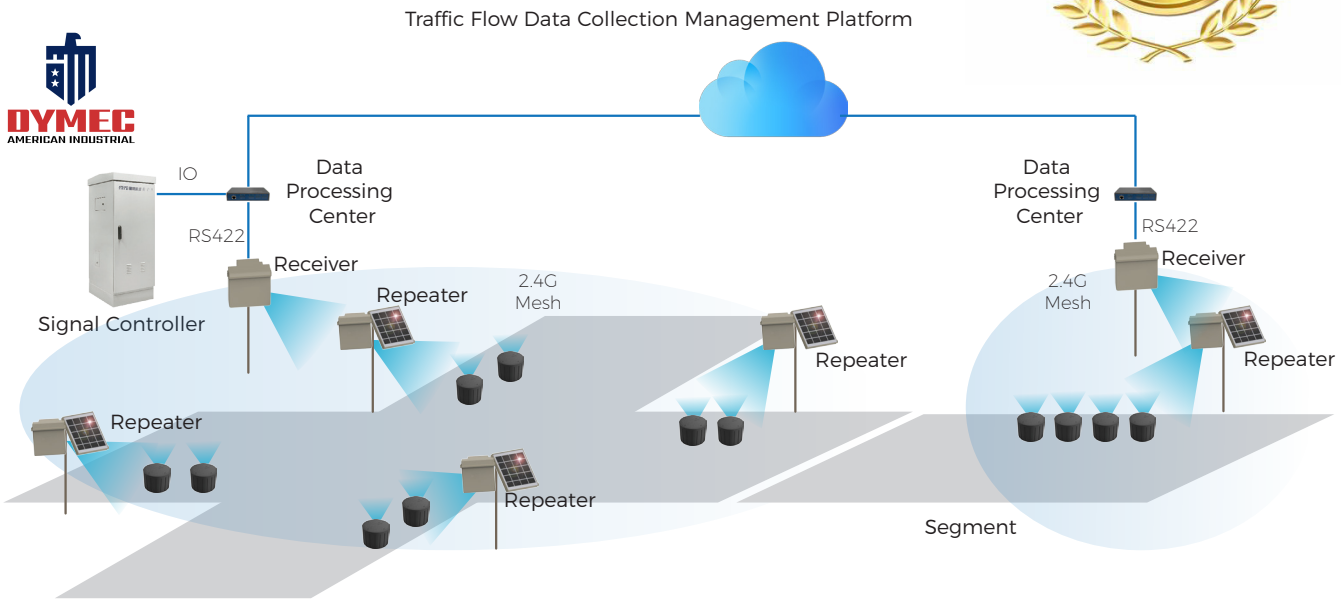
# ClairGeo MSeries

## Geomagnetic Vehicle Detection System

Onsite Installs
150,000+
Units




- Distance between Repeater and the nearest Detector: <30m
- Distance between Repeater and the nearest Repeater/Receiver: <300m (200m in the presence of obstacles such as tree leaves or other obstructions.)

## Overview

The Geomagnetic Vehicle Detection System utilizes wireless sensors to detect the presence and movement of vehicles. By capturing data on traffic flow, speed, average speed, occupancy time, vehicle length, queue length, and other parameters, it enables macroscopic monitoring of urban road conditions. This system provides rich and precise real-time detection data for traffic signal control, serves as the foundation for traffic flow data in traffic guidance systems, and offers essential design considerations for urban traffic organization optimization and infrastructure planning. ClairGeo MSeries supports X,Y,Z axis detection and directional wireless communication for higher anti-interference capabilities.

## Key Features

### X, Y, Z Axis Detection

The M Series employs three-axis (X, Y, Z) detection, collecting driving data at a frequency of 128Hz. It ensures stable detection in the designated area, providing high accuracy in occupancy rates. Additionally, there is no interference from vehicles in adjacent lanes.

### Double-layer Ultrasonic Welding Waterproof Design

It adopts double-layer sealing integrated without screw threads, and both inner shell and outer shell are with ultrasonic welding technology for a perfect waterproof performance.

### Anti-interference Capability

When the device receives a weak signal with a strength of -78dBm, it can still ensure a frame length of 20 bytes and a frame loss rate of less than 1%, even in the presence of strong interference signals.

### Data Accuracy

The system ensures accurate data acquisition through a high-precision magnetic sensor, 12-bit ADC resolution, high sampling rate, and triaxial three-dimensional sampling, complemented by optimized software algorithms.

- Flow accuracy not less than 99%.
- Average occupancy accuracy not less than 95%.
- Average vehicle speed relative error less than 2 km/h, detection speed range 0 to 180 km/h.
- Detection speed relative error less than 2 km/h, detection speed range 0 to 180 km/h.

# ClairGeo-MDET

## Geomagnetic Vehicle Detector

The detector is designed for data collection, utilizing highly sensitive magneto resistive sensors for precise vehicle information detection. It employs three-axis (X, Y, Z) detection at a frequency of 128Hz, ensuring stability and high accuracy in occupancy rates within the designated area, without interference from adjacent lanes. Featuring a double-layer ultrasonic welding waterproof design, it guarantees optimal waterproof performance. With robust anti-interference capabilities, including DSSS for in-band interference suppression, effective out-of-band interference suppression, dual-channel communication technology, and system networking technology, the detector achieves reliable performance in complex signal environments. The system ensures data accuracy through a combination of high-precision magnetic sensors, 12-bit ADC resolution, high sampling rates, triaxial three-dimensional sampling, and optimized software algorithms.

## Key Features

### Quick & Simple Installation

Each detector is capable of being installed within 5-10 minutes. The process involves drilling a specified location with a diameter of 102mm and a depth of 80-90mm. The detector is then placed into the hole, adjusted to align with the traffic direction, and finally sealed with sealing glue.

### Auto-Calibration Function

The geomagnetic detector employs cutting-edge magneto-resistive sensing technology, measuring the Earth's magnetic field composed of the X, Y, and Z axes at a frequency of 128Hz. In the presence of a vehicle, a noticeable change occurs in the magnetic field along the X, Y, or Z axis. In the absence of vehicles, each detector continuously measures the background magnetic field, estimating a reference value. The detectors automatically calibrate based on the magnetic field at their installation location and any long-term changes in the local magnetic field. The reference values may vary over time.

### Configurable Detection Area and Sensitivity

Vehicle detection at intersections may have diverse requirements, ranging from cars, trucks, to even light rail trains. The wireless sensor offers configurability with 16 different modes, providing various magnetic field sensitivities and options for setting the vehicle detection area.



### Remote Firmware Updates

Through wireless networks, firmware updates for the front-end detectors can be remotely conducted from the management center. This ensures timely updates of the front-end detectors with new firmware versions, maintaining the system's state-of-the-art capabilities.

### Long Detector Lifespan

The detector exhibits an extended lifespan through its design features. When there is no vehicle detection data, the communication module enters a sleep mode (i.e., low power mode). To distinguish between the absence of vehicles and a detector malfunction, communication with the upper end is maintained within a specified time frame, with a default value of 30 seconds, even in the absence of vehicle detection data. The detector is designed with power-efficient technology, utilizing long-lasting batteries and flexible settings.


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## Specification

| | | | |
|---|---|---|---|
| **Dimension** | Diameter: 94mm (3.70 inches)<br>Height: 64.5mm (2.54 inches) | **Wake-up Time** | 3.5μS |
| **Wireless Channel** | 2.4GHz | **Flow Accuracy** | 99% |
| **Channel Bandwidth** | 2MHz | **Speed Accuracy** | 98% |
| **Channels** | 16 | **Occupancy Time Accuracy** | 98% |
| **Receive/ Transmit Rate** | 250kbps | **Headway Time Accuracy** | 98% |
| **Antenna Type** | Patch antenna | **Detection Speed Range** | 0 to 180km/h |
| **Antenna Range** | 120° (±60°) | **Relative Speed Error** | ±2km/h |
| **Receive Sensitivity** | -100dBm | **Average Power Consumption** | <10dBm |
| **Detection Mode** | Presence/Passing | **Lifespan** | 5 years<br>While single lane daily average traffic calculation reaches 20,000 vehicles |
| **Detection Sensitivity** | Level 0 to 15 | **Power Supply** | Li-SOCI2 3.6V battery, 18Ah |
| **Background Magnetic Field Range** | ±6Gs | **Protection Rating** | IP68 |
| **Detection Method** | Earth's magnetic field three-axis detection, adjustable critical values, and automatic calibration of background magnetic field changes. | **Protective Structure Design** | Double-layer shell structure design for dual impact resistance |
| **Detection Range** | Adjustable from 0 to 3 meters. | **Protection Sealing Process** | Double-layer ultrasonic welding sealing for dual waterproofing |
| **Types of Detected Vehicles** | Common vehicle types include iron tricycles, trucks, trailers, buses, and sedans. | **Operating Temperature** | -45 to 85°C (-49 to 185°F) |
| **Main Frequency** | 25MHz | **Humidity** | 95% non-condensing |
| **Flash Memory** | 128KB | **Detector Sealing Method** | The detector adopts an integrated, screw-free sealing design to ensure long-term use without water ingress. |
| **RAM** | 16KB | **Installation Method** | Embedded using geomagnetic adhesive sleeve, with the detector's upper surface flush with the road surface; drilling diameter is 102mm, and depth is 70-80mm. |

# ClairGeo-MRPT

## Geomagnetic Detector Repeater

DYMEC AMERICAN INDUSTRIAL

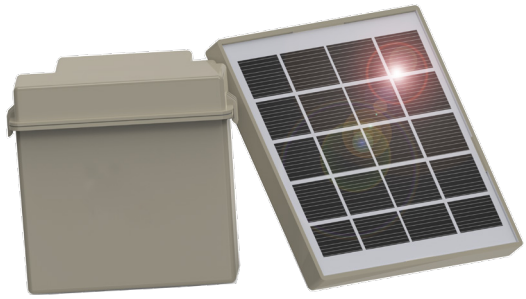
## Overview

The ClairGeo-MRPT repeater is used to extend the transmission distance, facilitating bidirectional data transfer between the detector and the receiver. The repeater is powered by battery and solar panel, eliminating the need for an external power source.

## Key Features

### Expanded Range and Coverage

A repeater can broaden the signal range and coverage of a receiver. The repeater's installation position must allow the detectors or directly connected repeaters and receivers fall within its line of sight and range. The maximum distance between a repeater and a receiver or another repeater is 300 meters, significantly extending the coverage of a receiver.



### Bidirectional Wireless Communication

Enables bidirectional communication between detectors and repeaters, repeaters and receivers, and between repeaters.

### Battery-Powered

Operates in a low-power mode for energy efficiency.

### Wireless Firmware Upgrades

Supports firmware upgrades through access points and remote firmware upgrades.

### Simple Installation

Easy to install at any location that provides good signal coverage to the receiver or connected repeaters.

### No Adjustment or Calibration Needed

Requires no tuning or calibration.

## Specification

| | |
|---|---|
| **Dimension** | Receiver: 109*109*90 (mm), 4.29*4.29*3.54 (inches)<br>Solar panel: 135*135 (mm), 5.31*5.31 (inches) |
| **Wireless Channel** | 2.4GHz |
| **Channel Bandwidth** | 2MHz |
| **Channels** | 16 |
| **Receive/Transmit Rate** | 250kbps |
| **Antenna Type** | Patch antenna |
| **Antenna Range** | 120° (±60°) |
| **Receive Sensitivity** | -100dBm |
| **Power Supply** | Li-SOCl2 3.6V rechargeable battery, equipped with a solar panel |
| **Battery Lifespan** | 5 years |
| **Protection Class** | IP67 |
| **Operating Temperature** | -45 to 85°C (-49 to 185°F) |
| **Humidity** | 95% non-condensing |


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# ClairGeo-MRCV

## Geomagnetic Detector Receiver

DYMEC AMERICAN INDUSTRIAL

## Overview

The ClairGeo-MRCV receiver maintains bidirectional wireless connections with detectors and repeaters, establishing time synchronization, sending configuration commands and acknowledgment messages, and receiving aggregated data from detectors. The data is then transmitted via the 422 bus to the data processor. After processing, it is relayed to nearby traffic signal controllers, remote servers, traffic management systems, or other devices.

## Key Features

- Interface: 422 bus.
- Data Processing: Capable of processing detection data into different formats to meet the requirements of different devices.
- Synchronization of all lower devices.
- Wireless signal quality detection, able to assess signal strength and connection quality of the link.
- Firmware remote upgrade.
- Easy installation.
- No need for adjustment or calibration.



## Specification

| | |
|---|---|
| **Dimension** | 160*160*90 (mm), 6.30*6.30*3.54 (inches) |
| **Wireless Channel** | 2.4GHz |
| **Channel Bandwidth** | 2MHz |
| **Channels** | 16 |
| **Receive/Transmit Rate** | 250kbps |
| **Antenna Type** | Patch antenna |
| **Antenna Range** | 120° (±60°) |
| **Receive Sensitivity** | -100dBm |
| **Power Supply** | 48VDC |
| **Battery Lifespan** | 5 years |
| **Protection Class** | IP67 |
| **Operating Temperature** | -45 to 85°C (-49 to 185°F) |
| **Humidity** | 95% non-condensing |

# ClairGeo-MDPC

## Data Processing Center

## Overview

The ClairGeo-MDPC data processing center is used to receive detection data from the receiver. Through specific algorithms, it processes and generates detection data, capable of transmitting scheduled and real-time data to the central platform server. It can locally store detection data for historical queries and, through network communication, send data to the traffic platform. Additionally, it provides signal switch quantities to the intersection's signal controller for signal induction control, etc.

## Key Features

- Interface: Ethernet port, supports IP protocol, IO (switching/level), RS232/RS485.
- Data Processing: Connected to the receiver for front-end data collection and storage, and transfers or copies data to the central device.



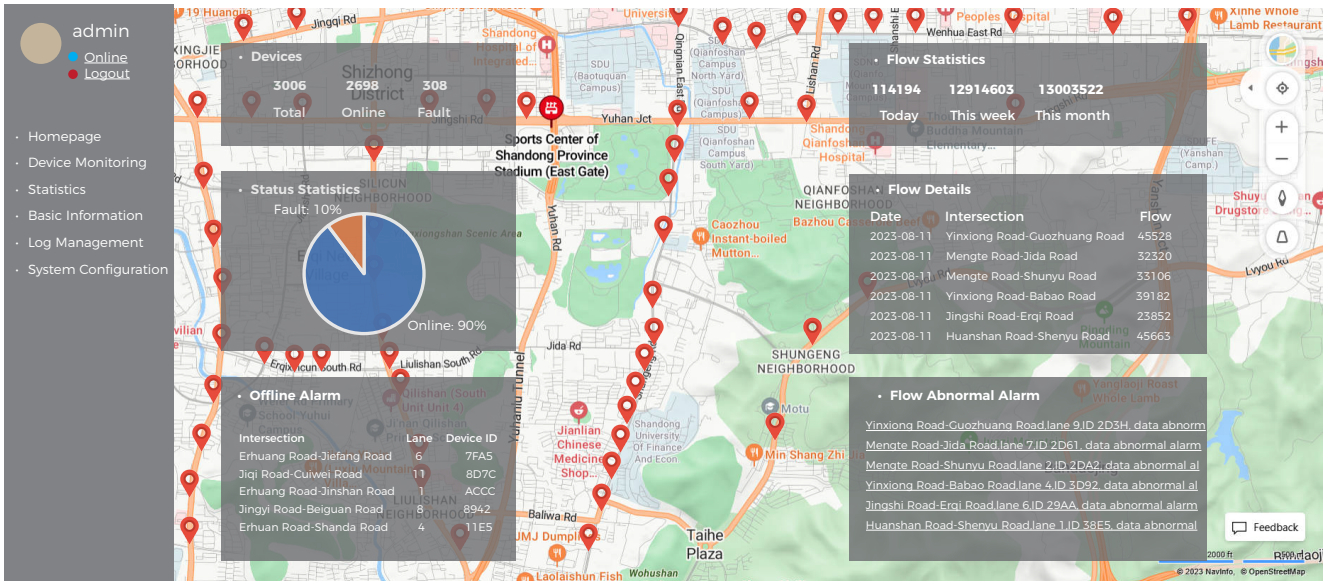
## Specification

| | |
|---|---|
| **Dimension** | 172*126*33 (mm), 6.77*4.96*1.30 (inches) |
| **Storage Type** | SD card, default capacity 8GB, expandable to 16GB |
| **Local Data Storage Time** | More than 5 years |
| **Local Data** | Flow, average speed, occupancy rate, maximum speed, minimum speed, headway time, spacing between vehicles, average vehicle length |
| **Interfaces** | RS232, RS485 (with additional conversion interface), Ethernet port, IO (switching/level); |
| **Output Detection Mode** | Presence/Pass-through |
| **I/O Output Channels** | 24 channels, expandable in a cascading manner |
| **Power Supply** | 48V DC/220V AC |
| **Environmental Temperature** | -45 to 85°C (-49 to 185°F) |
| **Power Consumption** | 5W |
| **Humidity** | 95% non-condensing |
| **RJ45 Output** | Network port outputs parameters such as flow, speed, occupancy rate, and spacing between vehicles |


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# ClairGeo-MMGT

## Traffic Flow Data Collection Management Platform




## Overview

The ClairGeo-MMGT traffic flow data collection management platform is based on the geomagnetic sensor and data processor. It utilizes the Spring Boot backend service and Vue frontend framework for business separation, combined with GIS visualization, to achieve business functions such as geomagnetic device management, device status monitoring, geomagnetic detection data statistics, and queries.

## Function Overview

- Geomagnetic device status monitoring based on GIS and intersection structure, with intuitive display effects.
- Query and export historical data of geomagnetic detection flow, speed, and occupancy rate at different time granularities for lanes, directions, and intersections.
- Data statistics and chart display of geomagnetic detection flow, speed, and occupancy rate at different time granularities.
- Robust user permission management mechanism, supporting multiple types of users.
- Intersection channelization generation and combination of manual base map import to improve device operation and configuration efficiency.
- Integration of third-party platform data interfaces, enabling data integration services.

## Key Features

### GIS Dashboard & Statistical Analysis

Freedom to choose the statistical time and intersection for analysis, with clear visibility of traffic flow status changes at the intersection. Geomagnetic detection flow data statistics allow separate statistical analysis for each direction. The platform supports data export functionality, enabling diverse secondary data analysis.

### Device Management & Status Monitoring

The platform can display and monitor the online/fault data of devices, such as intersection names, lanes, ID numbers, online status, and faults (battery levels, link quality, signal strength), facilitating the remote maintenance of the geomagnetic system.

## Ordering Information

| Model | Description |
|---|---|
| **ClairGeo-MDET** | MSeries geomagnetic vehicle detector |
| **ClairGeo-MRPT** | MSeries geomagnetic detector repeater. (Need one for each direction.) |
| **ClairGeo-MRCV** | MSeries geomagnetic detector receiver. (Need one for each intersection.) |
| **ClairGeo-MDPC** | MSeries data processing center |
| **ClairGeo-MMGT** | MSeries traffic flow data collection management platform (optional) |