GD-20 Multi-channel System

RES/IP/SP
5/12 independent channels
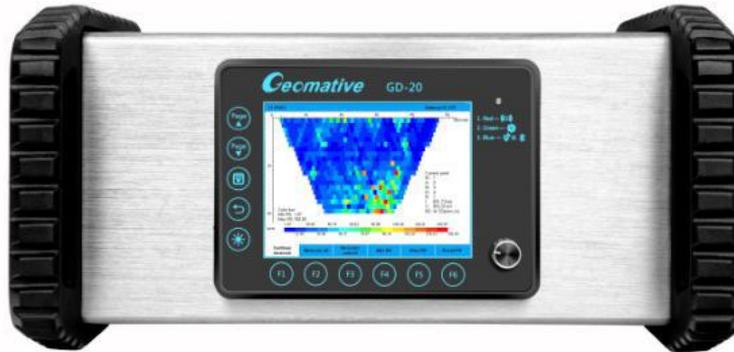
GD-20 is a brand new multichannel geo-electrical system, designed with 5 or 12 channels and up to maximum 10 survey points can be measured concurrently for ERT survey, highly enhancing field survey efficiency. GD-20 can be used in SP, ERT and IP surveys. Comparing to single channel instruments, GD-20 boosts ERT survey efficiency up to 2-3 times in average and lowering working duration of field survey.

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GD-20 is portable and equipped with internal storage for data recording. Multichannel switch box. GD-20 is capable of performing VES, ERT and For VES, 12 depths can be measured concurrently. For ERT surveys, data acquisition can record up to 10 concurrent channels. mode satisfies the need for arrays with infinite far electrodes of N terminal, with 10 individual acquisition channel for the best data collection efficiency.
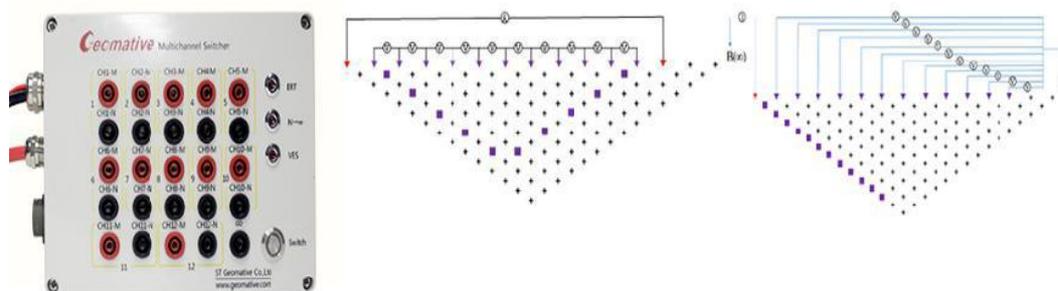
Multi-instrument measurement: 2 array scripts can be measured concurrently for single channeled arrays, promising survey efficiency and the stability of measurement environment
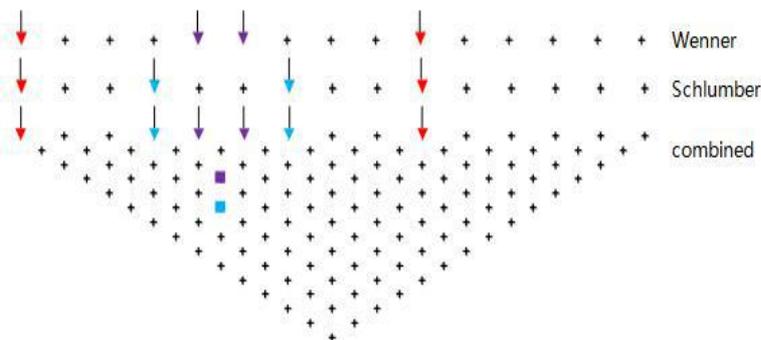
GD-20 multi-channel designed and optimization functions, greatly improving the efficiency of the tes

The average test time of ERT resistivity increased 2-3 times, which means a 30-day project now it can be done in 10 days.

The average test time of ERT induced polarization increased 4-5 times, which means a 30 days project now can be done in 7 days.

Under the same condition, GD-20 system is more efficient than AGI Supersting R8 system.

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ERT Resistivity Test Time Comparison

Device script	Number of electrodes	Geomative measuring points	GD-20 12-channel system test time (minutes)	GD-10 single channel test time (minutes)	AGI measuring points	AGI Supersting R8 8-channel system test time (minutes)
Dipole-dipole	120	5265	75	123	4850	161
AM	120	7140	70	166	7095	115
Cross-hole	60	2255	23	56	2255	72
Wenner	120	2340	58	58	2340	288

ERT test time contrast (16s cycle)						
Device script	Number of electrodes	Geomative measuring points	GD-20 12-channel system test time (minutes)	GD-10 single channel test time (minutes)	AGI measuring points	AGI Supersting R8 8-channel system test time (minutes)
Dipole-dipole	120	5265	525	1942	4850	851
AM	120	7140	466	2023	7095	609
Wenner	120	2340	663	663	2340	1521

Applications:

-Energy resources exploration
-Metal and non-metal mining resources prospecting
-Groundwater resources exploration
-Underground contamination variation detection
-Well electrical resistivity testing
-Interwell tomography
-Urban engineering exploration
-Cavity exploration& pile foundation bedrock

 -Seawater intrusion detection
 - Borehole/Cross-borehole investigation
-Geological mapping
-Archeological studies
-Real-time monitoring of landslides, tailings dams.
-Sediment detection of river, lake& reservoir
-Surface or underwater surveys in the ocean

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In ERT surveys, the major influencing factors to survey efficiency and operation cost are the switching device and multi-takeout cabling, overall size and weight of measurement system, layout efficiency, module reliability and the robustness to adapt to environment and clients' demand. Geomative integrated the advantages of both conventional centralized cabling system and distributed cabling system, incorporating the low-cost and high reliability of the former with the high efficiency and infinitely extensible cable sections of the latter system. A distributed-centralized compacted cabling technique is hence developed, the Geomative. Each cable section has either 5 or 10 takeouts and is controlled through a centralized exchange control at the either end of the cabling heads, while the communication between the cabling heads and the measurement host adopted a distributed controlling approach. Both long cross-section ERT profiling survey and IP profiling can be performed by this system, in which the electrode placement is simple and robust, and the cabling system is highly reliable and low cost.
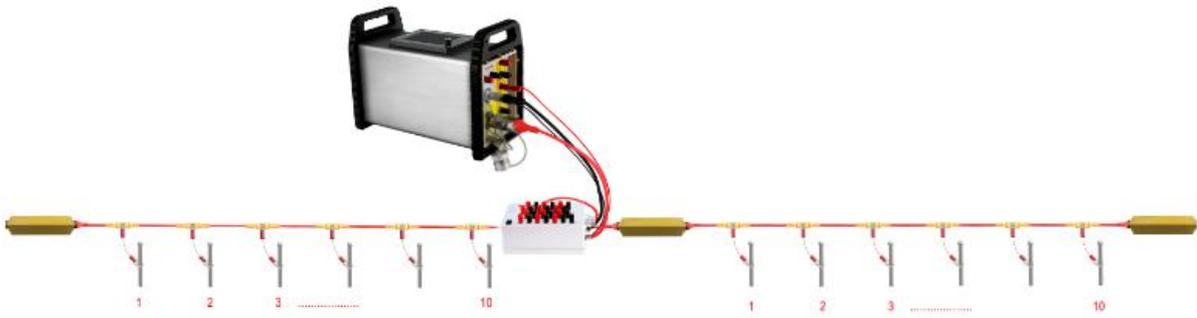
GD-20 adopted modularized design and fully upgradable scheme, lowering the hardware maintenance and replacement cost. When clients intend to upgrade the purchased instrument, clients will only need to purchase corresponding license authorization and modules. Subsequent upgrades can be performed online through Geomative Studio directly and pre-purchased hardware resources are fully utilized. Furthermore, Geomative Studio software facilitates GD-20 geo-electrical measurement system to realize two major features:

● Project management model mode enables client to manage complicated task particulars and measurement data from field surveys;

● Array configuration management function saves client the field operation time and enhance survey efficiency.

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1D Resistivity or IP VES

In 1D VES survey, transmission up to full power 7200W (1200V*6A) can be emitted to allow excited pulse signals to reach deeper strata. For small signals, up to 255 stacking amounts are allowed to enhance measurement accuracy. 1D survey layout can be placed and measured at 12 points concurrently, further reducing the amount of electrode scanning.
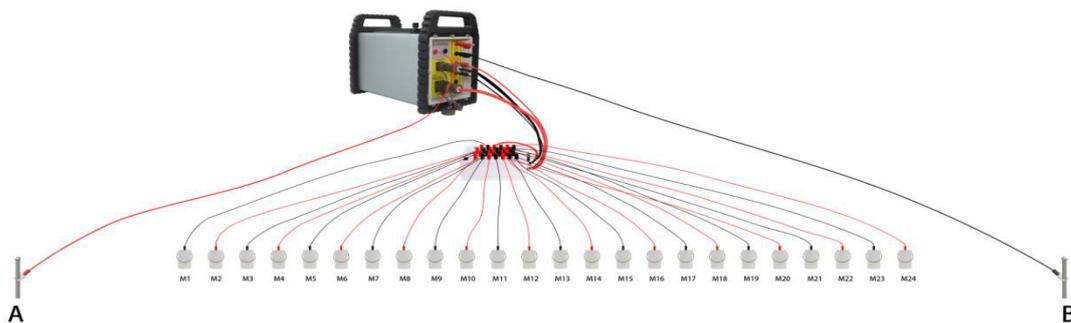
1D array scripts

4P-VES	Composite Profiling
Dipole VES	3P-VES
Mid-grandient	User defined

2D ERT Resistivity or IP Scanning

GD-20 ERT system is capable of conducting 2D cross-section profiling of ERT and IP in field. Through the array script management in Geomative Studio, clients can predefine survey parameters on PC prior to field surveys. Up to 3200W (800V*4A) transmission power can be deployed in field.

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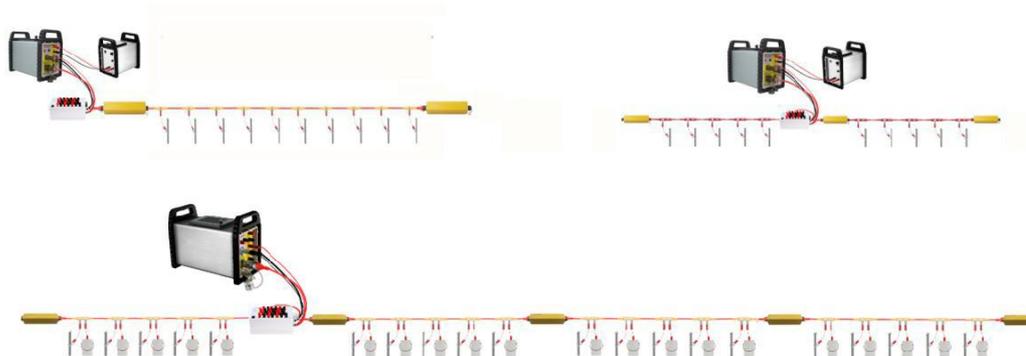
The 2D array

α-Arranging / Winner	Winner - Schlumberger Arrangement
β arrangement / dipole devices	Tri-polar MNB
γ Arrangements / Differential Devices	Cross-Hole Devices
Triode AMN	Bipolar Triode
Pole AM	Edge gradient
Dipole - dipole	Borehole equipment
Schlumberger devices	Triode AMN

3D ERT Resistivity or IP Scanning

Using GD-20 ERT measurement system, the sectional centralized cabling layout can be deployed robustly in a snakelike layout pattern to perform 3D ERT and IP survey. Up to 3200W (800V*4A) can be transmitted under this mode. If ERT cabling is insufficient, limited cabling can be deployed in a dual-direction shifting combination or multiple paralleled 2D survey line data fusion method to cover a larger 3D region.

High-power IP Mid-gradient scanning

Figure 21 Cavity zone (very high resistivity - red color) found in 3D resistivity Model from S-shape of Plot A area, data obtain from Dipole-Dipole electrode array reading.
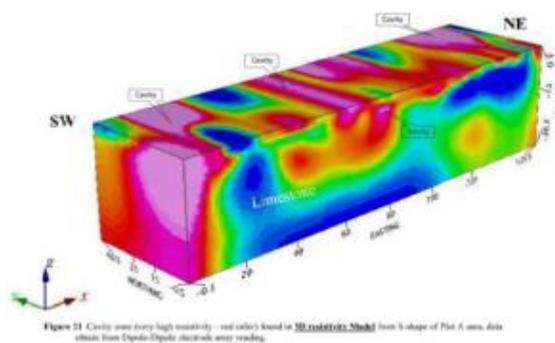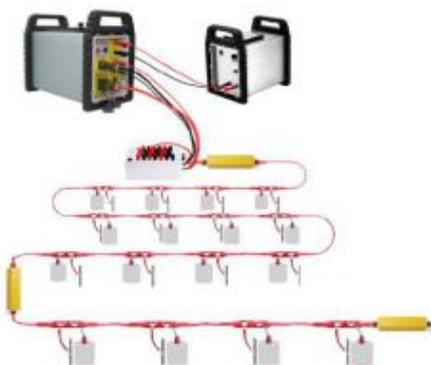
Geomative is the first in the industry to adopt ERT modules in the high-powered IP mid-gradient cross-sectional profiling. Similar to the ERT method, clients can deploy a pair of AB electrodes and multiple sets of non-polarizable electrodes. AB transmitting electrode is connected to the AB terminal port on the GD-20, while the non-polarizable electrodes are connected to the ERT cables takeouts. During IP survey, the host instrument emits electrical signal simultaneously and sequentially select MN electrodes in

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automated mode. Under sufficient amount of cabling and electrodes, the whole lateral cross-sectional profiling can be accomplished in one run, with a significant enhancement in survey efficiency. If signal emission is performed using external transmitter, clients can simply connect the AB terminal port of GD-20 host to the emission circuit in series. GD-10 will automatically monitor and detect the transmitted electrical signals, triggering and synchronizing the MN acquisition channels simultaneously.
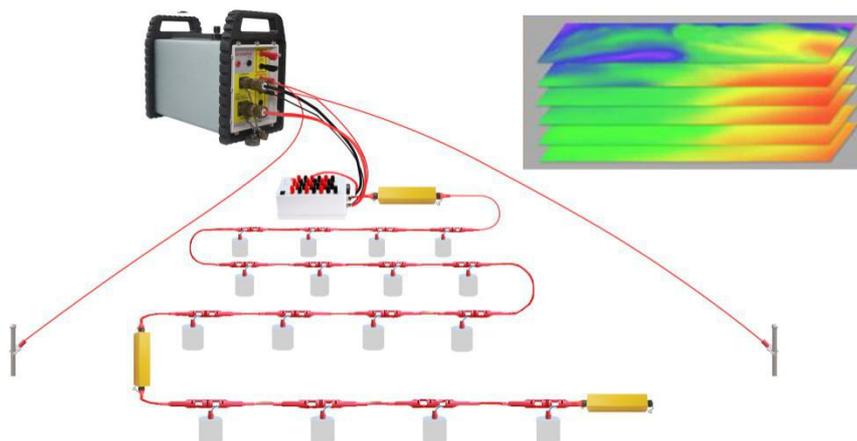
The 3D Array script
Wenner（α）
Wenner（β）
Schlunmberger
Dipole-Dipole
Pole-Dipole
Pole-Pole
Mid gradient

Features

- **Efficiency and Data Quality Assurance from Automatic Stacking Method**

    GD-20 automatically compute and analyze signal strength and data quality during data surveys, in order to determine whether to extend acquisition durations/intervals or to enter data stacking mode. GD measurement system enters high efficiency scanning survey for survey locations with high signal-to-noise ratio, otherwise the acquisition duration is extended or data stacking mode is activated to enhance data quality as much as possible. Clients can also select desired stacking amount according to any point, layers or survey tasks.

- **Efficiency Optimized 2D Roll-along Survey**

    In case of limited cable amount and length, roll-along survey can be used to cover sufficiently long profiles.

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Based on the comprehensive scripting function of Geomative, for each newly created roll-along profiles, the system will only load the array configuration script for the current roll-along profile instead of survey points from the entire profile, boosting survey efficiency significantly.
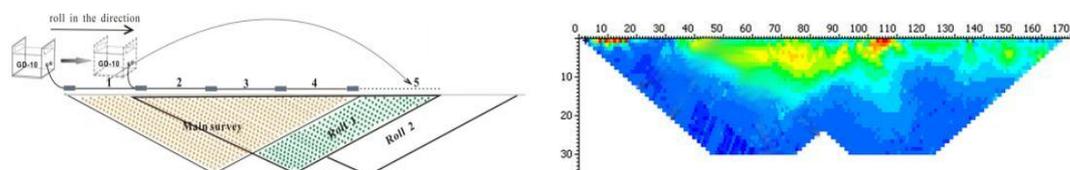
- **Novel Dual-Way Connection and Management Technique**

  Geomative innovated a novel dual-way connection and switching technique, which utilized the front cable connector to manage any arbitrary takeouts. The second last cable takeouts (for dual-takeout cable) or the last cable takeout (for single-takeout cable) at the end of cable core is used to connect the preceding cabling via the cable connector to the subsequent cabling section, in order to establish dual-way connection and management.

1) Single-takeout cabling : By using multiple core cable with the same core amount, connectable takeout amount is doubled up.

2) Double-takeout cabling : The second connecting point can be combined into the current electrode, in order to double up the maximum transmissible current. Non-polarizable electrodes can also be installed in the survey layout, in order to transform into an IP measurement system with individual transmitting and receiving electrodes.

- The protection level of ERT cables and switch relays has reached IP67, fully capable of profiling measurement, with unique 12-channel ERT simultaneous reception scheme, more effective completion of surface data acquisition.

- Both built-in GPS and external differential GPS signal input is supported. Under continuous roll-along survey, location information can be recorded in real-time.

Multi-dimensional customized solution for borehole monitoring

Our borehole survey solutions overturneds the conventional practice of 1D resistivity sounding the in borehole surveys, which supports SP, ERT, IP and other data collection approaches

- Hole-hole
- Hole-ground
- Hole-ground-hole

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GD-20 is equipped with customized electrode wiring box and marine cables, made of stainless steel and titanium alloy material, greatly enhancing oxidation stability and data acquisition accuracy.

Powerful GD-20 Monitoring Host

- GD-20 Supreme ERT System can perform instantaneous measurement up to 10 channels, where every measurement only requires 1 second, so towed continuous roll-along profiling can be performed.
- The maximum 4A transmitting current can not only adapt to high conductive marine environment, but also measure effective signals from deeper depths through high current emission.
- Both built-in GPS and external differential GPS signal input is supported. Under continuous roll-along survey, location information can be recorded in real-time.

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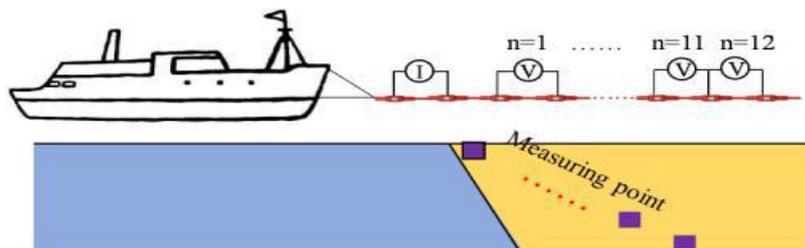
Specification

Transmitter

Maximum Tx power : 7200W; 3200W; 1600W

Maximum Tx Voltage : 800V; 1200V

Maximum Tx Current : 6A; 4A; 2A

Current accuracy : Better than 0.3%

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Protection : IP65, over-current, over-voltage, short circuit

Pulse type : square wave

Pulse width : 1s、2s、4s、8s、16s、32s、64

Input impedance : ≥200MΩ

Receiver

No.of channels : 5,12

Manual iteration : 1~255 times

Automatic iteration: 1~10 times

Voltage range : ±24V

SP compensation : ±10V

Noise rejection : ≥120dB

Dynamic Averaging : 24bits A/D conversion

Accuracy : 0.3%±1uV

Precision: 0.1%

Others

Weight : 8.5KG

Size : 39cm*20cm*29cm

Storage temperature : -10℃~+60℃

Working temperature : -10℃~50℃

Operating humidity : ≤95%

Memory capacity : 8GB

Charging voltage : 120~250VAC（50HZ/60HZ）

Display screen : 5.7-inch full-color LCD screen, 640*480

External power : DC24~60V

Built-in battery : 16.8V lithium battery

I/O Port：USB,RS485

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