



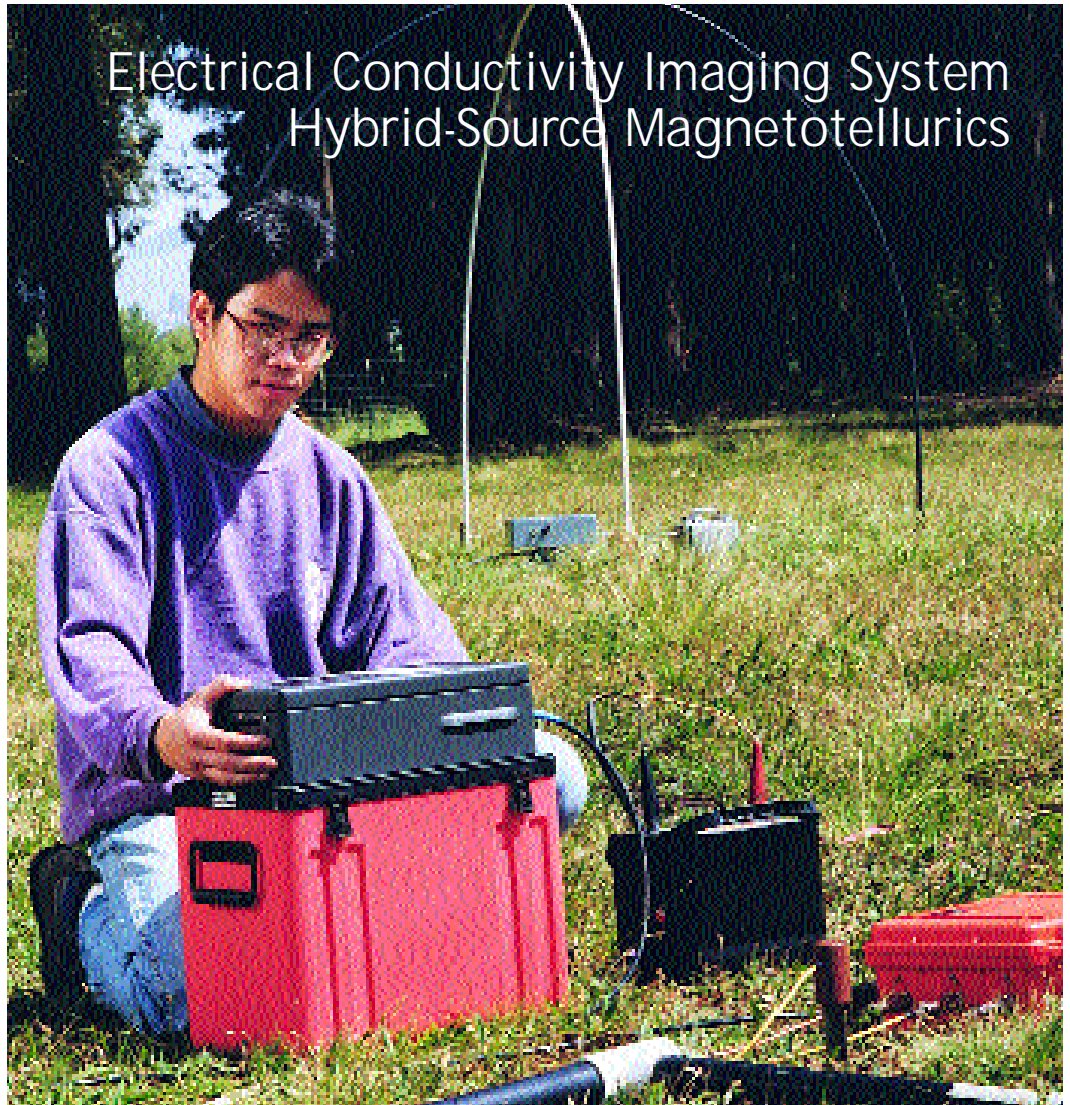
**GEOMETRICS**

# Stratagem EH4



Electrical Conductivity Imaging System  
Hybrid-Source Magnetotellurics

- Groundwater Surveys
- Depth to Bedrock Assessment
- Engineering Studies
- Geological Structure Mapping
- Minerals Exploration
- Electromagnetic Research

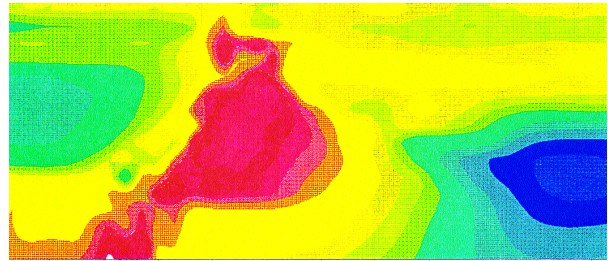


Stratagem EH4 provides high-resolution two-dimensional images of geologic structures by detecting and mapping variations in subsurface conductivity/resistivity.

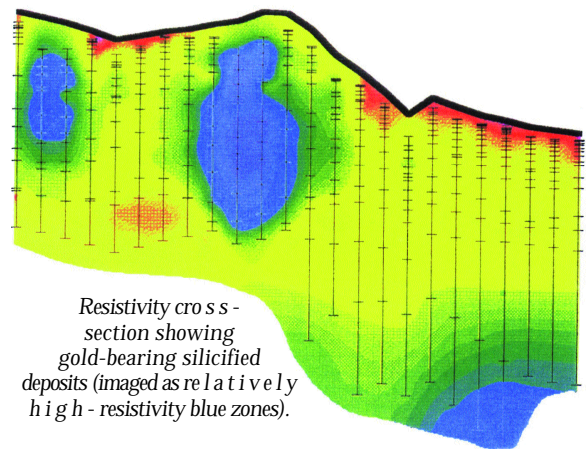
- In-field Display and Print-out of 1D Inversion and 2D Section for Improved Quality Control.
- Both Scalar and Tensor Measurement of Resistivity for More Accurate Data Interpretation.
- Optional Combined MT/Seismic System Provides Instrument Economy and Flexibility.
- Natural MT Signal and Controlled Source Transmitter Enhance Signal Availability.
- Images from 10 m up to 1 km for Complete Sounding Curves.
- Optional Low-Frequency Sensors for Greater Depth of Investigation.

# Geometrics Introduces Hybrid-Source, High Resolution Magnetotelluric Imaging

Stratagem EH4 uses the magnetotelluric (MT) method to measure subsurface conductivity. The magnetotelluric method is based on the fact that the ratio of the magnetic to electric fields (known as the impedance) at a given frequency is constant for a constant resistivity. Natural signal sources, such as lightning activity, can be measured to determine this ratio. Unfortunately, natural signals are sometimes not available at the time, frequency, and amplitudes needed. Stratagem's hybrid-source technique helps overcome this problem. Hybrid source means we use a combination of natural MT signals and man-made transmitter signals. Any available natural background signals are used in the entire frequency band while the Stratagem transmitter is used to provide additional high-frequency signals in the range of 1k Hz to 70k Hz where natural signals are weak. The standard Stratagem can be operated using frequencies from 10 Hz to 100k Hz. The low-frequency option can use signals as low as 0.1 Hz for a greater depth of investigation.



Resistivity cross-section showing geothermal activity along fault (imaged as the low-resistivity red zone).



Resistivity cross-section showing gold-bearing silicified deposits (imaged as relatively high-resistivity blue zones).

## Fast Data Collection and Instrument Set Up

The operator can select the frequency bands and the number of time series "stacks" for data collection allowing optimization of high/low frequency data collection. Typical data collection time per station is 5 to 10 minutes. The Stratagem can then be moved and set up in from 5 to 10 minutes per station. This means complete setup and data acquisition can be done in 10 to 20 minutes giving from 3 to 6 stations per hour. The MT technique means that each station is a complete sounding. In other words, you can do 3 to 6 complete soundings per hour.

## 1D and 2D Field Plots

Stratagem lets you view 1D soundings and 2D sections in the field to provide better field quality control and immediate access to resistivity results.

## Built-in Thermal Printer

In addition to the LCD video display you can use the built-in thermal printer for field generation of hardcopy for time-series data; signal amplitude; phase; coherence; apparent resistivity; depth curves; and depth and frequency cross-sections.

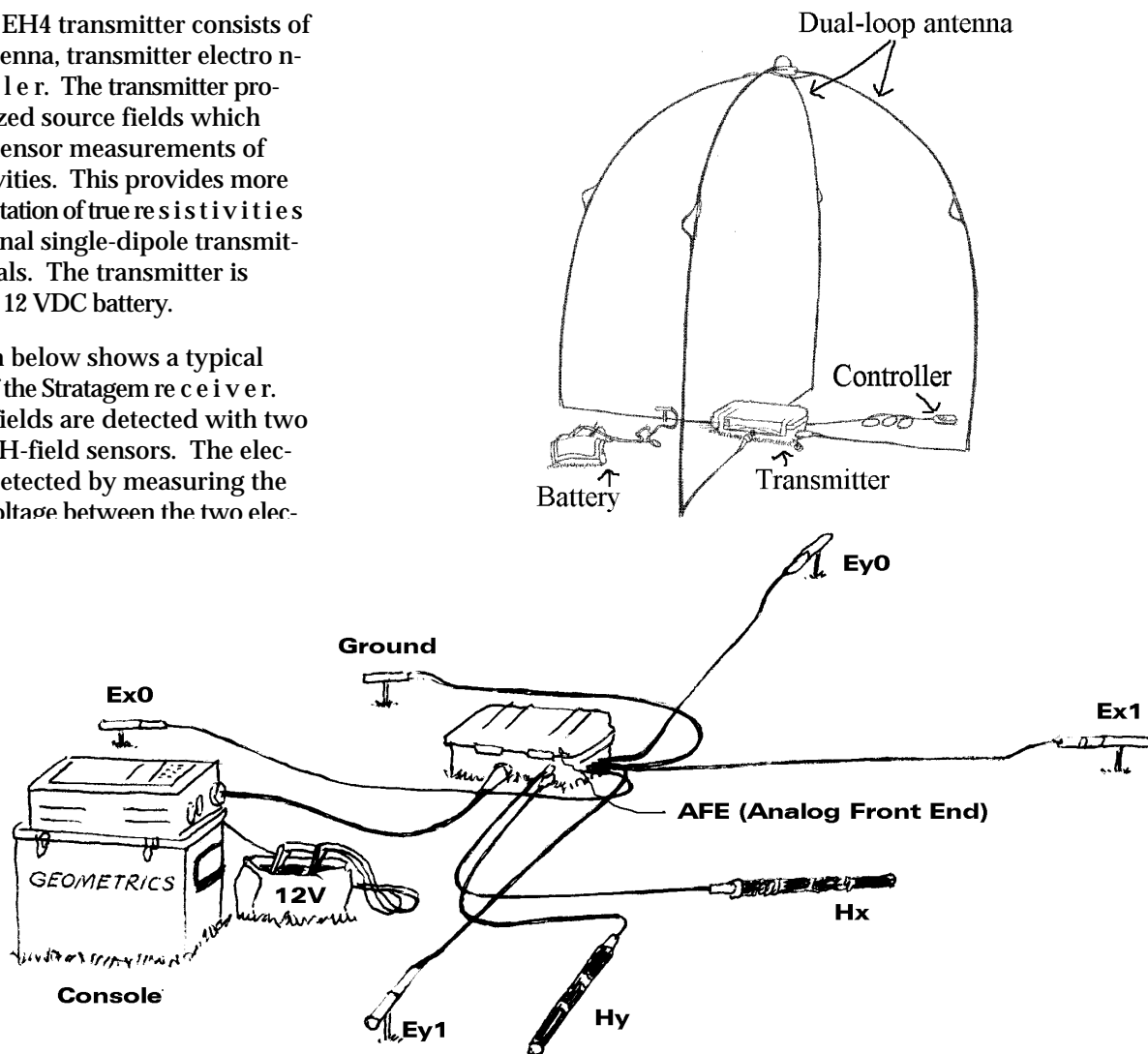
## Combined EM/Seismic in Stratagem/StrataView Combination:

Ask about Geometrics' combined Stratagem/StrataView for maximum economy in geophysical instruments. With the addition of seismic data acquisition and digital signal processing boards, the appropriate seismic connectors, geophones, software, and other standard accessories, the instrument can be operated as a seismograph.

# Stratagem EH4 Typical Field Set Up

The Stratagem EH4 transmitter consists of a dual-loop antenna, transmitter electronics, and controller. The transmitter provides unpolarized source fields which allow for true tensor measurements of ground resistivities. This provides more accurate interpretation of true resistivities than conventional single-dipole transmitter source signals. The transmitter is powered by a 12 VDC battery.

The illustration below shows a typical configuration of the Stratagem receiver. The magnetic fields are detected with two perpendicular H-field sensors. The electric fields are detected by measuring the differential voltage between the two electrodes of the Ex0 and Ex1 for example. sensors is an Analog Front transmitted to the console for analog-to-digital conversion and digital signal processing.



■ **You can explore from the near surface to depths as great as 1 km:** The actual depth to which a target can be imaged depends on the resistivity/conductivity of the earth at the measurement site and the lowest frequency for which there are reliable data. Depths up to 500 m can be expected with standard sensors (10 Hz to 100k Hz), and up to 1 km with optional low-frequency sensors (down to 0.1 Hz). This is based on the skin depth formula " $\delta = 500\sqrt{\rho/f}$ ," where  $\rho$  = resistivity,  $f$  = frequency, and  $\delta$  = skin depth.

■ **You can archive and store complete data sets:** The Stratagem EH4 maintains files of the complete time series data, cross-power and spectral amplitudes, as well as full tensor and scalar values of resistivity, phase, and coherence. Inverted depth and resistivity data are saved and can be exported to third-party software. These data files can be used in the built-in Stratagem software and with third-party software tools.

■ **You can have confidence in the instrument:** The Stratagem EH4 was developed jointly by ElectroMagnetic Instruments, Inc. and Geometrics, Inc. Since its founding in 1969 Geometrics, Inc. has been a recognized leader in developing reliable, innovative geophysical instruments. Founded in 1984, EMI has been a driving force in advancing magnetotellurics technology and instrumentation.

Visit Geometrics' web site at <http://www.geometrics.com> for information about our seismographs, magnetometers and other products.

# SPECIFICATIONS

## STRATAGEM™ EH4 ELECTRICAL CONDUCTIVITY IMAGING SYSTEM

<b>Operating Principle:</b>	Natural & Controlled Source Tensor MT
<b>Frequency Range:</b>	10 Hz to 100 kHz
<b>Transmitter:</b>	Model TxIM2 with Vertical Loop Antennas
<i>Frequency Range:</i>	1 kHz to 70 kHz
<i>Antenna Moment:</i>	400 Amp-m <sup>2</sup>
<i>Antenna Size:</i>	Two Perpendicular Vertical Loop Antennae each 4 m <sup>2</sup>
<i>Power Requirements:</i>	12 v, 60 Ah Battery
<b>Electrical Sensors:</b>	Four Model BE-26 Buffered Active High Frequency Dipole 26 Meter Cable with Four SSE Stainless Steel Electrodes
<b>Magnetic Sensors:</b>	Two Model BF-IM Magnetic Field Sensors (10 Hz to 100 kHz) with 10 Meters of Cable
<b>Analog Front End:</b>	One Model AFE-EH4 Unit for Analog Signal Conditioning. Couples 2 electric and 2 magnetic channels to the Data Acquisition Package.

## DATA ACQUISITION PACKAGE

<b>Channels:</b>	Four (2E, 2H)
<b>Hard Disk:</b>	1.2 Gbyte or greater

<b>Analog to Digital Conversion:</b>	18-bit
<b>Digital Signal:</b>	
<i>Processor:</i>	32-bit floating point
<i>Bandwidth:</i>	DC to 96 kHz
<b>Display:</b>	Liquid Crystal VGA
<b>Plotter:</b>	Built-in 4" (11 cm) wide plotter
<b>Power:</b>	12 V, 40 Ah
<b>Operating:</b>	
<i>Temperature:</i>	0° C to +50° C
<i>Component Cases:</i>	Rugged Portable/Waterproof

## OPTIONS

<b>Compatibility with StrataView™ for Seismic Work:</b>	Available with 12, 24, or 48 channels
<b>Magnetic Sensors:</b>	Low Frequency Investigations. 0.1 Hz to 1 kHz Magnetic Sensor
<b>Electrical Sensors:</b>	Four Model BE-50 Buffered Active High Frequency Dipole 50 Meter Cable

## High-Power Antennae:

<i>Frequency Range:</i>	300 Hz to 35 kHz
<i>Antenna Moment:</i>	6,000 Amp-m <sup>2</sup>
<i>Antenna Size:</i>	Two Perpendicular Vertical Loop Antennae each 45 m <sup>2</sup>

<b>GEOMETRICS, INC.</b>	2190 Fortune Drive, San Jose, CA95131, USA (408) 954-0522 • Fax (408) 954-0902 • email: sales@geometrics.com
<b>GEOMETRICS Europe</b>	Manor Farm Cottage, Galley Lane, Great Brickhill, Bucks, England MK17 9AB 44-1525-261874 • Fax 44-1525-261867
<b>GEOMETRICS China</b>	Laurel Industrial Company, Beijing Hotel, Room 8035, 33 Chang-An Avenue, Beijing 100004, People's Republic of China • 86-1-5137766 ext. 8035 • Fax 86-1-5135853

