

# MINISTING

# MINI STING RICH RESIDENT METERS AGENTALISM STATE OF THE STATE OF THE

## SMALL, BUT MIGHTY

The MiniSting ™ R1 is a highpowered, induced polarization (IP) and electrical resistivity instrument used for testing grounding grids, soil resistivity testing for corrosion protection design, and more. This single-channel tool is expertly engineered for manual resistivity jobs. Ease of use, low cost, and high accuracy make it ideal for low-manpower explorations and training demonstrations.

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# **FEATURES**

**EARTH RESISTIVITY** 

**& IP METER** 

#### **High-Powered & Lightweight**

This high-powered, lightweight tool has a built-in rechargeable NiMH battery—you can get a day's worth of manual surveying from one charge. The system includes a battery charger.

#### An easy-to-use, menu-driven system

Recorded data is saved in the internal memory—and at a convenient time—downloaded to a computer for further processing. Our utility software, The Administrator, is included with the MiniSting $^{\text{TM}}$  as well as a serial download cable with a USB adapter. The Administrator software is used for data download.

#### **Rugged construction**

Whether you're working in the swamp or the desert, the MiniSting $^{\text{TM}}$  is versatile enough to withstand harsh climates and provide accurate data.

#### Versatile

The MiniSting<sup>TM</sup> reports in feet or meter: For example, the Wenner 4-pin method is typically specified for Wenner spacing in feet, but the reporting is required in Ohm Centimeter. Simply set the MiniSting<sup>TM</sup> for feet before surveying, and switch to meter after the survey before you download the data. Then move the decimal point two steps to the right to get Ohm Centimeter. This instrument can be configured in several ways depending on what you are measuring.

# Pairs seamlessly with AGI tools for immediate results

For example, you can get more from your data when you pair the MiniSting™ with the EarthImager™ 1D—in addition to empirical calculations, you'll also get modeled calculations that represent true resistivity, layer thickness, and depth to each layer so you can use your results and immediately take next steps with certainty.

#### **PREPROGRAMMED ARRAYS**

The MiniSting™ is preprogrammed in manual measurement mode for the following arrays:

- + Wenner
- + Pole-Dipole
- + Self-Potential (SP)

- + Schlumberger
- + Pole-Pole
- + Resistance

- + Dipole-Dipole
- + Mise-A-La-Masse
- + Azimuthal

#### **►** MINISTING™ USE CASES:

The MiniSting™ geophysical instrument is recommended for vertical electrical sounding (VES), profiling, the IEEE fall-off-potential (FOP) method, and the four-pin Wenner soil test (ASTM G57) for soil resistivity.

It is versatile enough for both water and earth uses, including:

- + Groundwater Investigation
- + Grounding Studies
- + Cathodic Protection Design
- + Soil Tests

### $\textbf{MiniSting}^{\text{TM}} \ \textbf{Technical Specification}$

Measurement modes Apparent resistivity, resistance, voltage (SP), induced polarization (IP), battery voltage Measurement range A volt RX to 0.1 milliol (resistance), 0-500 V full scale voltage auto-ranging.  Measuring resolution A digits in engineering notation  Output current 1-2-510-20-59-100-200-500 mA.  Output voltage The user can swich between high and low voltage limit for the transmitter (800 Vp-p or 320 Vp-p voltage limit). Actual electrode voltage depends on transmitted current and ground resistivity.  Input gain ranging Automatic, always uses full dynamic range of receives.  Input voltage PS compensation Automatic cancellation of SP voltages during resistivity measurement. Constant and linearly varying SP cancels completely.  Time domain chargeolibility (M), six time slots measurement. Constant and linearly varying SP cancels completely.  Time of domain chargeolibility (M), six time slots measurement. Constant and linearly varying SP cancels completely.  Time of domain chargeolibility (M), six time slots measurement. Constant and linearly varying SP cancels completely.  Time of domain chargeolibility (M), six time slots measurement. Constant and linearly varying SP cancels completely.  Time of domain chargeolibility (M), six time slots measurement. Constant and linearly varying SP cancels completely.  Time of DN+, OFF, ON+, OFF  PI current transmission  N+, OFF, ON+, OFF  PI current transmission  Automatic cancellation of SP voltages during resistivity for an analysis of the six of the source of the six of the source of the six of the source of the six of the		MiniSting™ R1 IP, MEMORY EARTH RESISTIVITY & IP METER
Measurement range 400 kQ to 0.1 milliQ (resistance), 0.500 V full scale voltage auto-ranging.  Measurement range 4xx 30 nV, depends on voltage level Scene resolution Output current 1-2-5-10-20-50-100-200-500 mA.  Cutput voltage The user can switch between high and low voltage limit for the transmitter (800 Vp-p or 320 Vp-p voltage limit). Actual electrode voltage depends on transmitted current and ground resistative, imput gain ranging Automatic, always uses full dynamic range of receiver.  Imput impedance and automatic cancellation of SP voltages during resistivity measurement. Constant and linearly varying SP cancels completely.  Yee of IP measurement Time domain chargeability (N), six time slots measured and stored in memory  IP current transmission ON+, OFF, ON-, OFF IP time cycles 1, 1, 2, 5, 4 s and 8 s Basic measurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done.  Cycle time Basic measure time is 1, 2, 3, 6, 7, 2 or 14.4 s as selected by user via keyboard, auto ranging and commutation  display and 1.4 s.  Signal processing Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (AVIT) and apparent resistivity (2m). Resistivity is calculated using user entered electrode array coordinates.  Settler than 120 8d a for 20 if the measurements.  Signal processing Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (AVIT) and apparent resistivity (2m). Resistance, (3 to 2, 3, 5 to and 60 Hz)  Better than 120 8d a for 20 if the continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (AVIT) and apparent resistivity (2m). Resistance, and appar	Item	Description
Measuring resolution  Measuring resolution  A digital in engineering notation  Output cultrant  1-25-10-20-50-100-2005 0m.A.  Output voltage  The user can switch between high and low voltage limit for the transmitter (800 Vp-p or 320 Vp-p voltage limit). Actual electrode voltage depends on transmitted current and ground resistivity.  Input impedance  Input impedance  Input impedance  New S00 V  SP compensation  Automatic cancellation of SP voltages during resistivity measurement. Constant and linearly varying SP cancels completely.  Time domain chargeability (M), six time slots measured and stored in memory  IP current transmission  Continuous averaging after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done debugged and advance cycles. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done debugged and active company and advanced and set in 2, 3, 6, 7, 2 or 14.4 s. as selected by user via keyboard, autor ranging and commutation add should transmit estativity (Im). Resistivity is calculated using user entered electrode array coordinates.  Noise suppression  Better than 100 dB at F>20 Hz  Better	Measurement modes	Apparent resistivity, resistance, voltage (SP), induced polarization (IP), battery voltage
4 digits in engineering notation Output current 1-25-10-20-50-100-200-500 mA. Output voltage The user can switch between high and low voltage limit for the transmitter (800 Vp-p or 320 Vp-p voltage limit). Actual electrode voltage depends on transmitted current and ground resistivity.  Input gain ranging Automatic, always uses full dynamic range of receiver. Input impedance 2-20 MC Input voltage Max 300 V  Ps compensation Automatic cancellation of SP voltages during resistivity measurement. Constant and linearly varying SP cancels completely.  The comment of the seasurement constant and linearly varying SP cancels completely.  The comment of the seasurement constant and linearly varying SP cancels completely.  The comment of the seasurement constant and linearly varying SP cancels completely.  The comment of the seasurement constant and stored in memory  The comment of the seasurement constant and stored in memory  The comment of the seasurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done Received from the seasurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done Received from the seasurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done Received from the seasurement of the seasurement of the seasurement and set should be set of the seasurement and set of the seasurement. Storage is effected automatically and display uning estimate of measurements). Field measurement accuracy depends on ground noise and resistivity. Instrument will calculate and display immining estimate of measurements). Field measurement accuracy depends on ground noise and resistivity. Instrument will calculate and	Measurement range	400 k $\Omega$ to 0.1 milli $\Omega$ (resistance), 0-500 V full scale voltage auto-ranging.
Output current 1-2-5-10-20-50-100-200-500 mA. Output violage The user can switch between high and low voitage limit for the transmitter (800 Vp-p or 320 Vp-p voitage limit). Actual electrode voitage depends on transmitted current and ground resistivity.  Input apparance Input windpadnace Input windp	Measuring resolution	Max 30 nV, depends on voltage level
The user can switch between high and low voltage limit for the transmitter (800 Vp-p or 320 Vp-p voltage limit). Actual electrode voltage depends on transmitted current and ground resistivity.  Input voltage  Automatic annotation.  Automatic annotation of SP voltages during resistivity measurement. Constant and linearly varying SP cancels completely.  Time domain chargeability (M), six time slots measured and stored in memory  ON+, OFF, ON+, OFF  IP current transmission  IP current transmission  ON+, OFF, ON+, OFF  IP time cycles  1, 2, 2, 4 and 8 s  Running average of measurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done cycle time  Basic measure time is 1.2, 3, 6, 7.2 or 14.4 s as selected by user via keyboard. auto ranging and commutation adds about 1.4 s.  Signal processing  Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (ΔV/I) and apparent resistivity (Mn), Resistivity is calculated using user entered electrode array coordinates.  Signal processing  Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (ΔV/I) and apparent resistivity (Mn), Resistivity is calculated using user entered electrode array coordinates.  Noise suppression  Better than 120 dis at power line frequencies (15 2/3, 2, 0, 50 and 66 Hz).  Total accuracy  Better than 120 dis at power line frequencies (15 2/3, 2, 0, 50 and 66 Hz).  Calibration is done digitally by the microprocessors based on correction values stored in memory.  Supported configurations  Resistance, Schlumberger, Wenner, dipole-dipole, pole-pole, palmuthal, mise-a-la-masse, SP (absolute) and SP (gradient).  Data storage  If ull resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  Memory capacity  Memor	Screen resolution	4 digits in engineering notation
transmitted current and ground resistivity.  Input gain ranging Automatic, always uses full dynamic range of receiver.  Input pain ranging Automatic, always uses full dynamic range of receiver.  Input voltage Max 500 V  SP compensation Automatic cancellation of SP voltages during resistivity measurement. Constant and linearly varying SP cancels completely.  Time domain chargeability (M), six time slots measured and stored in memory  IP time cycles 1s, 2s, 4s and 8s  Running average of measurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done Cycle time Basic measure time is 1z, 3.6f, 7z or 14.4s as selected by user via keyboard, auto ranging and commutation adds about 1.4s.  Signal processing Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (ΔV/I) and apparent resistivity (2m). Resistivity is calculated using user entered electrode array coordinates.  Noise suppression  Better than 100 dB at power line frequencies (16 2/3, 20, 50 and 60 Hz).  Total accuracy  Better than 100 dB at power line frequencies (16 2/3, 20, 50 and 60 Hz).  Better than 100 dB at power line frequencies (16 2/3, 20, 50 and 60 Hz).  Supported configurations  Calibration is done digitally by the microprocessor based on correction values stored in memory.  Supported configurations  Resistance, Schlumberger, Wenner, dipole-dipole, pole-dipole, pole-pole, azimuthal, mise-a-la-masse, SP (absolute) and SP (gradient).  Full resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  Memory capacity  More than 3000 measuring points can be stored in internal memory.  Data transmission  Re-232C channel included to dump data from instrument to PC on user command.  User controls  Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors  Alphanumeric LCD displ	Output current	1-2-5-10-20-50-100-200-500 mA.
Input Impedance	Output voltage	
Input voltage Max 500 V  SP compensation Automatic cancellation of SP voltages during resistivity measurement. Constant and linearly varying SP cancels completely.  Type of IP measurement Time domain chargeability (M), six time slots measured and stored in memory  IP turner transmission ON+, OFF, ON+, OFF  IP time cycles 1, 2, 2, 4 s and 8 s  Measure cycles Running average of measurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done cycle time Basic measure time is 1.2, 3.6, 7.2 or 14.4 s as selected by user via keyboard, auto ranging and commutation adds about 1.4 s.  Signal processing Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (ΔV/I) and apparent resistivity (Dm). Resistivity is calculated using user entered electrode array coordinates.  Noise suppression Better than 100 dB at F>20 Hz  Better than 100 dB at power line frequencies (16 2/3, 20, 50 and 60 Hz).  Total accuracy Better than 100 dB at power line frequencies (16 2/3, 20, 50 and 60 Hz).  Calibration is done digitally by the microprocessor based on correction values stored in memory.  System calibration Calibration is done digitally by the microprocessor based on correction values stored in memory.  Supported configurations  Data storage Full resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  Memory capacity More than 3000 measuring points can be stored in internal memory.  Solver controls Ox	Input gain ranging	Automatic, always uses full dynamic range of receiver.
Automatic cancellation of SP voltages during resistivity measurement. Constant and linearly varying SP cancels completely.  Type of IP measurement Time domain chargeability (M), six time slots measured and stored in memory  IP current transmission ON+, OFF, ON+, OFF IP time cycles 1 s, 2 s, 4 s and 8 s  Measure cycles Running average of measurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done cycle time Basic measure time is 1.2, 3.6, 7.2 or 14.4 s as selected by user via keyboard, auto ranging and commutation adds about 1.4 s.  Signal processing Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (ΔV/I) and apparent resistivity (Ωm). Resistivity is calculated using user entered electrode array coordinates.  Noise suppression Better than 100 8a for 200 Hz Better than 100 8a for 200 Hz Better than 100 8a for 200 Hz Better than 100 8d as power line frequencies (16 2/3, 20, 50 and 60 Hz).  Better than 13 of or reading in most cases (lab measurements). Field measurement accuracy depends on ground noise and resistivity. Instrument will calculate and display running estimate of measuring accuracy.  System calibration Calibration is done digitally by the microprocessor based on correction values stored in memory.  Resistance, Schlumberger, Wenner, dipole-dipole, pole-dipole, pole-pole, azimuthal, mise-a-la-masse, SP (absolute) and SP (gradient).  Data storage Full resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  Memory capacity More than 3000 measuring points can be stored in internal memory.  Bata transmission  R5-232C channel included to dump data from instrument to PC on user command.  User controls  Olsepid which were the proof keyboard with numeric entry keys and function keys.  Cryoff switch.  Messure botton, integrated within main k	Input impedance	>20 MΩ
Time domain chargeability (M), six time slots measured and stored in memory  IP current transmission  ON+, OFF, ON-, OFF  IP time cycles  1 s, 2 s, 4 s and 8 s  Running average of measurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done cycle time  Basic measure time is 1.2, 3.6, 7.2 or 14.4 s as selected by user via keyboard, auto ranging and commutation adds about 1.4 s.  Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (ΔV/I) and apparent resistivity (Ωm). Resistivity is calculated using user entered electrode array coordinates.  Noise suppression  Better than 100 dB at 5-20 Hz  Better than 110 of Ba th power line frequencies (16 2/3, 20, 50 and 60 Hz).  Better than 120 dB at power line frequencies (16 2/3, 20, 50 and 60 Hz).  Better than 13% of reading in most cases (lab measurements). Field measurement accuracy depends on ground noise and resistivity. Instrument will calculate and display running estimate of measuring accuracy.  System calibration  Calibration is done display by the minerprocessor based on correction values stored in memory.  Supported configurations  Resistance, Schlumberger, Wenner, dipole-dipole, pole-dipole, pole-pole, azimuthal, mise-a-la-masse, SP (absolute) and SP (gradient).  Data storage  Full resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  More than 3000 measuring points can be stored in internal memory.  Data transmission  Res-232C channel included to dump data from instrument to PC on user command.  User controls  Q1 key tactile, weather proof keyboard with numeric entry keys and function keys.  On/off switch Measure button, integrated within main keyboard.  LCD night light switch (push to light).  Display  Alphanumeric LCD display (4 lines x 20 characters) with night light.  One point in point	Input voltage	Max 500 V
P current transmission  ON+, OFF, ON-, OFF IP time cycles  1 s, 2 s, 4 s and 8 s  Running average of measurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done Cycle time  Basic measure time is 1.2, 3.6, 7.2 or 14.4 s as selected by user via keyboard, auto ranging and commutation adds about 1.4 s.  Signal processing  Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (ΔV/I) and apparent resistivity (Ωm). Resistivity is calculated using user entered electrode array coordinates.  Noise suppression  Better than 100 dB at f> 20 Hz Better than 110 dB at f> 20 Hz Better than 120 dB at power line frequencies (16 2/3, 20, 50 and 60 Hz).  Better than 19 of reading in most cases (lab measurements). Field measurement accuracy depends on ground noise and resistivity. Instrument will calculate and display running estimate of measuring accuracy.  System calibration  Calibration is done digitally by the microprocessor based on correction values stored in memory.  Supported configurations  Resistance, Schlumberger, Wenner, dipole-dipole, pole-pole, azimuthal, mise-a-la-masse, SP (absolute) and SP (gradient).  Data storage  Full resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  Memory capacity  More than 3000 measuring points can be stored in internal memory.  Bata transmission  Sez-222C channel included to dump data from instrument to PC on user command.  20 key tactle, weather proof keyboard with numeric entry keys and function keys.  On/off switch Messure button, integrated within main keyboard.  LCD night light switch (push to light).  Display  Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors  4 banana plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connec	SP compensation	Automatic cancellation of SP voltages during resistivity measurement. Constant and linearly varying SP cancels completely.
IP time cycles  1 s, 2 s, 4 s and 8 s  Measure cycles  Running average of measurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done cycle time  Basic measure time is 1.2, 3.6, 7.2 or 14.4 s as selected by user via keyboard, auto ranging and commutation adds about 1.4 s.  Signal processing  Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (ΔV/I) and apparent resistivity (Ωm). Resistivity is calculated using user entered electrode array coordinates.  Noise suppression  Better than 10 28 at 7-20 Hz  Better than 10 28	Type of IP measurement	Time domain chargeabilitiy (M), six time slots measured and stored in memory
Measure cycles Running average of measurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done Cycle time Basic measure time is 1.2, 3.6, 7.2 or 14.4 s as selected by user via keyboard, auto ranging and commutation adds about 1.4 s.  Signal processing Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (ΔV/I) and apparent resistivity (Ωm). Resistivity is calculated using user entered electrode array coordinates.  Noise suppression Better than 100 dB at 7c 20 Hz Better than 100 dB at 7c 20 Hz Better than 1100 dB at 7c 20 Hz Be	IP current transmission	ON+, OFF, ON-, OFF
Experience of the season of t	IP time cycles	1 s, 2 s, 4 s and 8 s
adds about 1.4 s.  Signal processing Continuous averaging after each complete cycle. Noise errors calculated and displayed as percentage of reading. Reading displayed as resistance (ΔV/I) and apparent resistivity (2m). Resistivity is calculated using user entered electrode array coordinates.  Noise suppression Better than 100 dB at f>20 Hz Better than 120 dB at power line frequencies (16 2/3, 20, 50 and 60 Hz).  Total accuracy Better than 1% of reading in most cases (lab measurements). Field measurement accuracy depends on ground noise and resistivity. Instrument will calculate and display running estimate of measuring accuracy.  System calibration Calibration is done digitally by the microprocessor based on correction values stored in memory.  Supported configurations Resistance, Schlumberger, Wenner, dipole-dipole, pole-dipole, pole-pole, azimuthal, mise-a-la-masse, SP (absolute) and SP (gradient).  Data storage Full resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  Memory capacity More than 3000 measuring points can be stored in internal memory.  Data transmission RS-232C channel included to dump data from instrument to PC on user command.  User controls On/off switch Measure button, integrated within main keyboard. LCD night light switch (push to light).  Display Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors 4 banana plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connector for RS-232C and synchronization connections.  Power supply 12V, 4.5 Ah NiMH bulit-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery cha	Measure cycles	Running average of measurement displayed after each cycle. Automatic cycle stop when reading errors fall below user set limit or user set max cycles are done
and apparent resistivity (2m). Resistivity is calculated using user entered electrode array coordinates.  Better than 100 dB at power line frequencies (16 2/3, 20, 50 and 60 Hz).  Total accuracy  Better than 19% of reading in most cases (lab measurements). Field measurement accuracy depends on ground noise and resistivity. Instrument will calculate and display running estimate of measuring accuracy.  System calibration  Calibration is done digitally by the microprocessor based on correction values stored in memory.  Supported configurations  Resistance, Schlumberger, Wenner, dipole-dipole, pole-dipole, pole-pole, azimuthal, mise-a-la-masse, SP (absolute) and SP (gradient).  Full resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  Memory capacity  More than 3000 measuring points can be stored in internal memory.  Data transmission  RS-232C channel included to dump data from instrument to PC on user command.  User controls  On/off switch Measure button, integrated within main keyboard.  LCD night light switch (push to light).  Display  Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors  4 banana plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connector for RS-232C and synchronization connections.  Power supply  12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Operating time  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)	Cycle time	
Better than 120 dB at power line frequencies (16 2/3, 20, 50 and 60 Hz).  Total accuracy  Better than 1% of reading in most cases (lab measurements). Field measurement accuracy depends on ground noise and resistivity. Instrument will calculate and display running estimate of measuring accuracy.  System calibration  Calibration is done digitally by the microprocessor based on correction values stored in memory.  Supported configurations  Resistance, Schlumberger, Wenner, dipole-dipole, pole-dipole, pole-pole, azimuthal, mise-a-la-masse, SP (absolute) and SP (gradient).  Data storage  Full resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  Memory capacity  More than 3000 measuring points can be stored in internal memory.  Data transmission  RS-232C channel included to dump data from instrument to PC on user command.  User controls  20 key tactile, weather proof keyboard with numeric entry keys and function keys.  On/off switch Measure button, integrated within main keyboard.  LCD right light switch (push to light).  Display  Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors  4 banana plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connector for RS-232C and synchronization connections.  Power supply  12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)	Signal processing	
calculate and display running estimate of measuring accuracy.  System calibration  Calibration is done digitally by the microprocessor based on correction values stored in memory.  Resistance, Schlumberger, Wenner, dipole-dipole, pole-dipole, pole-pole, azimuthal, mise-a-la-masse, SP (absolute) and SP (gradient).  Data storage  Full resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  Memory capacity  More than 3000 measuring points can be stored in internal memory.  Data transmission  RS-232C channel included to dump data from instrument to PC on user command.  User controls  20 key tactile, weather proof keyboard with numeric entry keys and function keys.  On/off switch Measure button, integrated within main keyboard.  LCD night light switch (push to light).  Display  Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors  4 banan plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connector for RS-232C and synchronization connections.  Power supply  12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)	Noise suppression	
Supported configurations Resistance, Schlumberger, Wenner, dipole-dipole, pole-dipole, pole-pole, azimuthal, mise-a-la-masse, SP (absolute) and SP (gradient).  Full resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  Memory capacity More than 3000 measuring points can be stored in internal memory.  Bata transmission RS-232C channel included to dump data from instrument to PC on user command.  User controls  20 key tactile, weather proof keyboard with numeric entry keys and function keys. On/off switch Measure button, integrated within main keyboard. LCD night light switch (push to light).  Display Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors 4 banana plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connector for RS-232C and synchronization connections.  Power supply  12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)  Weight  6.6 kg (14.5 lb.)	Total accuracy	
Pull resolution reading average and error are stored along with user entered coordinates and time of day for each measurement. Storage is effected automatically.  Memory capacity  More than 3000 measuring points can be stored in internal memory.  RS-232C channel included to dump data from instrument to PC on user command.  User controls  20 key tactile, weather proof keyboard with numeric entry keys and function keys. On/off switch Measure button, integrated within main keyboard. LCD night light switch (push to light).  Display  Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors  4 banana plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connector for RS-232C and synchronization connections.  Power supply  12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)  Weight  6.6 kg (14.5 lb.)	System calibration	Calibration is done digitally by the microprocessor based on correction values stored in memory.
automatically.  Memory capacity  More than 3000 measuring points can be stored in internal memory.  RS-232C channel included to dump data from instrument to PC on user command.  User controls  20 key tactile, weather proof keyboard with numeric entry keys and function keys. On/off switch Measure button, integrated within main keyboard. LCD night light switch (push to light).  Display  Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors  4 banana plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connector for RS-232C and synchronization connections.  Power supply  12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Operating time  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)  Weight  6.6 kg (14.5 lb.)	Supported configurations	Resistance, Schlumberger, Wenner, dipole-dipole, pole-dipole, pole-pole, azimuthal, mise-a-la-masse, SP (absolute) and SP (gradient).
Data transmission  RS-232C channel included to dump data from instrument to PC on user command.  User controls  20 key tactile, weather proof keyboard with numeric entry keys and function keys. On/off switch Measure button, integrated within main keyboard. LCD night light switch (push to light).  Display  Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors  4 banana plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connector for RS-232C and synchronization connections.  Power supply  12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Operating time  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)  6.6 kg (14.5 lb.)	Data storage	
User controls  20 key tactile, weather proof keyboard with numeric entry keys and function keys. On/off switch Measure button, integrated within main keyboard. LCD night light switch (push to light).  Display  Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors  4 banana plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connector for RS-232C and synchronization connections.  Power supply  12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Operating time  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)  6.6 kg (14.5 lb.)	Memory capacity	More than 3000 measuring points can be stored in internal memory.
On/off switch Measure button, integrated within main keyboard. LCD night light switch (push to light).  Display  Alphanumeric LCD display (4 lines x 20 characters) with night light.  Connectors  4 banana plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connector for RS-232C and synchronization connections.  Power supply  12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Operating time  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)  Weight  6.6 kg (14.5 lb.)	Data transmission	RS-232C channel included to dump data from instrument to PC on user command.
4 banana plug, pole screws for current and potential electrodes. 3-pole KPT connector for external power, 10-pole KPT connector for RS-232C and synchronization connections.  Power supply  12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)  6.6 kg (14.5 lb.)	User controls	On/off switch Measure button, integrated within main keyboard.
synchronization connections.  Power supply  12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.  Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)  6.6 kg (14.5 lb.)	Display	Alphanumeric LCD display (4 lines x 20 characters) with night light.
Operating time       Depends on conditions, internal circuitry in auto mode adjusts current to save energy. At 20 mA output current and 10 kΩ electrode resistance more than 2000 cycles are available from a fully charged battery pack.         Battery charger       Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)         Weight       6.6 kg (14.5 lb.)	Connectors	
2000 cycles are available from a fully charged battery pack.  Battery charger  Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)  6.6 kg (14.5 lb.)	Power supply	12V, 4.5 Ah NiMH built-in rechargeable battery. External power connector on front panel, the instrument automatically selects external battery if present.
Weight 6.6 kg (14.5 lb.)	Operating time	
	Battery charger	Dual stage charger with switchable input (115/230 V AC @ 50/60 cycles)
Dimensions Width 255 mm (10"), length 255 mm (10") and height 123 mm (5").	Weight	6.6 kg (14.5 lb.)
	Dimensions	Width 255 mm (10"), length 255 mm (10") and height 123 mm (5").