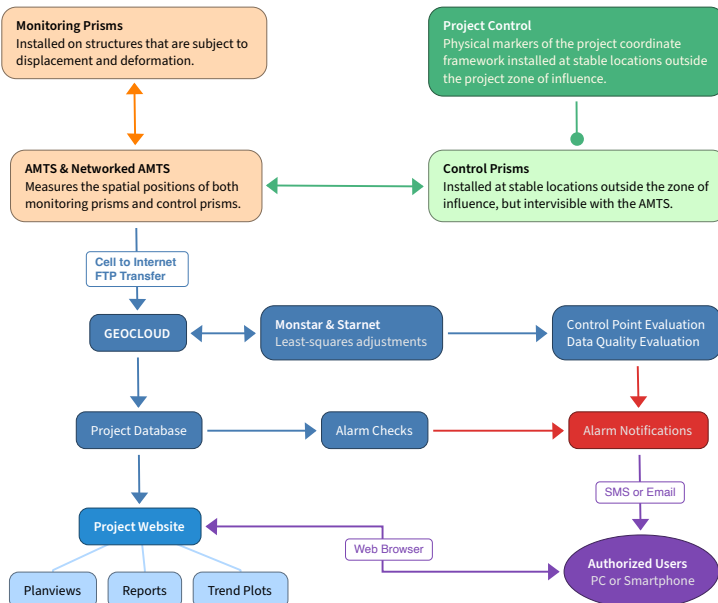
Parapet Brackets

Parapet brackets are secured by clamps, minimizing impact at the mounting location. Solar power is available for most AMTS systems, eliminating the need for AC wiring.



Wall Brackets

Wall brackets can be installed on any wall or column. The photo above shows a corner bracket anchored to a bridge pier.



AMTS Data Flow

Each AMTS measurement cycle consists of multiple observations of all prisms. Measurements are then transmitted to GeoCloud servers.

GeoCloud directs measurements to Monstar for least-squares adjustments and quality checks. Monstar then formats data for import into the GeoCloud project database.

The import process checks for missing data, tests measurements against alarm thresholds, and then stores data in the project database. Alarms are sent out by email or text message.

At this point, AMTS measurements are fully integrated with data from other sensor types and available for planviews, plots, and reports generated by the GeoCloud project website.